GOULD AND PYLE'S CYCLOPEDIA

OF

PRACTICAL MEDICINE AND SURGERY

SCOTT

GOULD AND PYLE'S

CYCLOPEDIA OF PRACTICAL MEDICINE AND SURGERY

WITH PARTICULAR REFERENCE TO DIAGNOSIS AND TREATMENT

FOURTH EDITION, REVISED AND ENLARGED

By R. J. E. SCOTT, M. A., B. C. L., M. D.,
NEW YORK

WITH SIX HUNDRED AND FIFTY-FOUR ILLUSTRATIONS

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PREFACE TO THE FOURTH EDITION

The present revision will be found to include many new articles as well as a large number of changes. New material will be found under the following headings: Acidosis; Anthrax; Antinarcotic Legislation; Atophan; Baseball Finger; Benedict's Test for Sugar; Benedikt's Syndrome; Blood Pressure; Bronchoscopy; Carrel-Dakin Solution and Treatment of Wounds; Macewen's Sign and Brudzinski's Sign in Cerebrospinal Meningitis; Chauffeur's Fracture; Affections of Cicatrices; Dietetic (Starvation) Treatment of Diabetes; Schick's Reaction in Diphtheria; Emetine Treatment of Dysentery; Erythremia; Garrod's Thread Test; Gas Gangrene; Treatment of Gonorrhea; Treatment of Gout; Intraspinal Therapy in Locomotor Ataxia; Treatment of Malaria; Calcium Sulfid Treatment of Poisoning by Corrosive Sublimate; Fischer's Treatment of Nephritis; Karell's Treatment of Nephritis; Optochin; Infantile Paralysis; Pellagra; Liquid Petrolatum; Phenolsulphonepthalein Test; Parresine; Rickets; Rocky Mountain Spotted Fever; Coley's Treatment of Sarcoma; Staphylococcus and Streptococcus Infections; Sickroom; Tennis Leg; Russo's Test in Typhoid Fever; Typhoid State; Trench Feet; Trench Fever; Vincent's Angina; War Surgery; Weil's Disease.

A few articles have been omitted; condensation has been effected wherever possible; and the needs and requirements of the busy practitioner have ever been kept in mind.

New York. R. J. E. SCOTT.

PREFACE TO THE THIRD EDITION

In spite of the very thorough revision to which this work was subjected three years ago, the call for a new edition has made it possible to include several new sections as well as to make such changes in some of the articles as are necessary to bring them into accord with recently established facts. The number of cross references has been materially increased; and it is hoped that this work, in its revised form, will prove even more useful than before.

New articles will be found on: Accommodation; Adalin; Schaefer's Method of Artificial Respiration; Ulcer of the Bladder; Fracture of the Carpal Bones; Cervical Ribs; Coleman-Shaffer Diet in Typhoid and Other Fevers; Cysts; Dementia Præcox; Emetin in Dysentery, and in Pyorrhæa Alveolaris; Removal of Gunpowder Stains; the Harrison Law; Hibbs' Method of Treating Congenital Dislocation of the Hip, and Osteoplastic Operation for Pott's Disease of the Spine; Hirschsprung's Disease; Kraepelin's Classification of Mental Diseases; Idiocy and Imbecility; Intratracheal Insufflation of Ether; the Luetin Reaction; Madelung's Deformity; Mesenteric Cysts; Narcophin; Omentum; Pantopon; Pulmotor; Retroperitoneal Tumors; Achromatic Bifocals, and Fused Bifocals; Care of Spectacles; Splenectomy; Sprengel's Shoulder; Trigger Finger; and Twilight Sleep.

New York. R. J. E. SCOTT.

PREFACE TO THE SECOND EDITION

The general plan of this book, so skilfully outlined by the previous editors, has been maintained. At the same time every part of it has been thoroughly revised, much of it has been rewritten, a number of new articles have been incorporated, and a few of the old ones have been omitted.

In the new material will be found articles on: Anatomic Age; Appendicitis; Autointoxication; Bier's Hyperemic Treatment; Blood-pressure; Breast (Tumors); Brill's Disease; Cerebrospinal Meningitis (Treatment); Colon Bacillus Infection; Craniectomy; Cryoscopy; Cytology; Eclampsia; Feces; Food-adulteration; Fourth-of-July Accidents; Glandular Fever; Hand (Palmar Abscess); Heart-block; Hookworm Disease; Immunity; Inoscopy; Lambert's Treatment for Narcotic Addiction; Laryngeal Muscles (Paralysis); Modified Milk in Infant Feeding; Mosquitos; Nose (Diseases of the Accessory Sinuses); Opsonin Therapy; Parasites; Paratyphoid Fever; Pellagra; Pyorrhea Alveolaris; Radium; Roentgen Rays; Sepsis; Serum Therapy; Sleeping Sickness; Teeth (Extraction); Tuberculin; Tuberculosis (Treatment); Uterus (Retrodisplacements); Vaccine Therapy; and Vaginal Douche.

The following articles (among others) have been largely rewritten or added to: Alcohol; Anemias; Antiseptics and Disinfectants; Blood (Examination); Caisson Disease; Carcinoma; Cystoscope; Hernia; Intestinal Surgery; Lungs (Surgery); Malarial Fevers; Pain; Phototherapy; Prostate Gland (Hypertrophy); Rape; Sewage Disposal; Stomach (Surgery); Syphilis (Salvarsan); and Worms.

These lists by no means represent all the changes in the work. Indeed, it is safe to say that very few articles remain exactly as they were in the former edition. This is not due to any desire for change or love of unnecessary work on the part of the present editor but was necessitated by the advances made in every branch of medical science during the past decade.

There are more than two hundred additional illustrations besides the large number of old figures that have been replaced by better ones.

Special provision has been made for the reader in need of immediate information on diagnosis and treatment. In furtherance of this object, cross-references have been very freely inserted. Catch words are placed at the top of each page; the first title indicates the first topic in the left-hand column, and the second one the last topic in the right-hand column. The prescriptions, which are very numerous, are written in English, and without abbreviations; and the scruple sign has been eliminated as being both confusing and unnecessary.

Attention is directed to the information in tabular form; not only is there a great increase in the number of tables presented, but they are all so arranged that they can be read without the book being turned round.

Readers of the first edition will miss from the list of contributors such names as Senn, Bullitt, Burnett, Hughes, Solly, DeForest Willard, and others now deceased.

Throughout the whole period of the preparation of this new edition, the interests of the general practitioner have been kept in mind. While we have been fortunate in se-

curing the services of eminent specialists, and are very thankful to them for their valuable contributions, it is for the practitioner and not for the specialist that the volume is mainly intended. In a word, the purpose of the present edition of this Cyclopedia is to provide the general medical reader with a source of information *on every medical subject except his own specialty.* It is hoped, and believed, that the busy practitioner or family doctor will find this volume to be a ready helper in every emergency that may confront him, and a trustworthy guide in his daily practice.

NEW YORK. R. J. E. SCOTT.

PREFACE TO THE FIRST EDITION

It has been our object to present in one handy volume, concisely and authoritatively, the most important facts in all branches of medicine and surgery that are of working value to the active practitioner. At the same time we have endeavored to provide a trustworthy handbook for easy and rapid reference in physical and clinical diagnosis, general therapeutics, operative technic, materia medica, toxicology, and other subjects, concerning which information is constantly needed in undergraduate study and in daily practice. Diagnosis and treatment have received particular attention. Many minor subjects of genuine value to the practitioner, but usually held of too little importance for discussion in the text-books, are here given proper consideration. Numerous well-tried and valuable formulas are distributed through the volume. When it has been possible, the information has been presented in tabular form or arranged in convenient parallel columns.

Besides the multitude of original contributions, there has been frequent recourse to the latest medical periodicals and text-books and the standard medical dictionaries and cyclopedias of all languages; and we are under especial obligation to the works of Potter, Moullin, Walsham, Tyson, and Hughes.

A striking criticism of many large collaboration books is that as each contributor is held personally responsible for his work, he must necessarily be allowed to preserve his distinct and separate individuality, not infrequently dissenting from teachings elsewhere in the same volume; the reader is thus left bewildered by a mass of heterogeneous and undigested material. To avoid this and other disadvantages, and to secure the desired homogeneity in this cyclopedia, we have asked permission of our contributors to merge their work anonymously in proper subordination and under the free control of the editors. By this arrangement the separate contributions have been wrought over, supplemented, and rendered organically unitary with the rest.

As to the practical use of the book: To become perfectly familiar with such a reference work the owner should look through it carefully to fix the general style of classification in his mind. Although the subjects are generally introduced under the most common title, an attempt has been made to classify disease and injury according to the part involved. Numerous cross-references render a general index unnecessary. Further to facilitate reference, frequent subdivision and a uniform system of bold-face headings have been adopted, so that the subject-matter of a page may be seen at a glance. Throughout the book English generally has been preferred to Latin.

GEORGE M. GOULD,
WALTER L. PYLE.

A CYCLOPEDIA

OF

PRACTICAL MEDICINE AND SURGERY

A

ABASIA.—Motor incoordination in walking. See Astasia.

ABDOMEN, DISEASES. Classification.—(1) Diseases of the anterior abdominal walls; (2) diseases of the peritoneum; (3) diseases of the organs contained in the abdominal cavity; (4) diseases of the abdominal vessels; (5) diseases of the sympathetic or other nerves; (6) diseases of the cellular tissue, abscess, etc.; (7) diseases of the posterior abdominal wall, pelvis, diaphragm, etc.; (8) diseases of the parts adjacent to the abdominal region. The different diseases are described under their separate headings.

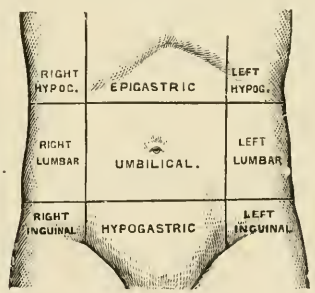
ABDOMEN, EXAMINATION, IN THE FEMALE.—Let the patient lie upon her back on a bed or table, with no clothing except a night-dress. The lower extremities and pubes should be covered with a sheet, while the abdomen is exposed by drawing the night-dress well up to the costal margin. As in examination of the chest, we use the senses of sight, touch, and hearing.

Inspection reveals the presence of dilated veins, of areas of pigmentation, and of the *lineæ albicantes*. These lines indicate that the abdomen has been greatly distended from some cause—probably, although not necessarily, by pregnancy. By inspection may also be determined the size and shape of the abdomen, and the presence of any localized bulging or prominence. The latter may be indicative of an intraabdominal mass, or it may be the result of displacement of one or more of the abdominal organs. Abdominal movements can also be distinguished.

Palpation should be practised very gently at first, and with a warm hand, so that contraction and rigidity of the abdominal muscles may be avoided. As the examiner proceeds, the fingers may be pressed more deeply into the abdomen. The various abdominal regions should be palpated, and the presence of any mass, or enlargement or displacement of organs noted. By this means fluctuation in an encysted fluid-accumulation is readily determined. The kidneys, especially the right, may be palpated, and in favorable cases the vermiform appendix may be felt.

Percussion is performed in the usual manner, the patient lying upon her back. If the presence of free fluid in the abdomen is suspected, percussion should be performed with the patient in different positions, so that the change in percussion-note may be perceived.

ABDOMEN, GENERAL PHYSICAL DIAGNOSIS. Topography.—The abdomen may be divided into 9 regions by 4 lines, 2 horizontal and 2 vertical, as in the accompanying illustration and in the table on the following page; the names of the regions and their contents are also shown there. Unfortunately, different authors draw these lines through different points, and so there is no uniformity. A more practical method is that which



Abdominal Regions.

divides the abdomen into four quadrants by a vertical line and a horizontal line which intersect at the umbilicus.

Right Upper Quadrant	Left Upper Quadrant
Liver and gall-bladder.	Left extremity of liver.
Head of pancreas.	Spleen.
Right kidney.	Splenic flexure of colon.
Colon, hepatic flexure.	Left kidney.
Pyloric end of stomach.	Pancreas.
	Fundus of stomach.

Right Lower Quadrant	Left Lower Quadrant
Colon. Cecum. Appendix.	Colon. Sigmoid flexure.

General enlargement of the abdomen may be caused normally by an accumulation of food or drink after a hearty meal, or by pregnancy. Pathologic distention is due to gases, dropsical effusions, morbid growths, and enlarged viscera. The "pot-belly" of children is seen in cases of scrofulous affection of the mesenteric glands, and sometimes in chronic gastrointestinal catarrh.

When the abdomen is distended with gas, there is a high-pitched note on percussion. In fluid distention there is fluctuation and a characteristic dulness. In general effusion the fluid changes position with change of the patient's posture. If the effusion is circumscribed, it indicates special visceral diseases, particularly of the liver, ovary, or kidney, according to the location. In tympanites the epigastrium is quite prominent, while in ascites it is moderately flat.

THE ABDOMINAL VISCERA REGIONALLY ARRANGED

Right.	Middle.	Left.
Hypochondriac.	*Epigastric.*	*Hypochondriac.*
Liver: portion of right lobe (gall-bladder, usually cut by longitudinal line). *Kidney:* upper and outer part. *Colon:* hepatic flexure and part of ascending colon.	*Liver:* quadrate, caudate, Spigelian, and greater part of left lobes (gall-bladder usually cut by longitudinal line). *Pancreas:* head and body. *Spleen:* upper and inner part. *Kidneys:* upper and inner part, with pelvis renalis. *Suprarenal bodies.* *Stomach:* middle and pyloric regions, cardiac and pyloric orifices. *Duodenum:* first and second portions and termination of third portion. *Large intestine:* transverse colon, variable portion.	*Liver:* portion of left lobe. *Spleen:* lower and outer part. *Pancreas:* tail. *Kidney:* upper and outer part. *Stomach:* great culdesac. *Colon:* splenic flexure.

Longitudinal plane along outer border of rectus.

Upper horizontal plane at level of lowest point of costal border.

Lumbar.	*Umbilical.*	*Lumbar.*
Kidney: lower and outer part *Ascending colon* and portion or whole of *cecum.* *Small intestine:* chiefly ileum.	*Kidneys:* lower and inner portions with ureters. *Duodenum:* lower flexure and part of third portion. *Jejunum* and *ileum.* *Transverse colon:* portion. *Sigmoid flexure* and commencement of *rectum.*	*Kidney:* lower and outer part. *Small intestine:* chiefly jejunum. *Descending colon* and portion of *sigmoid flexure.*

Lower horizontal plane at level of anterior superior iliac spines carried into true pelvis.

Inguinal.	*Hypogastric.*	*Inguinal.*
Small intestines. *Cecum:* lower portion, occasionally. *Inguinal canal.*	*Small intestines.* *Sigmoid flexure* and *rectum* (portion). *Cecum:* occasionally. *Ureters.* *Bladder:* in children; and if distended, in adults. *Fundus uteri* and appendages.	*Small intestines.* *Sigmoid flexure:* portion. *Inguinal canal.*

Enlargement of the right hypochondrium is most frequently due to disease of the liver or gall-bladder. Occasionally, tumors of the kidney or hydronephrosis cause swelling in this location. Such tumors lie behind the ascending colon, and their dulness is thus obscured by superficial tympany. Examination of the urine is of value in these cases.

Enlargement of the lumbar regions may be due to tumor, cyst, or abscess of the kidney.

Enlargement of the right inguinal region may be due to diseases of the cecum and appendix, to fecal impaction, to tumors of the ovary, to pelvic abscesses, and to enlarged or movable kidney.

Enlargement of the epigastrium may be due to distention of the stomach, to dilatation or morbid

growth of this organ, to cancer or cyst of the pancreas, to cancer of the large intestine, to tumor of the left lobe of the liver, or to aneurysm.

Enlargement of the umbilical region may be due to umbilical hernia; to rupture of the abdominal muscles; to a floating spleen, kidney, or liver; to tuberculous disease of the omentum or mesenteric glands; to dilatation after a full meal; to cancer of the stomach, liver, or gall-bladder, particularly on the right side. Disease of the pancreas and spleen, and effusions into the lesser peritoneal cavity may cause swelling, beginning at the left side. The vertebræ may project and cause tumors in this location.

Enlargement in the hypogastric region may be caused by distention of the bladder, by pregnancy, and by tumors and cysts of the uterus. It is also common in dilatation and prolapse of the stomach, in which conditions the lesser curvature of the stomach can be readily outlined.

Enlargement of the left hypochondrium may be due to enlargement of the spleen, to movable kidney or tumors of the kidney, to effusions into the lesser peritoneal cavity, and to dilatation or carcinoma of the stomach.

Enlargement of the left inguinal region may be due to malignant tumor of the sigmoid flexure, to volvulus, to fecal impaction, and to the causes of enlargement on the right side that are anatomically possible in this location.

The movements of abdominal swellings with the movements of respiration indicate that they are probably connected with the diaphragm, and depend on disease of the liver or spleen, as the other organs have no normal attachment to the diaphragm.

Pulsation of the abdominal aorta sometimes indicates aneurysm; but in most instances it is merely a nervous symptom of no clinical significance. It is common in neurasthenic women and in the subjects of hyperthyroidism. Pulsation of the liver, usually in association with jugular pulsation, is occasionally seen in tricuspid regurgitation.

The skin of the abdomen is wrinkled and atrophied in senility, emaciation and cachexia due to any cause. *Lineæ albicantes* indicate previous stretching of the abdominal walls by pregnancy, obesity or pathologic enlargement; they are constantly seen in multiparæ. Dilated veins and areas of pigmentation result from portal obstruction and are observed in cases of hepatic cirrhosis. The term *caput medusæ* is used to describe the characteristic radiation from the umbilicus of a mass of dilated veins. It is on the abdomen that the characteristic rose-spots of typhoid fever are found.

The movements of the abdomen are increased during dyspnea and there may be pronounced retraction of the epigastric and hypochondriac regions. The movements are restricted by tight lacing, or tight clothing; by enlargement or distention; by ascites, or abdominal tumor; and especially by paralysis of the diaphragm, generally unilateral, which causes retraction of the abdomen during inspiration. **Retraction** is also seen in extremely thin and emaciated persons. It may be the result of prolonged abstinence, of extreme purging and vomiting, as in cholera, dysentery, and similar diseases, and of many prolonged and wasting diseases. If the retraction is associated with marked rigidity and pain, we may suspect hepatic, renal, or metallic colic, or the beginning of peritonitis. In the second stage of tuberculous meningitis of children there is retraction of the abdomen.

Palpation of Abdomen.—By this method of diagnosis we detect the size, form, position, attachment, and condition of the internal organs, as well as the degree of fluctuation. In applying this method the tissues should be relaxed as much as possible by having the patient lie on his back, with the thighs flexed on the body. In many instances the patient should be turned from one side to the other while the examination is being made, in order that the internal organs may gravitate from the part. In palpation the **character of the pain** is an important factor: the pain of an inflammatory condition of a serous membrane is sharp and cutting, while if the mucous membrane is involved, it is usually dull. Pain due to involvement of the nervous mechanism, as in colic, is sharp and is relieved by pressure, while in acute inflammatory processes pain is usually increased on pressure. See ABDOMEN (Pain in).

Percussion of Abdomen.—This method of diagnosis reveals: (1) The condition of an organ, whether solid or filled with air; (2) the boundaries of the organ. To apply percussion, the patient should be in the same position as for palpation. Mediate percussion is best. To obtain the accurate boundary of an organ that is of denser medium than the surrounding parts, the first few strokes should be made over the one that has a more resonant or tympanitic note; as, for instance, to find the upper border of the liver, the first few strokes should be made over the lung, gradually going downward; and to find the lower border, begin over the region of the ascending colon, gradually percussing upward. The character of the note should be considered, whether *dull*, *flat* or *tympanitic*.

Auscultation of Abdomen.—Either the mediate or immediate method may be used. In mediate auscultation the stethoscope is used; in immediate auscultation the ear is applied to the bare surface. In applying this method the patient should be in the recumbent posture. It is particularly applicable as a diagnostic measure in aneurysms of the abdominal aorta and in detecting the fetal heart-sound. The examinations of the viscera are discussed under their separate headings. See STOMACH, LIVER, KIDNEY, SPLEEN, etc.

ABDOMEN, PAIN IN.—**Diffuse abdominal pain** generally means peritonitis. Rheumatism of the abdominal muscles may be so severe as to lead to a mistaken diagnosis. The presence of rheumatism elsewhere and the associated symptoms lead to a correct diagnosis. There is sometimes diffuse abdominal pain in hysteria.

Localized abdominal pain is a valuable guide to the focus of injury or disease: as, for instance, appendicitis is characterized by a pain in the

right iliac region. However, abdominal pain is often referred, and it is sometimes very difficult for the patient to locate the exact point of pain. It is always best to call to our aid the pain elicited by pressure. Neuralgia is recognized by the intermittent character of the pain and the well-known points of tenderness, and by the associated anemia. The seat of abdominal pain is further discussed under the different organs and their injuries and diseases.

Acute abdominal pain points to inflammation, perforation, gastralgia, enteralgia, or occlusion of some of the numerous abdominal channels. **Sudden and severe pain** is usually due to traumatism, perforation, or colic Traumatism is diagnosed by the history and signs of injury. Perforation is indicated by the history and location of the diseased part and by the character of the associated symptoms. **Colic** is a spasm of the mucous canal. We may have intestinal, hepatic, renal, uterine, and vesical colic. In colic the pain is paroxysmal, and each spasm may be attended by vomiting, rapid pulse, cold sweat, and more or less collapse. The history and the associated symptoms must determine the variety of colic. Lead colic is often difficult to diagnose. See Colic.

Persistent abdominal pain results from various visceral diseases, chronic peritonitis, ulcers, gastrointestinal neuroses, diseases of the vertebræ, or abdominal aneurysm. In vertebral disease there is pressure on the peripheral nerves as they emerge from the spinal column, and the pain is intermittent and located about the navel. Abdominal aneurysm, causing pressure on the spine or erosion, produces a similar pain.

ABDOMEN, WOUNDS AND INJURIES.—The abdominal walls, or the viscera, or both may be affected. It is impossible to estimate immediately the extent of injury, because death has ensued without any apparent injury, and without the discovery of any structural lesion, even after autopsy. Shock may pass off within a few hours or even minutes, or it may prove fatal or be followed, without break or interruption, by internal hemorrhage or rupture of hollow viscera. The viscera may be reduced to pulp with no evidence of external injury. For this reason prognosis in wounds and injuries of the abdomen must be very guarded.

Contusion without Injury to the Viscera.—There may be hematoma of the subcutaneous tissue or in the sheath of the recti muscles, abscess of the abdominal wall, laceration of muscles, such as the recti, or of the diaphragm, and rupture of the parietal peritoneum, or subsequent peritonitis.

Hematoma of the abdominal wall is usually absorbed, although suppuration may ensue. Abscesses are characterized by the great amount of induration that surrounds them, and by the fetid nature of their contents. Lacerations of muscles are not rare. They may be caused by sudden effort in parturition or in lifting, or by a blow, and they are frequent in tetanus and sometimes follow typhoid fever.

Rupture of the recti muscles is diagnosed by sudden pain and swelling, increased pain on movement, and sometimes a sulcus may be felt between the torn ends. Nothing can be done to secure the ends. Rest on the back, with the shoulders raised and the thighs flexed on the abdomen, is advised. A large concave pad should be placed over the protrusion, and retained by a broad roller or an elastic bandage. As the opening is large, there is little danger of intestinal strangulation.

Rupture of the diaphragm, if the patient lives, may be recognized by the presence of a traumatic phrenic hernia. The parietal peritoneum sometimes gives way from its own want of elasticity. Peritonitis ensuing must be treated on general principles.

General treatment consists in placing the patient on the back and securing reaction from the shock. Alleviate the pain by morphin or another analgesic. Apply ice and lead-water and laudanum at varying intervals. Give but little ice by the mouth. Food is inadvisable for 48 hours. After 24 hours the intermittent application of heat by fomentations or poultices is advisable, and the bowels should be kept open by salines.

Contusion with Visceral Injury.—The first symptoms are marked shock and acute pain. Persistence of collapse and intense coldness of the extremities would lead us to suspect internal hemorrhage. The immediate development of peritonitis points to injury of the peritoneum itself, or to injury of one of the hollow viscera.

Rigidity of the abdominal muscles, with marked restlessness and pallor, though variable in degree, are strong diagnostic indications of visceral rupture, more especially of the stomach and liver. Constipation, though usually present in bowel rupture, is not to be relied on, and is practically worthless as a symptom when a diagnosis must be arrived at within a few hours.

The symptoms of injury to the various viscera are as follows:

Liver.—Pain and dulness over the hepatic region, great collapse, bilious vomiting, and clay-colored stools.

Kidney.—Bloody urine, frequent urination, pain in the lumbar region, and possibly retraction of the testicle.

Spleen.—Symptoms of profuse internal hemorrhage, with extreme shock and collapse, pain and dulness over the splenic region.

Stomach.—Bloody vomiting and great collapse. However, the stomach may be injured without hematemesis.

Intestines.—Bloody stools, great shock, tympanites, and possibly emphysema, owing to the escape of flatus into the subperitoneal tissue, and thence into the superficial structures.

The treatment is expectant, and consists, in many cases, of simply relieving the pain and obtaining reaction from the shock. The patient should be placed at perfect rest in a recumbent position. Unless it is absolutely necessary to have the symptoms unmasked, opium should be administered. External warmth and stimulants are indicated. The local treatment consists in cold applications to the abdomen. The diet should be mild and unirritating, and if there is reason to suspect rupture of any part of the gastrointestinal

canal, the patient should be nourished by nutrient enemata. The patient should be catheterized, particularly if there is any sign of injury to the bladder or kidney; at all events, to prevent undue retention of urine. Purgatives should be avoided. If there are unmistakable signs of persistent internal hemorrhage, and the patient is sinking rapidly, an Abdominal Section (*q. v.*) is peremptorily demanded. If there is great suffering from gaseous distention, the surgeon is justified in puncturing the bowel through the linea alba with a trocar. Operative interference is contraindicated in traumatisms of the abdominal cavity, in severe shock, unless to control hemorrhage. Never operate when the patient is in a condition of collapse or cyanotic from peritonitis and heart failure. General peritonitis from bowel rupture is nearly always fatal, but a few recoveries after operation have been reported.

The earlier rupture of the alimentary canal or urinary bladder is operated upon, the better. The chance of recovery decreases rapidly after 6 hours and the case is usually hopeless after 24 hours. Indeed, most of the cases succumb in from 12 to 48 hours.

Nonpenetrating wounds of the abdominal parietes should be thoroughly cleansed, and any foreign bodies removed. If there is much hemorrhage, the wound should be enlarged, if necessary, to find the bleeding vessel, which should be promptly ligated. If it is found impossible to secure the bleeding point, the wound should be packed with sterilized gauze, and under no circumstances immediately closed. If the wound shows a tendency to gape, it should be united with several sutures. If the muscles are severed, they should be united by a separate buried catgut suture.

Penetrating wounds of the abdomen should be treated from the beginning by absolute rest and the use of opium. The shock should be met in the ordinary manner, and the wound should be covered with a temporary antiseptic dressing. If any of the viscera are seriously wounded, there will be collapse, severe local pain, and possibly local swelling, although there is usually rapid abdominal distention. There may be vomiting of blood. If there is extensive internal hemorrhage, the characteristic signs of progressive hemorrhage will be present. Protruded viscera should be carefully examined, and if uninjured, should be cleansed with either sterilized water or some weak antiseptic solution. If there is constriction of the bowel, the wound should be enlarged and the obstruction to the return removed. If gaseous distention prevents the return of the bowel, it should be aspirated and the gas removed. If the bowel is seriously injured or gangrenous, it is always best to open it and allow its contents to escape and to suture it to the edge of the wound, forming an artificial anus; any further surgical procedure can be effected later, when complete reaction has been established. Lacerated or gangrenous omentum should be ligated with silk, and removed. Small punctured wounds of the intestine may be held together by a fine pair of forceps, and a silk or gut ligature passed around the wound. The ends are then cut off close, and the intestine is returned. Incised wounds involving a considerable portion of the caliber of the bowel should be sutured by one of the methods having for its object the inversion of the edges of the wound and the consequent coaptation of the serous surfaces. See Intestines (Surgery of).

If there is reason to believe there is much blood-clot in the abdomen, or that septic matter has entered, the cavity should be carefully cleansed by persistent sponging and flushing with a warm saline solution or a weak sterile solution of boric acid (1 : 20), at a temperature of about 110° F. As the fluid is poured in, the hand should be introduced and moved about so as to free all the clots. When the clots no longer float out, the residue should be carefully mopped out with sponges. The wound may then be sutured and dressed.

The injuries to the abdominal viscera are discussed under their special heads, as Stomach, Kidney, Peritonitis, etc. Special attention is called to the article on certain abdominal wounds under the heading Gunshot Wounds (*q. v.*).

ABDOMINAL ANEURYSM.—See Aorta (Aneurysm).

ABDOMINAL SECTION. Preparatory Treatment of the Patient. General.—Before subjecting the patient to a major operation, it is unquestionably very important that the heart should be in the best possible condition to withstand the shock. To this end, if there is any cardiac weakness or valvular insufficiency, a course of heart tonics—such as strychnin and digitalis—should precede the operation. If there is no time for such a course of treatment, then before the anesthetic is given the heart should be stimulated by a hypodermic injection of 1/20 of a grain of strychnin. Minor valvular lesions are not a contraindication to operation. Many cases with mitral murmurs have been operated on successfully. It is probable that aortic lesions are the more serious; but, unless very bad, they do not contraindicate operation.

As cases have been reported in which death has followed abdominal sections from suppression of urine or from nephritis, as shown by the presence of albumin and casts, it is very necessary that the condition of the kidneys be thoroughly investigated and any abnormalities corrected beforehand. In a large proportion of gynecologic cases demanding abdominal section, renal insufficiency, to a greater or less degree, is found. The kidneys may be put in a healthier condition and made to do their work properly by administering large quantities of water, by the use of hot-water baths daily, and by the administration of diuretics such as the salts of potassium or diuretin. The choice of the anesthetic must also be made somewhat according to the condition of the kidneys, it being generally held that ether is more dangerous than chloroform in its action on these organs. The same may be said to be true of the respiratory tract. Bronchitis with cough following celiotomy is, to say the least, a very annoying complication, and, if severe, may be serious. It is, therefore, advisable to defer an operation should an acute bronchitis exist.

The intestinal tract should be thoroughly cleared out, and the patient kept upon a diet which will not leave much residuum for 48 hours before the operation. The advantage of this is that there is very little food left to ferment within the intestines and produce gas. This is one of the most annoying symptoms after operation, and everything that is possible should be done to avoid it. Distended intestines are also greatly in the way during the operation. Autointoxication by retained excretions is often productive of serious consequences. By the treatment suggested for the kidneys and intestines, this condition may be overcome. Its existence should be carefully inquired into in every case, and, if found, should be thoroughly treated before operation. Undoubtedly, much suffering can thus be avoided, as well as some fatal results.

Local Preparation.—The patient is given a warm tub bath after which the skin is shaved, thoroughly washed with green soap and warm water, then with alcohol and finally with bichlorid of mercury solution, 1 : 1000. Many eminent surgeons consider it sufficient to prepare the field of the operation in this manner after the patient has been placed upon the operating table. If, however, the preparation be made the day before the operation, as others prefer, a towel wet with the same solution may be placed over the abdomen, fastened by a binder, and left until the patient is placed upon the table; or a dressing of dry sterile gauze may be used instead of this wet dressing. The preparation is repeated after the patient is placed upon the table. Many have discarded the brush, merely washing the skin thoroughly with gauze. Sterilization of the skin with tincture of iodin is a new method which has given excellent results. Grossich reports 2284 operations in which it was employed without a single case of infection. He merely paints the *dry* skin, which has been previously shaved. Other surgeons, however, wash the skin with the usual solution before applying the iodin.

The Operating Room.—In all modern hospitals appropriate operating rooms are provided. In private houses the operating room should always be chosen beforehand, and, if possible, properly prepared. The first point is to secure a good light. A northern exposure is better than one in which the sun shines directly into the room. A high window, unobstructed by veranda, trees, or intervening buildings is desirable. If time allows, the carpet should be removed from the floor. The draperies over the window nearest the operating table should be removed some time previously, so that all dust will have time to settle and be wiped up. The floor should be thoroughly scrubbed; and if it is dampened at the time of the operation, the dust will be prevented from rising. It is not necessary to wash the walls and ceiling, as has been sometimes recommended, because if they are untouched, no dust will be given off from them.

The temperature of the room should be between 70° and 80° F. Too warm a room is annoying to the operator, and does no good to the patient. There should also be some provision for ventilation, to allow of the escape of the fumes of the anesthetic, and to supply plenty of oxygen to the patient, whose respiratory function is necessarily somewhat impeded.

The Table.—There are many good operating tables at present supplied for hospital use. Most of them are too heavy to make transportation possible. In a private house a table may generally be found that will do. It should be 6 feet long, 2 feet wide, and from 30 to 34 inches high. If no such table can be secured, 2 or 3 stands placed end to end will answer the purpose, provided they are strong enough; or a board may be set upon two horses or the backs of chairs, the seats of the chairs facing each other, and fastened together by a stick, to prevent their tipping.

A table especially designed for securing the Trendelenburg posture is in many cases indispensable. There are several frames made that may be adapted to any table. That designed by Krug is very satisfactory. It can be adjusted to any ordinary wooden table by clamps, and is easily transported. If no such appliance is at hand, a chair may be used, resting upon its top and the front edge of the seat; or one end of the table may be raised by chairs or blocks, the legs of the patient being allowed to hang over the edge of the table. Before use, the table should be thoroughly scrubbed with an antiseptic solution.

Water.—As large quantities of sterilized water are generally needed, it is always desirable that this should be prepared beforehand. The water may be boiled in a clothes-boiler, and put in clean pails to cool over night, covering the pails with sterilized towels tied over the tops. The morning of the operation a fresh supply of boiled hot water should also be provided.

Towels.—As many towels are useful in operations it is generally well for the surgeon to supply himself beforehand. He can then have his towels put into a sterilizer and carefully done up ready for use. This is quite necessary, as in many households of the poorer class enough towels cannot be procured. If the towels have not been previously sterilized, they can be rendered sterile at the time of the operation by wetting them in a 1‰ : 1000 sublimate solution. Two or three sterilized sheets should also be provided.

Sponges.—Marine sponges are now seldom employed, gauze sponges having come into almost universal use during the last few years. These latter should, of course, be made beforehand, carefully sterilized, and put up in packages, each package containing a certain definite number, as 9 or 12. In this way tally can be more easily kept of the number of pads used.

If sea sponges are used, they should be thoroughly prepared beforehand by the following method: After being pounded and beaten to get out as much sand and grit as possible, they should be washed in clear water many times, until no more sand washes out. They should then be placed in a solution of hydrochloric acid, 1 : 10, for 24 hours. They can then be placed in a 1 : 20 solution of carbolic acid; or, if it is desired to make the sterilization very complete, they may be put in a strong

warm solution of permanganate of potassium, and decolorized in oxalic or sulphurous acid solution. They should then be rinsed thoroughly in warm sterilized water, and tied up tightly in a sterilized cotton bag to dry. After sponges have been used, even though they have been infected with pus or other septic material, it is not necessary to throw them away. The same sponges have been used for many operations without any bad results. The method of cleansing these sponges is as follows: They are soaked in strong, hot soapsuds, made with pearline or some other powdered soap, for 24 hours. They are then thoroughly washed in a succession of hot baths until all the soap is washed away, and then left under the running water for several hours to get out the remainder of soap that may be left. After this they are put while wet in the 1 : 20 carbolic acid solution, and left for at least 24 hours; or they may be sterilized with formaldehyd gas in the formalin sterilizer, or subjected to steam sterilization in the autoclave. They should be placed damp in the sterilizer. They should afterward be preserved in tightly closed cotton bags. A convenient number of sponges for the operator to carry with him for a celiotomy is 12,—3 large flat sponges and 9 round ones.

Ligatures.—The ligatures recommended to be used are catgut, silkworm-gut, and very fine silk. Catgut should be used for most purposes, such as tying adhesions and pedicles, sewing together flaps of peritoneum, sewing under oozing surfaces, as well as sewing up the fascia and skin in closing the abdominal wound. If properly prepared, catgut is absolutely reliable, as has been proved in many hundreds of cases. Many methods have been advocated for preparing catgut. Undoubtedly, the kumol method is very satisfactory, but it is somewhat difficult, and is not generally used outside of hospitals. By this method the catgut is sterilized at a temperature of 165° C.

The following method is simple, and has answered well in practice. The catgut is obtained from the dealers in jewelers' supplies, in skeins of 5 meters each. It is impregnated with a considerable quantity of oil. In order to remove this, and at the same time to sterilize it, the catgut is soaked in a 1 : 1000 solution of corrosive sublimate and ether. It is left in this for periods varying from 4 to 8 hours, according to the size of the catgut. Afterward it is boiled in alcohol for 20 minutes, to extract all the sublimate, and is then preserved in alcohol until it is used. Careful bacteriologic experiments show that catgut prepared in this way is perfectly sterile. It is not irritating to the tissues, nor are its strength and its elasticity diminished.

Recently, several methods have been described of preparing catgut by the aid of formalin. The following method can be recommended; and the catgut thus prepared is more enduring within the tissues than that prepared by the former method: Place the rolls of catgut in a 2 percent solution of the commercial formalin. Let it remain for from 12 to 24 hours, according to the size. Wash in running water for 4 hours, to remove the formalin; then in salt solution, and preserve dry or in alcohol.

Iodin catgut may be prepared by immersing the catgut in a 1 percent solution of iodin and potassium iodid for at least 8 days. It may be kept in the solution for several months without injury. A very convenient method is that of Salkindsohn, who uses a solution of 1 part of tincture of iodin and 15 parts of proof spirit.

Silverized catgut, used by Blake, is prepared by immersing the catgut in a 2 percent solution of collargol for one week, and then soaking it in 95 percent alcohol for 30 minutes, after which it is wound on glass spools and transferred to fresh alcohol of the same strength.

Silkworm-gut is very generally recommended for closing the abdominal wound. This can be sterilized by boiling in water, and preserved dry in hermetically sealed tubes, or in alcohol. Another method recommended is to place the strands of silkworm-gut in a test-tube which is plugged with absorbent cotton. The tube should then be placed in a steam sterilizer for 1 hour the first day, and for 30 minutes each of the two following days. As the steam penetrates the plug, the silkworm-gut is perfectly sterilized, and may be preserved without removing the cotton.

Silk is only useful, in abdominal surgery, for closing wounds of the intestine. Fine white sewing silk may be used for this purpose, and may be sterilized in the same manner as the silkworm-gut. Should the operator fear the use of catgut and desire to use silk for tying pedicles and for other similar purposes, larger strands can be provided. Nos. 3 and 4 surgeons' silk are generally useful for such purposes. The great objection to the use of silk in the abdomen is that, if placed deep within the abdominal cavity, should a sinus form and the piece of silk at the bottom of it become infected, the sinus will remain open for years, or until the silk is expelled. An experience of this kind will teach a useful lesson, and as catgut has served its purpose so well, we unhesitatingly advise its use to the exclusion of the former.

Iodoform Gauze.—It is well for the surgeon to be supplied with iodoform gauze. It should be in strips of different widths. Strips 1 and 2 inches wide respectively will be found useful. For leaving within the abdominal cavity, the frayed edges should be turned in and sewed together. Four thicknesses are better than two. The gauze may be purchased ready-made. or, better, prepared according to the following plan: Mix together equal parts of alcohol, ether, and glycerin. Mix with this 1 part of iodoform. When the iodoform is dissolved, dip the gauze in the mixture and squeeze dry. Pack in glass jars until used.

Drainage Pad.—For ovariotomy and operations when it is possible that it may become necessary to wash out the abdomen, a rubber drainage pad is very useful, unless a special table with arrangements for drainage is in use. This pad (called the Kelly pad) should be 25 inches in diameter, with an inflatable rim and an apron extending over the edge of the table to carry away the waste. A smaller perineal pad may also be needed for

cleansing the vagina previous to the operation. The pads should be thoroughly scrubbed with soap and water and sterilized with sublimate solution beforehand.

Dressings.—For dressing the abdominal wound various materials have been used. Formerly, dusting powders and antiseptic gauze or wool were much in vogue, but at present they are rarely seen in the best clinics.

All that is necessary is a narrow piece of sterile gauze several layers thick, fastened over the line of incision with narrow sterile adhesive strips, over which a pad of gauze or gauze and cotton is fastened by means of broader strips of plaster. If desired a scultetus bandage may be applied after the gauze dressing has been put on.

The important thing about an abdominal dressing is to have it so adjusted that it will not slip out of place and expose the incision. It should not be cumbersome, nor should it be applied so tightly as to render the patient uncomfortable. The double gauze dressing above recommended fulfills its purpose admirably, as the first piece protects the incision throughout its entire length, and cannot slip beneath the superjacent pad.

In addition to the materials thus provided there should be a small table for instruments, 3 clean pails, a foot-bath tub, 2 china basins and 2 pitchers, a saucer, a tray for instruments, or, if that cannot be obtained, a large meat-platter, and a china bowl holding about a quart. Two granite-ironware basins will also be found convenient. If no sink or closet is handy, a large tub for dirty water should be provided. In the case of a large ovarian cyst, an empty clothes-boiler will also be necessary to receive its contents.

Instruments.—The instruments must be chosen according to the operation to be performed. As a general rule, the fewer the instruments the better, if everything absolutely necessary is provided. At the same time, in some unexpected emergency some little-used instrument may serve a good purpose. For the average abdominal section the following instruments will be found all that are necessary:

A scalpel with a broad-ended handle, that can be used for separating adhesions.

One pair of small straight scissors.

One pair of long scissors curved on the flat.

One pair of short scissors curved on the flat.

Two needle-holders—one large (Sims'), one small (Wyeth's).

Four long hemostatic forceps.

Twelve short hemostatic forceps.

Two Jacob's traction forceps.

Two pedicle needles, right and left.

Two Nélaton's cyst forceps. } (In case of a cyst.)
One trocar—Emmet's or Tait's. }

One strong volsellum forceps.

One dissecting forceps with broad tips.

Three glass drainage-tubes, different lengths.

Needles. The needles useful are:

The largest size half-curved surgical needles, for closing the abdominal incision.

A small, fine needle, for closing the skin.

A short, round (without cutting-edges) needle, curved near the tip, for sewing in the pelvis. The eye should be large enough to admit No. 2 catgut (Emmet's vesicovaginal fistula needle).

A strong curved needle with large eye, to sew the fascia.

Several straight cambric needles, for sewing intestine or bladder.

Sterilization of Instruments.—There are several methods in use for sterilizing instruments. Some of them are more or less destructive to the instruments, while others do not affect them at all. The placing of an instrument in a steam sterilizer, while it may effectually destroy all disease germs, certainly injures exposed steel or iron, so that knife- and scissor-edges that are not protected by nickel plate are quickly corroded. A boiling alkaline solution, while very strongly antiseptic, will not injure the instruments so much as steam. For ordinary sterilization in private houses the method recommended is to boil the instruments in such a solution for 10 minutes. Washing soda may be used for this purpose, and can generally be obtained. In default of this, a very strong solution of bicarbonate of sodium will do.

A very convenient form of sterilization has now been placed in our hands in the formalin sterilizer. Formaldehyd gas is set free in a tightly closed tin box, by an alcohol lamp, there being placed in a cup over it paraldehyd pastils. Sponges and dressings may be sterilized in the same way, but take longer.

It is a good custom to place the instruments in the sterilizer about the time the administration of the anesthetic is begun. They may then be removed at the beginning of the operation, when they will be found perfectly sterile. This method has been found very efficient and practical.

Preparation of the Operator and His Assistants.—Careful preparation of the persons and clothing of the operator and his assistants is of the utmost importance. Undoubtedly, the hands of the operator are the most common source of infection, and the utmost care should be taken to render them as sterile as possible. The careful avoidance of contact with septic material is, therefore, desirable, although often impossible. The most exact habits of personal cleanliness, both as regards person and dress, are a necessity for both operator and all those directly concerned with operations. At the time of the operation, all taking part should be clothed in carefully sterilized operating gowns. In this way all contact of hands or instruments with ordinary clothing is avoided.

The hands and the forearms, to above the elbows, should be cleansed with the most scrupulous care. The cleansing should be done with hot soapsuds and a nail-brush. With this the hands should be scrubbed for several minutes, and then kept immersed in the suds for an equal length of time. After this the soap may be washed off in clean water, and then the finger-nails should be carefully cleaned with a nail-file, both the parts under the nail and around the matrix. After this the hands should be again well scrubbed with soap and water, to remove all the partly loosened particles, and then well washed with alcohol.

Special attention should be given to the finger-tips and nails, and to the parts between the fingers. Then, while still wet, the hands should be immersed in a 1:1000 mercuric chlorid solution for 2 or 3 minutes. Merely dipping the hands into the solution is not sufficient; they, as well as the forearms, must be well washed with it. While this method may not render the hands, as tested by the bacteriologists, absolutely sterile, it has proved satisfactory in practice, and is now adopted by many operators. This method will apply to the hands of the operator and of all assistants and nurses.

The bichlorid solution should be washed off with sterile water, and sterile rubber gloves put on. The sleeves of the operating gown should be long, so that they may be tucked into the gloves at the wrist, thus completely covering the skin. The surgeon and assistant should wear linen masks which cover both head and face.

After the hands have once been rendered aseptic, great care must be taken not to touch any unsterilized objects, such as articles of furniture, clothing, the head and face of the individual, or unsterilized portions of the patient's body. If it should become necessary to do this, the hands should be again thoroughly immersed in the sublimate solution.

Anesthetics.—Ether has unquestioned advantages over chloroform in the greater degree of muscular relaxation which it induces. Its irritating effect on the kidneys renders it dangerous where there has been any previous trouble with those organs; and in cases of this kind, or where bronchitis or other pulmonary disorders exist, chloroform may be substituted. The anesthetic should be in the hands of a skilled administrator. See ANESTHETICS.

Technic of Operation.—All the preparations having been made, as already indicated, the patient, being thoroughly anesthetized, is placed upon the operating table. The lower extremities should be enveloped in warm flannel drawers or stockings.

If any operation is to be done that will involve opening the vagina—such as total extirpation of the uterus—the patient should be placed upon the perineal pad, and the vagina should be thoroughly scrubbed with a piece of gauze held in a dressing forceps, previously dipped in green soap. After the scrubbing the soap should be washed out and the vagina syringed with a 1:2000 sublimate solution. If there is any septic material coming from the uterus, as in cancer of the body, the uterus should be first thoroughly curetted and packed with iodoform gauze. A cancerous cervix should also be curetted, disinfected, and the vagina lightly packed with iodoform gauze.

These steps completed, the patient is placed full length upon the table, and the lower extremities firmly fastened to the table. Over the legs and thighs, as far as the symphysis, should be placed a heavy blanket inclosed in a sterilized sheet, the legs being wrapped in this as much as possible. The night-dress of the patient should be pushed up nearly to the armpits, and a folded sheet placed around the body below it, just below the breasts, to prevent the soiling of the patient's clothing.

If the abdomen has been properly prepared, no steps in this direction need be taken; but if the preparation has not been made, the abdomen should now be shaved, scrubbed with green soap and water, followed by a mixture of equal parts of alcohol and ether, and then scrubbed with the mercuric chlorid solution, 1:1000.

It is a good custom to place a rubber sheet (rubber on both sides) over the patient, reaching nearly from the clavicles to the knees, in which an opening about a foot long has been made. This must be carefully sterilized. Towels dipped in 1:1000 sublimate solution and wrung out are folded over the edges of the opening in the rubber sheet on each side, and a similar towel is laid across the chest and another across the thighs of the patient. In this way the patient's skin is protected and is not too much cooled by the dampness. The rubber sheet prevents evaporation, and unquestionably tends to prevent shock and depression from undue cooling of the surface.

The operator then takes his stand at the left side of the patient. Immediately beside the operator should be placed the table containing the tray with instruments, the bowl with the short hemostats, and the saucer with the needles. The jars of catgut and silk should also be arranged upon this table, a nurse standing behind it ready to thread needles, cut catgut, and pass instruments. Opposite the operator should be the assistant, and behind him and to his right should be another nurse, whose duty it is to take care of the sponges. She should have 2 pails of hot sterilized water, placed upon chairs or a bench, one for washing out the blood from the sponges, and the other for rinsing them before handing them back to the assistant. Two granite-ironware basins may be placed upon the legs of the patient, one for holding clean sponges, and the other for receiving the soiled ones. The nurse may thus take the soiled sponges from one basin, wash them, and return them to the other.

The **first step** of the operation consists in incising the abdominal wall. The site of the incision must depend on the organ to be operated upon. As all operations are, in a sense, exploratory, the first incision should be quite small—barely large enough to admit one or two fingers. It may be enlarged later, according to circumstances. The incision through the skin is made with a scalpel, after which the different layers are picked up and held tense between two hemostatic forceps, and cut with the scissors. If the peritoneum is opened in this way, air will enter the moment it is nicked, and it will balloon open, allowing the intestines or omentum to fall back into the abdominal cavity. In this way it can be incised with perfect safety.

The abdomen being opened, two fingers, or the whole hand, as may be necessary, are introduced for exploratory purposes. An exact diagnosis of the condition having been made, the operation is then either abandoned or proceeded with, according to circumstances. If dense adhesions are encountered, as in the case of large growths, they can usually be broken up with the hand; it is generally recommended that this should be done before the tumor is reduced in size in any way. In case of in-

flammatory exudates in the pelvis, a line of cleavage can generally be found between the different adhering organs. In this way ovarian abscesses and pus-tubes can be gently and carefully separated by the finger-tips and freed from adhesions to surrounding organs. The greatest care should be taken not to injure the intestines. If the intestines are found to be adherent, it is well to place the patient in the Trendelenburg posture, and to try to dissect them loose, sight being relied on rather than touch.

All bleeding points should be tied as soon as possible, and all bands of adhesion should be tied on both sides before cutting. Pedicles may best be tied by the Bantock knot. This prevents the slipping of the ligature.

In cases of hysterectomy the arteries supplying the uterus may be tied before they are cut, thus preventing nearly all hemorrhage. In the case of large cystic tumors, after the cyst has been emptied with the trocar it should be removed from the abdomen and the pedicle carefully ligated. If the hemorrhage from the tumor is severe, the pedicle can be clamped until it is tied, the clamps being removed at the moment that the ligature is tightened.

After the diseased parts are removed or the operation is completed, the toilet of the peritoneum should be most carefully made. All oozing should be checked by pressure, by tying bleeding places, or by sewing under the bleeding area with catgut. Adhesions or injured spots on the omentum that continue to bleed should be carefully tied. All clots, débris from tumors, pus, or other extraneous matter should be carefully sponged out. If this proves difficult or impossible, the abdomen may be flooded with hot normal salt solution (about a dram to the pint). This may be poured in from a pitcher. The patient should lie on a pad to carry off the water. Small dram bottles of sterilized salt may be prepared beforehand.

After the operation is completed and the peritoneal cavity thoroughly cleansed, the omentum should be carefully placed over the intestines, and on top of it a flat sponge or pad, when the operator may proceed to close the abdominal incision. There are many ways of doing this. A very satisfactory method is to close the peritoneum with a continuous suture of fine catgut, either plain or chromicized, then to suture the fascia and muscle with chromicized catgut No. 2, and finally to close the skin with interrupted sutures of silkworm-gut. But before the suture is completed, the flat sponge should be withdrawn from the abdomen, and the nurse directed to count the sponges. This she must do aloud, counting the sponges separately from one basin into another. If pads have been used, the exact number should be known beforehand, and every one must be accounted for at this time. The difficulty of keeping an accurate count of pads is an objection to their use. By having them done up in packages containing an equal and definite number a better count can be kept, as the opening of each new package adds a definite known number to those already in use. Many cases have occurred in which sponges and instruments have been left in the abdomen, hence the necessity for extreme care. Through-and-through sutures of silkworm-gut are not used as much as formerly, most operators believing that tier suturing is preferable. In closing long incisions three or more silkworm-gut sutures may be passed through muscle, fascia and skin after the peritoneum has been closed, if the operator thinks they will afford additional protection against reopening of the wound. They are clamped with hemostats and tied after the fascia has been sutured in its continuity. There is ample experience to show that this procedure is unnecessary.

After the incision has been closed, the abdomen should be washed and dried and the dressing applied in the manner above described.

The patient should then be placed in bed, surrounded by hot-water bags or bottles, the greatest care being taken that the water is not hot enough to burn her.

Drainage.—Drainage has fallen into disuse, and is now used only in very particular instances. It has been found that the peritoneum can resist the invasion of a very large number of pyogenic bacteria, and that patients do better without drainage than with it. In pelvic surgery, particularly in pus cases, drainage has been extensively used; but of late long series of cases have been reported without drainage, and with an exceedingly low rate of morbidity and mortality. Some of the objections to the drain are that the drainage-tube tract is likely to become infected, with a resulting sinus; the greater tendency to suppuration of the abdominal wound; and the far greater frequency of ventral hernias following. In pelvic surgery the glass drainage-tube may be used, but it is not applicable in other cases. In operations in the upper part of the abdomen the drainage-tube can seldom be used, and here we must substitute gauze drains.

The cases that should be drained are abscesses within the peritoneal cavity that are walled off, and whose walls cannot be removed; extensive peritoneal suppuration; tubercular peritonitis; and when the intestine, bladder, or gall-bladder has been sutured and there is fear that the suturing will not be tight. With these, and possibly a few other very rare exceptions, drainage within the abdominal cavity may be entirely dispensed with.

Should the glass drainage-tube be used, its contents should be emptied by a long-nozzled uterine syringe, the greatest care being taken that the syringe and all the surroundings are entirely aseptic. Even with the utmost care, infection is likely to occur. The tube should be emptied at first every 10 or 15 minutes, the intervals being increased as the amount of effusion diminishes. The tubes may be removed in from 24 to 48 hours, or when the discharge ceases. Gauze drains may be left in for periods varying from 2 to 6 days. Their removal causes intense pain, which makes it advisable to use them as rarely as possible.

The pelvis is sometimes packed with gauze to check oozing. This is very rarely necessary, but is an efficient means of saving life in exceptional cases. This can hardly be called drainage.

In a small proportion of cases in the pelvis

drainage may be effected by opening into the posterior culdesac of the vagina. A gauze drain should then be placed in Douglas' pouch, a portion of it being pushed through into the vagina. It may be removed in from 2 to 4 days. Such drainage is very rarely necessary.

After-treatment.—The after-treatment of a person on whom abdominal section has been done can best be carried out if we will remember that the less we do the better. The work of the surgeon having been performed, the natural recuperative powers of the patient must be relied on to complete the processes of repair. For the first 24 hours the patient's diet should be restricted to water. This, in most cases, may be allowed in large quantities. If vomiting exists, the water will do no harm, even if it is rejected, as it thus washes out the stomach; at the same time, a certain amount of it is absorbed. Morphin should be used as sparingly as possible. The great majority of cases require none. Occasionally, in very sensitive individuals, morphin will be needed in small doses for the first 24 or 36 hours. It should be dispensed with as early as possible. Codein may often be substituted with advantage.

Patients probably suffer more from intestinal colic due to gas than from any other one thing. This may be avoided in part by having the intestinal tract thoroughly cleared out before the operation, and by avoiding all foods that ferment until the digestive processes are resumed. The anesthetic, as well as the handling of the intestine and the shock of the operation, seem to check the digestive function, and it is only resumed after several days, and then slowly. Food, therefore, is of no use to the patient.

On the third day after operation small quantities of broth may be administered, and if retained and digested, the patient may soon receive solid food. The juice of oranges or other fruit is often acceptable at an early day, relieving the dryness of the mouth and throat.

In case of extreme vomiting, the usual remedies may be applied. The smelling of vinegar, drinks of very hot tea or water, the use of bismuth, oxalate of cerium, carbolic acid in drop doses, and similar agents may be tried. The washing out of the stomach will often prove beneficial, especially with patients who are familiar with the procedure.

The bowels may be moved on the third or fourth day by means of fractional doses of calomel, followed in 12 hours by a saline laxative and an enema. If the intestinal tract has been thoroughly cleaned out before the operation, there is no need of administering laxatives so early as was formerly the practice, for instance 24 hours after the operation.

Distention may be relieved by the use of the rectal tube, small high enemata of emulsion of asafetida, and the internal administration of salol and chloroform, according to the method of Wm. H. Teller, who mixes equal parts of the two drugs and gives 3 drops in a teaspoonful of brandy every 3 or 4 hours. The chloroform completely dissolves the salol, forming a thick heavy liquid, which is held in solution in brandy or whiskey, but not in water, as the latter precipitates the salol. This mixture may be given any time after the first 24 hours.

The skin sutures may be removed on the eighth to tenth day, the wound being supported by 2 or 3 long strips of adhesive plaster for a few days longer. The bursting open of the wound after the removal of the stitches has occurred; but usually, in this event, a prompt reclosing of the abdomen is followed by no injury.

The patient may be allowed to sit up after the fourteenth or fifteenth day, and thereafter to gradually resume her usual mode of life. In most instances it is well for the patient to wear a well-fitting abdominal supporter for 6 months after the operation, in order to remove all strain from the newly formed cicatrix, and thus to diminish the danger of a ventral hernia.

ABDOMINAL TUMORS.—These are best classified as follows:

1. **Tumors of the parietes,** including inflammations, abscesses, cysts, fatty and fibrous growths, sarcoma, carcinoma, obesity, edema, elephantiasis, ventral and umbilical hernias, and spasmodic contraction of an abdominal muscle.

2. **Intraperitoneal tumors,** which may arise from the peritoneum, liver, gall-bladder, pancreas, spleen, stomach, intestine, omentum, mesentery, bladder, uterus, round ligaments, broad ligaments, Fallopian tubes, or ovaries, subperitoneal cysts, peritoneal effusion, peritoneal hematocele, tympanites, ascites, phantom tumors, and extrauterine pregnancy.

3. **Retroperitoneal tumors,** including aortic aneurysms, abscesses, cysts, fibroma, sarcoma, carcinoma, kidney tumors, and hematocele. See Abdomen (General Physical Diagnosis), Liver, Kidney, Stomach, Uterus, Hernia, Ascites, etc.

ABDUCTION OF THE EYE.—The power of the external recti, measured by the maximum ability to preserve singleness of vision with prisms placed bases toward the nose. It is commonly from 6 to 8 degrees. See Eye-muscles (Anomalies).

ABORTIFACIENTS.—Drugs or agents causing the expulsion of the fetus or ovum. Their mode of action is not clearly understood, but it is generally regarded as due to direct stimulation of the uterine center in the cord or to congestion of the uterus that produces reflex stimulation thereof. Any drastic purgative or gastrointestinal irritant may produce this reflex action. Most volatile oils act thus, as do colocynth, tansy, pennyroyal, and many other vegetable agents used by women to produce abortion. All abortifacients are dangerous to life in doses sufficient to excite action of the gravid uterus. If abortion is indicated, it should be effected by instrumental means. The principal drugs used as abortifacients are borax, cotton-root bark, ergot, hydrastis, oil of rue, pilocarpin, potassium permanganate, quinin, savin, ustilago, viscum flavescens (mistletoe), and strong purgatives. Injections of glycerin are a dangerous means of inducing abortion. See Emmenagogs, Oxytocics, Abortion, Abortion (Induction).

ABORTION.—The expulsion of the ovum before the fourth month.

Frequency.—The frequency of abortion is very

difficult to estimate; it is probable, however, that it occurs once in every four or five pregnancies.

Causes.—The causes of abortion may be briefly enumerated as follows:

1. Any pathologic condition of the ovum, membranes, or placenta, such as apoplexies, cystic degeneration of the chorionic villi, and cellular infiltration of the placenta.

2. Certain general diseases of the mother, including syphilis; typhoid fever; the exanthems; conditions interfering with proper aeration of the blood, as pneumonia and valvular heart-disease; various systemic poisons, as malaria, lead, and arsenic; certain blood-diseases, as grave anemia and leukocythemia; various local conditions, such as metritis, salpingitis, and ovaritis, cystitis, appendicitis, and placenta prævia.

3. Diseases of the father, such as syphilis, phthisis, and nephritis, in which the spermatozoa are diseased or of lessened vitality.

4. Death of the fetus from any cause.

5. Traumatism, as from a fall, a blow, or a kick on the abdomen.

6. Spasmodic muscular action, as in chorea, uncontrollable vomiting or coughing, convulsions of any kind.

7. Reflex causes, as violent emotion or mental shock. When the uterus shows a tendency to contract under the slightest stimulus (irritable uterus), any trivial cause, such as a long walk, a hot bath, or even the sight of another woman in labor, may result in abortion.

8. Criminal abortion, caused by the use of drugs, vaginal and uterine injections, and the introduction of an instrument into the uterus.

Symptoms.—The symptoms of abortion vary with the duration of pregnancy. Occurring during the first few weeks of gestation (**ovular abortion**), there will be hemorrhage, more or less profuse, intermingled with which there will be dark, fleshy masses (*decidua*). To these symptoms there may be added a sense of vague pain and discomfort in the sacral region. During the second and third months (**embryonic abortion**) the clinical phenomena will be more pronounced. There are continued and increasing hemorrhage, cramp-like bearing-down pain of a pronounced character, and finally expulsion of all or a part of the ovum. The physical signs at this period are well marked: at first the cervix will be found soft and the os slightly dilated; the uterus will be felt enlarged and soft behind the symphysis; later, the angle of anteflexion between the upper and lower uterine segments will be effaced (*Tarnier's sign*); and, finally, portions of, or the entire, ovum may be felt presenting. Occurring during the fourth, fifth, and sixth months (**miscarriage**), the symptoms will be still more pronounced; the hemorrhage is likely to be profuse, and may even be fatal; the pain will be severe, intermittent, and cramp-like, resembling labor pains at term; the membranes will rupture, with discharge of liquor amnii, and the fetal parts presenting may be distinctly felt by the examining finger. Occurring after the sixth month (**premature labor**), the clinical phenomena are in nowise different from those of labor at term.

Duration.—The time consumed in the expulsion of an ovum varies considerably. It may extend over a period of days, or even months, and it may occur almost instantaneously (**instantaneous abortion**). Usually the duration of a spontaneous abortion is from 24 to 48 hours.

Diagnosis.—The following table shows the main diagnostic points in the various forms of abortion:

Threatened Abortion.	Inevitable Abortion.	Incomplete Abortion.	Complete Abortion.
Hemorrhage slight and usually free from clots.	Hemorrhage profuse and continuous, clotted and dark colored.	Hemorrhage persistent, at times profuse, at others scanty, dark colored and offensive.	Entire cessation of hemorrhage.
Pain not marked.	Pain cramp-like and severe.	Occasional attacks of pain may be present.	Entire cessation of pain.
Os slightly patulous.	Cervical canal dilated.	Cervical canal dilated: admits finger, which feels portions of decidua, membranes, and blood-clot.	Os retracted.
Uterus soft, enlarged showing angle of anteflexion between upper and lower uterine segment.	Uterus soft, enlarged angle between upper and lower uterine segment effaced.	Uterus large, soft, and baggy; not involuting.	Uterus large, but retracted and firm; involution proceeding normally.
Discharge is bright colored blood.	Discharge consists of dark blood, clots, and portions of ovum.	Examination of discharged material shows only portions of the ovum.	Discharge is the ordinary lochia, which gradually ceases.
All signs of pregnancy present except amenorrhea.	Signs of pregnancy present except amenorrhea.	Signs of pregnancy arrested.	Subsidence of the signs of pregnancy with possibly the establishment of the milk secretion.

The diagnosis of miscarriage may be made by the history of the duration of pregnancy, fourth to sixth month inclusive; by discharge of the liquor amnii; by the greater pain and hemorrhage; by the stage of development of the fetus; and probably by the establishment of the milk secretion and lochial flow.

Prognosis.—The ovum is inevitably destroyed. The immediate dangers to the mother are hemorrhage and sepsis. During the first 3 months the ovum is likely to be expelled entire, and these dangers are therefore slight; from the fourth to the seventh month, however (**miscarriage**), the

placenta is intimately adherent to the uterine wall, portions of which, remaining in the uterine cavity, give rise to continued hemorrhage and septic infection. The remote dangers are subinvelution, endometritis and metritis, displacements, menorrhagia and metrorrhagia, salpingitis and ovaritis, and sterility.

Mortality.—The death-rate of spontaneous abortion and miscarriage is about 1.5 percent. The mortality of criminal abortion cannot be definitely computed; it is probably from 5 to 20 percent.

Prophylactic treatment comprises the correction of any ascertainable cause of abortion. If the patient has aborted a number of times previously (**habitual abortion**), or if there exists any other reason for suspecting premature expulsion of the ovum, a definite line of treatment should be instituted. Active exercise, such as the lifting of heavy weights, reaching for objects far above the head, bicycle or horseback riding, should be interdicted. Excessive sexual intercourse or other source of pelvic congestion should be avoided. Rest in bed at the periods corresponding to the normal menstrual epoch will be found beneficial. Local conditions, such as displacements, laceration of the cervix, and inflammatory pelvic disease, should be treated prior to pregnancy. If there is a history of syphilis in either parent, active antisyphilitic treatment should be instituted throughout the entire course of pregnancy.

Treatment of Threatened Abortion.—This includes rest in bed, with absolute quiet; the administration of nerve sedatives, preferably suppositories of opium—1 grain of the extract morning and evening; this may be supplemented by teaspoonful doses of the fluidextract of viburnum prunifolium 4 times daily.

If the abortion is due to general disease, such as typhoid fever, pneumonia, phthisis, or valvular heart-disease, no attempt should be made to prevent it.

Treatment of Inevitable Abortion.—If the preceding plan of treatment fails to control the symptoms, and if, in addition to pain and hemorrhage, there is dilatation of the os with expulsion of portions of decidua, treatment to prevent abortion will be of no avail, and appropriate measures must be instituted to hasten the emptying of the uterus.

Two methods of treatment have been advised for these cases. The first is **the expectant plan,** which may be described briefly as follows: Place the patient in bed, and if the bleeding is profuse, insert a tampon of iodoform gauze (1 yard) well up against the cervix. If this fails to control the hemorrhage, reinforce it by another yard or two of gauze and a perineal pad and binder. Small doses (1/2 of a dram) of the fluidextract of ergot should now be given every 2 or 3 hours. At the end of from 8 to 12 hours remove the tampon, when the ovum may be found extruded from the cervix; if not, a vaginal douche of mercuric chlorid (1 : 4000) must be given, and another tampon introduced. If upon the removal of this second tampon at the end of 10 or 12 hours the ovum is not discharged, then more vigorous methods to secure its expulsion must be adopted; these will be described under the active and better method of treatment.

The active plan comprises the following: (1) The physician's hands and instruments are sterilized; (2) the patient is etherized and placed on an appropriate table, or across the edge of the bed, her buttocks resting upon a Kelly pad; (3) the perineum, inner part of thighs, pubes, vulva, and vagina are thoroughly scrubbed with equal parts of tincture of green soap and water, using a soft nail-brush or pledgets of cotton, followed by a vaginal douche of mercuric chlorid (1 : 4000); (4) the anterior lip of the cervix is grasped with a double tenaculum and drawn well down to the vulvar orifice; (5) if necessary, the cervix is now dilated with a branched steel dilator (Wathen's) up to 1 1/2 inches; (6) placental forceps (Thomas') are now passed carefully into the uterus, and the ovum and greater part of the decidua quickly removed; (7) this is followed by thorough but careful curettage, leaving the uterine cavity free from any deciduous membrane or blood-clot; (8) an intrauterine douche of sterile water should now be given, preferably with a fountain syringe and a two-way metal catheter; (9) a light tampon of iodoform gauze is now placed in the vagina and the patient returned to bed.

A strip of gauze may be placed in the uterus in cases of sharp retroflexion, to secure free drainage, and occasionally an intrauterine tampon will be necessary when the uterus refuses to contract and hemorrhage persists after the use of the curet.

After-treatment.—The after-treatment of abortion comprises rest in bed for 10 days or 2 weeks, removal of tampon at the end of 24 hours, followed by a vaginal douche of mercuric chlorid (1:4000). The diet should be light and easily digested, and the bowels should be evacuated at the end of the second day. Later, a normal involution and return to perfect health will be favored by the administration of nutritious food and tonics.

The foregoing treatment is applicable to those cases occurring before the fourth month of gestation; after this time (**miscarriage**) the treatment is the same as for labor at term. See LABOR.

ABORTION, INDUCTION.—Emptying the pregnant uterus of its contents before the viability of the child (one hundred and eightieth day).

Indications for the Induction of Abortion.—(1) Pathologic vomiting, vomiting resisting all other treatment, particularly rectal alimentation; (2) albuminuria accompanied by casts, edema, excessive blood-pressure, persistent headache, and failing vision; (3) profuse uterine hemorrhage from premature separation of the membranes, or placenta prævia; (4) rarely, certain nervous diseases, such as chorea, acute mania, and melancholia; (5) blood-diseases, as pernicious anemia and leukocythemia; (6) certain local conditions, as retroflexion, prolapse, hernia of the uterus; (7) death of the embryo, as evidenced by a foul discharge and the disappearance of the presumptive signs of pregnancy; (8) intrauterine disease, as cystic degeneration of the chorionic villi, and hydramnios.

In general, it may be said that abortion should be induced if the mother's life is endangered by any condition or disease originating in or aggravated by pregnancy.

Method of Inducing Abortion.—The quickest, easiest, and best method of inducing abortion, applicable until the beginning of the fourth month, is as follows: (1) Disinfect the cervical canal, vagina, vulva, pubes, and inner part of thighs by scrubbing thoroughly with tincture of green soap and pledgets of cotton, followed by a vaginal douche of mercuric chlorid (1:4000); (2) seize the anterior lip of the cervix with a double tenaculum and draw it well down to the vulva, thus fully exposing the external os and straightening the cervical canal; (3) dilate the cervical canal with branched dilators (Wathen's) up to 1 1/2 inches, using first the smaller, then the larger, instrument; (4) remove the embryo and decidua with placental forceps (Thomas'), followed by thorough curetting with a sharp curet (Sims'); (5) irrigate the uterine cavity with warm sterile water, using a fountain syringe and a two-way metal catheter; (6) place a light tampon of iodoform gauze in the vagina, which may be removed at the end of 24 hours.

After the end of the third month of gestation the method of inducing abortion is the same as for the induction of premature labor. See Labor (Premature).

Medicolegal Aspect of the Induction of Abortion.—The following points relate only to criminal abortion:

1. It is a felony for any woman to take any drugs, use any instrument or any means whatsoever, for the purpose of producing an abortion upon herself.

2. It is a felony for any person to administer or cause to be administered to any woman any drugs, or cause to be used any instrument or other means whatsoever, for the purpose of producing an abortion upon her.

3. It is a misdemeanor to supply or cause to be supplied to any woman or any other person the means whereby abortion may be produced.

4. If the attempt is made to produce abortion, it makes no difference whether the woman is pregnant or not.

5. It makes no difference whether an injury is inflicted or not.

6. It makes no difference whether the attempt to commit abortion is successful or not.

7. It makes no difference what stage of pregnancy the woman is in at the time the attempt is made.

8. If death takes place from an attempt to produce abortion, the agent is indictable for wilful murder.

9. It makes no difference if the woman consent to, or even solicit, the attempt to produce abortion.

10. The victim is always considered an accomplice, and her evidence against the agent must be corroborated by other testimony.

ABRASION.—Excoriation of a mucous or cutaneous surface by mechanic means. The treatment consists generally in cleanliness, protection, and rest of the part. If the abrasion is extensive, sedative lotions and protective and emollient ointments may be employed, such as solutions of tannic acid, rose water, lead-water, zinc ointment, vaselin, etc.

ABSCESS.—See Suppuration.

ABSCISSION.—Removal of a part, as the prepuce, or a fractured bone, by cutting. Applied particularly to a surgical operation upon a staphylomatous cornea, in which the bulging portion is excised and the parts are brought together so that the posterior and chief part of the globe forms a "stump" for an artificial eye.

ABSINTHE.—A French liqueur; it is an alcoholic solution of the oil of absinthium (wormwood) exhibited with extract of anise, marjoram, and angelica.

ABSINTHISM.—Excessive drinking of absinthe induces marked symptoms earlier than those caused by the persistent use of other forms of alcohol. Besides epileptiform convulsions and tremors, especially of the upper extremities since the cervical part of the spinal cord is especially affected, there are observed hallucinations and vertigo.

ABSORBENT.—A drug or medicine that produces absorption or exudation of diseased tissue: as, *e. g.*, the iodids and mercurials. In surgery, a substance that mechanically takes up excreted matter, such as cotton, sponge, charcoal, magnesia, chalk, etc.

ACACIA (Gum Arabic).—A gummy exudation from *Acacia Senegal.* It occurs in roundish tears of various sizes, or broken into angular fragments, whitish or yellowish-white, translucent, very brittle; insoluble in alcohol, but soluble in water, forming a thick and mucilaginous liquid. It consists of *Arabin*, combined with calcium, magnesium, and potassium. Incompatible with acacia, are: Alcohol, ammonia, ether, ferric salts, lead subacetate, mineral acids, potassium tartrates, syrup of squill. Acacia has no physiological activity but that of a demulcent; it is chiefly used in coughs, sore throat, inflamed conditions of the stomach or intestines, in irritant poisonings, and as an external protective for burns, ulcers, and excoriations.

There are two special preparations: **Mucilage of A.**, containing acacia 34, lime-water 33, and water to 100. Dose, 4 drams. **Syrup of A.**, containing acacia 10, sugar 80, and water to 100.

ACANTHOSIS NIGRICANS.—A rare cutaneous disease characterized by increase of pigmentation associated with papillary hypertrophy developing even into verrucous nevus-like excrescences. The most common sites are the axillary, genitocrural, anal, and abdominal regions; also the neck and face. Epitheliomatous degeneration is sometimes observed in the lesions. In most cases, carcinoma is discovered in one of the abdominal organs. If a malignant growth is not present, the course of the disease is slow. Treatment is simply hygienic and expectant.

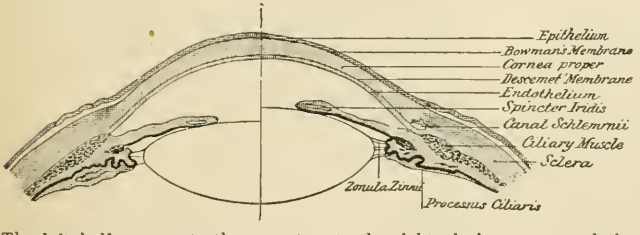
ACARUS SCABIEI.—See Scabies.

ACCESSORY SINUSES OF NOSE.—See Nose (Accessory Sinuses).

ACCOMMODATION.—Rays coming from a distant object—that is, beyond six meters—may be considered, for practical purposes, as parallel, and the normal eye at rest gives them such convergence that they are brought to an exact focus on the layer of rods and cones of the retina. Rays from any given point of a nearer object approach the eye with a divergence so considerable that they cannot be focused on the retina by the simple refractive properties of the dioptric system of a normal eye. However, to obviate this difficulty the eye has the faculty of increasing its refractive power in order to give increased convergence to the rays coming from a near object, and this change in the eye is called accommodation.

The Mechanism of Accommodation.—Optically considered, the extra divergence might be neutralized in two ways: by displacement of the retina backward, or by a shortening of the focal distance of the dioptric apparatus of the eye. Investigations have proved that accommodation is effected through the dioptric apparatus, the increased refractive power being due to a change of the curvature of the refractive surfaces of the lens. It is commonly believed that this is effected in the following manner: The ciliary muscle contracts, thus relaxing the suspensory ligament of the lens, allowing the inherent elasticity of the lens to act and push forward the anterior surface, which, by becoming more convex, increases its refractive power. The posterior surface of the lens scarcely alters in shape. This view is not accepted by Tscherning, who maintains that the ciliary muscle in contracting increases the tension of the suspensory ligament, and thus induces bulging of the lens anteriorly outward, and hardly at all toward the periphery. However, all theorists believe that ciliary contraction is the important factor in accommodation, although they differ as to how it acts. Associated with the act of accommodation is a simultaneous contraction of the pupil. The elastic power of the lens is due to a peculiar watch-spring arrangement of its fibers.

The Far and Near Points.—When the ciliary muscle is entirely relaxed and the eye is completely



The left half represents the eye at rest; the right, during accommodation.

at rest, distant objects are received at an accurate focus on the retina, and the eye is said to be adapted for its **far point**, or **punctum remotum**. When, however, the ciliary muscle has contracted to its fullest extent, the lens becomes convex to its greatest degree, and the nearest point from which rays may diverge and yet focus on the retina is called the **near point**, or **punctum proximum**. This is found by directing the patient to look at some fine print of a definite measurement, and bringing it slowly closer and closer to the eye until it becomes blurred and illegible, and noting the distance from the eye of the point where the print is still distinct. The print may be brought up close to the eye, and carried slowly away until it is first legible; the distance of this point from the eye gives an equally accurate result.

The distance between the far and near points is called the **range** or **amplitude of accommodation.** This range is dependent on the elasticity of the lens and lessens with advancing age, until about seventy or seventy-five years, when it becomes *nil* and the eye is incapable of adjusting itself for objects nearer than infinity. The range of accommodation is usually expressed in diopters, and is represented by that convex lens which, placed closely in front of the eye, would take the place of the increased convexity of the lens in giving rays from a near point a direction as if they came from infinity. The table in the article on PRESBYOPIA gives the range of accommodative power which an emmetropic eye at different ages is found to possess.

In hyperopia the range of accommodation is diminished to an extent expressed by the number of a lens which will enable the eye to see distant objects without accommodation.

The Association between Accommodation and Convergence.—**Convergence** is the power of directing the visual axes of two eyes to a near point, and is effected chiefly by the action of the internal recti. The nearer an object, the more convergence is necessary, and usually for every increase of the convergence there is a certain increase in accommodation, the internal recti and ciliary muscles acting in unison. Although accommodation and convergence are usually harmonious in action, they may take place separately and independently. If we paralyze the accommodation with a mydriatic, convergence is not interfered with, and also in advancing life, when greater contraction of the ciliary muscles is necessary to produce the requisite change in the convexity of the lens, the amount of convergence remains the same. It must be remembered that the relations between accommodation and convergence are necessarily very different in ametropia. See PRESBYOPIA.

ACCOMMODATION, AGENTS AFFECTING.—See MIOTICS, MYDRIATICS.

ACCOMMODATION, FAILURE.—See PRESBYOPIA.

A. C. E. MIXTURE.—An anesthetic mixture composed of alcohol 1 part, chloroform 2 parts, ether 3 parts. See ANESTHETICS.

ACETANILID (Antifebrin).—Phenyl-acetamid. A synthetic compound obtained by the interaction of aniline and glacial acetic acid. The trade name *Antifebrin* is copyrighted, and should be dropped from professional usage.

Acetanilid occurs in colorless, inodorous, glistening, lamellar crystals, of slightly pungent taste, soluble in 200 of cold water, 18 of boiling water, 4 of alcohol, freely in ether and in chloroform. Aver-

age dose, 4 grains; death has occurred from 5 grains, and recovery has taken place after a dram.

Incompatibles are: Alkaline bromids and iodids, chloroform, hydrated chloral, phenol, potassium and sodium hydroxids, resorcinol, spirit of nitrous ether, thymol.

Action.—Antiseptic, hemostatic; antipyretic; analgesic; diuretic; diaphoretic; depresses the heart, causes formation of methemoglobin, and disintegration of red blood-corpuscles; may induce skin eruptions. It is believed that acetanilid and other antipyretics of its class act through alterations produced in the heat-regulating mechanism which result in lowering the point at which the temperature is maintained. Consequently, a great increase in the dissipation of heat must take place in order to get rid of the warmth that has accumulated in the body, and this augmented output is attained by dilatation of the cutaneous blood-vessels. Their principal action practically, therefore, is by causing an increased heat loss through this vascular effect, by reason of which a large amount of blood is exposed to the cold air.

Therapeutics.—Externally, for venereal and other ulcerations, urticaria, eczema, erysipelas and other affections associated with considerable irritation, and as an antiseptic for wounds; internally, for the reduction of pyrexia and as an analgesic for neuralgias, dysmenorrhea, locomotor ataxia, migraine, and various headaches. Several proprietary remedies containing acetanilid are used to a considerable extent. On account of the danger of collapse effects, it is now generally considered preferable to reduce the temperature in fevers, when this is desired, by cold baths and other means.

There is one preparation: **Pulvis acetanilidi Compositus,** compound acetanilid powder; containing acetanilid 70, caffein 10, sodium bicarbonate 20. Average dose, 7 1/2 grains.

For neuralgias:

℞. Acetanilid, gr. x
Monobromated camphor, gr. v.
Make into 10 pills.
One pill every 2 hours.

℞. Acetanilid, gr. x
Quinin salicylate, gr. x.
Make into 10 powders.
One powder 3 times daily.

In such dermal diseases as eczema and in burns it may be used as an external application:

℞. Acetanilid, gr. xl to lx
Cold cream, ℥ j.
Make into an ointment and apply locally.

Poisoning by this drug is manifested by cyanosis, expressionless or anxious face, sweating, a soft, compressible, slow, and weak pulse, and shallow, slow respiration. Secondary anemia is present in a variable degree and the spleen is enlarged.

The blood has the characteristic chocolate-color normethemoglobinemia and does not regain its formal color on exposure to the air. The urine is dark in color and contains paramidophenol and an increased amount of ethereal sulphates, sometimes methemoglobin. Acetanilid poisoning results from ingestion of a toxic dose, from prolonged addiction or the external application of the drug to burns, ulcers, etc., where the absorbing surface is extensive. Stimulants, external heat, belladonna to maintain blood pressure, cardiac stimulants, such as strychnin, and oxygen inhalations are indicated.

Acetanilid habit is occasionally observed from the use of "headache powders," the chief ingredient of which is acetanilid. The victims present albuminuria, circulatory disturbances, as blue mucous membranes, weak irregular heart, and edema of feet and ankles, in conjunction with a total loss of moral sense.

ACETIC ACID.—A clear liquid, made up of 36 percent of absolute acetic acid ($CH_3.COOH$) and 64 percent of water, of acid taste, and miscible with water and alcohol. Dilute acetic acid contains 6 percent of the absolute acid and is the equivalent of vinegar. The glacial acetic acid is almost absolute acetic acid and is a powerful escharotic, and may be used to remove warts and other growths, and to apply to old sores where granulations are profuse and slow to heal. Dilute acetic acid is useful in various superficial skin-inflammations, such as sunburn, and in sprains. As an injection to expel seatworms, it should be diluted to 3 or 4 times its bulk with water. A lotion of acetic acid may be useful in night-sweats and to arrest epistaxis. It is a harmful remedy in obesity. It should not be taken by nursing mothers, as it may produce diarrhea in the child. Chemically pure acetic acid is commonly used to acidulate urine before examination.

In **poisoning** by acetic acid large quantities of milk should be given, besides alkaline liquids, such as lime-water, soap-water, etc., followed by the treatment of gastroenteritis.

For removal of vegetations about the external genitals:

℞. Salicylic acid, gr. xxx
Acetic acid, ℥ j.
Apply with a camel's hair brush.
Little pain is caused by this application.

For sponging the body in fever:

℞. Dilute acetic acid (or vinegar), ℥ j
Water, ℥ ij to iv.

ACETONE.—$CO\langle^{CH_3}_{CH_3}$ Dimethyl ketone. A colorless, mobile and volatile liquid, of peculiar odor and burning taste, present in crude wood-spirit. It occurs in small quantities in the blood and in normal urine, and in considerable quantities in the urine of diabetics; it is often a forerunner of diabetic coma, and is sometimes found in cases of carcinoma and cerebral lesion. Like methyl alcohol, it is miscible in all proportions with ether, alcohol, and water. It is an excellent solvent for

resins, gums, camphor, fats, and gun-cotton. It has anesthetic, hypnotic, and anthelmintic properties; and it has been used in cases of rheumatism and gout. The test for acetone is described under URINE (Examination).

ACETONURIA.—This is found in autointoxication of intestinal origin, after chloroform anesthesia, in cancerous cachexia, states of inanition and febrile, infectious and septicemic conditions, and certain nervous diseases such as tabes dorsalis and melancholia. The combination of acetone and sugar in the urine is good evidence of diabetes. See ANESTHESIA (Sequels); URINE (Examination).

ACETOZONE.—Benzozone, benzoyl-acetyl peroxid. An intense germicide, though practically not injurious to animal tissue. It has been used with great satisfaction in typhoid fever, cholera, amebic dysentery, urethritis, etc. Externally it is employed in abscesses, etc. Dose of the powder, 3 to 5 grains, with sugar of milk, in capsule; or 4 ounces of a solution of 15 grains in a quart of water.

ACETPHENETIDIN.—See PHENACETIN.

ACETUM.—Vinegar. See ACETIC ACID; VINEGAR.

ACETYL-SALICYLIC ACID.—See ASPIRIN.

ACHILLODYNIA.—Inflammation of the retrocalcanean bursa, causing severe, persistent pain in the heel. It may be caused by gout or by gonorrheal infection. The bursa may become so distended as to make incision and erasion necessary.

ACHOLIA.—The synonyms are cholemia and cholesteremia. (It may be classed under the head of Autointoxication.) A retention in the system of certain products that should have been eliminated by the liver. It is usually dependent upon rapid destruction of the liver cells, as seen in carcinoma, yellow atrophy, and hypertrophic cirrhosis of the liver. See AUTOINTOXICATION, JAUNDICE, LIVER, etc.

ACHONDROPLASIA.—Lack of the normal development of cartilage. Parrot's term for a form of fetal rickets in which the limbs are short, the curves of the bones exaggerated and there is an absence of the proliferating zone of cartilage at the junction of the epiphyses. The children are generally still-born. This condition resembles a fetal cretinism.

ACHORION.—A genus including several species of fungus (or fungoid) organisms found in the skin, especially the hair follicles. See FAVUS, RINGWORM, etc.

ACHYLIA GASTRICA.—A condition in which there is entire absence of hydrochloric acid in the gastric juice; it occurs in hysteria, neurasthenia, carcinoma, and atrophy of the gastric glands due to chronic inflammation. See GASTRIC NEUROSES (Hypochlorhydria).

ACIDITY.—During normal metabolic activity certain acids are constantly being formed throughout the system, which are eliminated through the emunctories of the body—skin, kidneys, lungs, and bowel. Not only are acids formed within the living body, but they are also introduced through the medium of certain articles of food. The acids formed belong to the organic compounds, generally lactic, oxalic, and uric acids; when the end-products of normal metabolism (urea, carbonic acid, etc.) are not formed, these organic acids may accumulate in the blood and tissues, either through excessive formation or defective elimination, giving rise to certain effects.

Effects of Acidity.—When the emunctories fail to eliminate these acids, the irritant action seems to be exerted upon the skin and mucous membrane, giving rise to nasal catarrh, bronchitis, and gastro-intestinal irritation. The excessive accumulation of uric acid may lead to the formation of uric acid calculi or to inflammation of the serous membranes (rheumatism). The skin may be affected, and herpes, eczema, and urticaria are common.

Estimation of Acidity.—The amount of acidity of the system may be approximately obtained by the amount of acid excreted in the urine. For this purpose Ralfe advises the following process: "Collect the urine during 24 hours, placing 100 c.c. in a beaker, and then adding a solution of sodium hydrate (standardized so that 1 c.c. = 0.01 gm. of crystallized oxalic acid) from a Mohr's buret until the fluid is neutralized. The number of cubic centimeters of the standard solution required to effect this is multiplied by 0.01, which gives the percentage acidity in terms of oxalic acid. To ascertain from this the total amount of acid in the 24 hours' urine is only a matter of calculation." These results are, however, only approximate, as may well be supposed. See also STOMACH CONTENTS (Examination), URINE (Examination).

Treatment.—The diet must be judiciously regulated, eliminating such articles as rich desserts, acid fruits and vegetables, and starchy foods. Soerensen and Metzger state that persons with gastric hyperacidity tolerate fats exceptionally well, and that a diet rich in easily melting fats, such as butter, oil, and especially milk and cream, is indicated. They also mention that oatmeal broth vanishes from the stomach with remarkable rapidity, even in cases of great motor insufficiency, with normal increased acidity. Alcohol, and especially wines, should be positively forbidden. Meats, such as beefsteak, and the excessive use of tea, coffee, and tobacco, lead to formation of uric acid, and should be restricted. Fish, eggs, and wild fowl may be allowed. Active exercise in the open air should be encouraged, in order to keep the digestion in as good condition as possible and to aid the skin in eliminating excrementitious material. The state of the bowels requires especial attention, constipation being carefully avoided by the administration of alkaline mineral waters, as the Friedrichshall and Hunyadi.

Dilute nitric (5 minims) and hydrochloric (5 minims) acid, taken an hour before meals, is thought to diminish the quantity of acid.

Should there be symptoms of dyspepsia, with eructation of sour material, the bicarbonate of sodium or potassium may be given. If the former drug is used (1/2 of a dram), it may be taken immediately before meals in one-fourth of a glass of water.

It should be remembered that the bicarbonate

of potassium has an irritant effect upon the kidneys if continuously administered over long periods, but from 4 to 8 grains can be taken for periods of a week or two without injury. The following prescription may be of service:

℞.	Lithium carbonate,	ʒ jss
	Wine of colchicum seed,	ʒ ijss
	Elixir of orange,	ʒ iv
	Solution citrate of potassium, enough to make	ʒ iv.

Two teaspoonfuls every 4 hours.

See Gout, Rheumatism, Uricacidemia.

ACIDOSIS.—This term was first introduced into pathology in connection with certain manifestations of diabetes which were believed to explain the development of coma in that disease. Around this concept as a nucleus has been built up such a mass of vague and contradictory doctrine that it would, perhaps, in some respects be well if it could be banished from pathology altogether; nevertheless in as far as the entity of a morbid process can be revealed by the criterion of treatment it has probably come to stay. In *American Medicine* for June, 1916, will be found a symposium of seventeen articles by prominent clinicians in which acidosis is discussed from every conceivable angle.

In its most restricted sense acidosis refers to the appearance in the urine of the so-called acetone bodies—acetone, diacetic acid and oxybutyric acid; but this phenomenon can occur in the normal subject, and, moreover, is present in the greatest variety of abnormal conditions. Although the bodies appear in the urine in the order named, oxybutyric acid is really the parent substance of the other two.

Acidosis has been defined as an accumulation of acid metabolic products in the body, the result either of excessive formation or defective elimination, or both. The claim is heard, however, that not the excess of acid but the coincident loss of alkali, or rather of bases, constitutes the pathological condition. Hence, at least in theory, if the body should be starved in regard to alkaline and earthy bases, what is known as acidosis would develop. From this viewpoint the accumulated acids are not necessarily toxic. The majority of writers, however, believe in the existence of an acid intoxication not unlike that produced by the ingestion of inorganic acids. In passing, it is worth while to call attention to the fact that in the general intoxication caused by oxalic acid there is little resemblance to acidosis.

It is commonly taught that the acetone bodies are formed at the expense of the protein and fat of the diet and not at all from the carbohydrate. Their appearance in diabetes is therefore readily explained by carbohydrate intolerance and defective utilization. Acidosis is an integral part of diabetes.

The phenomenon of acidosis is intimately bound up with starvation and in some of the conditions under which it occurs inanition is actually present, as in pernicious vomiting of pregnancy and intestinal obstruction. Moreover as a result of acidosis persistent vomiting may result and a vicious circle be set up.

Most writers describe a syndrome of acid intoxication characterized by drowsiness, thirst, restlessness, air hunger and acetone breath. For some reason vomiting is not enumerated in this syndrome although it is the principal symptom of cyclic vomiting—one of the best known forms of acidosis.

Save for its diabetic manifestations acidosis is best known clinically in association with **childhood.** For a considerable period the chief expression of this clinical condition was cyclical vomiting. More recently much has been written by pediatrists on a form of acidosis in young infants which appears to be due to base starvation. In this form the child may seem to be suffering from severe pneumonia—an affection, by the way, in which acidosis is known to occur. As a result of deprivation of mineral bases the blood becomes profoundly modified. There is destruction of the red cells with resulting air hunger expressed as rapid pulse and respiration. Cyanosis does not develop but the face is notably flushed and the resemblance to the picture of pneumonia startling. Such cases yield rapidly to the rational treatment of acidosis.

Certain eminent pediatrists make acidosis responsible for much of the pathology of childhood. Rickets they ascribe to lime deprivation due primarily to this condition. Pyelitis develops readily in the very acid urine. While most writers are at much pains to differentiate cyclic vomiting from conditions which greatly resemble it, others boldly attribute to acidosis most of the so-called bilious and nervous vomiting and even cases which would ordinarily be termed migraine.

Of especial interest to the surgeon is the acidosis of so-called delayed chloroform poisoning which much resembles cyclical vomiting; and the obstetrician is familiar with acidosis as seen in certain forms of pregnancy toxemia (it does not occur in ordinary eclampsia).

The best evidence of the existence of acidosis as an entity is the nature and result of treatment which is largely the same for all well defined and recognized forms of the condition. First to be considered is the **diet** in which protein consumption is not only to be cut to the minimum but limited to certain forms of protein which are least apt to form the acetone bodies, as casein and such protein as is obtainable from a vegetable diet. In cases with threatening symptoms forced carbohydrate feeding is recommended in the shape of solutions of glucose by the mouth or by enema or subcutaneous infusion. Fats should be left out of the diet entirely. Of remedies sodium bicarbonate is the main-stay and in certain cases of cyclical vomiting with alarming symptoms it may be advisable to administer it by intravenous injection since in quite a number of these cases the disease has proved fatal. In order to push the treatment of acidosis when the child is an adynamic condition Fischer recommends the citrates of sodium and potassium alone or with the bicarbonate.

The well-known Allen treatment for diabetes is

designed to prevent the development of acidosis in that disease but is not quite adapted to the treatment of acidosis in general. Glucose is of course contraindicated here and the patient receives in addition to vegetable diet a certain amount of alcohol as an oxidizable carbohydrate.

In regard to the **diagnosis** of acidosis the reader should consult works on biological chemistry for information in regard to the detection of the acetone bodies in the urine; further in reference to the details of treatment and the dosage the limits of this article forbid entering into them. See Diabetes Anesthetic (Anesthesia Sequels), Urine (Examination), Garrod's Thread Test.

ACIDS.—A compound of an electronegative element, or radical, with one or more atoms of hydrogen which latter can be replaced by electropositive or basic atoms without the formation of a base. The name acid is loosely applied to any substance having a sour taste. Acids vary in their terminations according to the quantity of hydrogen or other electronegative constituent. Those having the maximum of oxygen end in *-ic;* those of a lower degree in *-ous.* When there are more than two combinations, the prefix *hyper-* or *per-* is prefixed to the highest, and *hypo-* to the lowest. Acids that end in *-ic,* as sulphur*ic* acid, form salts terminating in *-ate;* those ending in *-ous* form salts terminating in *-ite.* A few acids (as hydrochloric) contains no oxygen, but all contain hydrogen. They change the color of litmus from blue to red, and unite with bases to form salts. Their physiological actions are chiefly due to their powers of neutralizing alkalies, withdrawing water from the tissues, and precipitating the globulins and some other proteids. They are poisonous to protoplasm, somewhat antiseptic, and many of them are powerfully corrosive to the tissues. Taken internally in dilute solution they have a sour taste, and cause an astringent sensation in the mouth and throat, induce a reflex flow of saliva, and in the stomach displace weaker acids from their combinations. Applied to the mouths of ducts from glands having an alkaline secretion they stimulate the latter, but check the secretion of glands producing acid secretions. In the blood and tissues they exist as salts by combination with the alkalies of the body, and if administered in sufficient quantity to neutralize the latter the animal dies, its blood being unable to carry carbon dioxid from the tissues to the lungs. They are rapidly excreted by the kidneys as acid salts, increasing the acidity of the urine. Therapeutically they are employed locally as caustics, styptics and anhydrotics, and internally in very dilute form as refrigerants, stomachics, astringents, ehmostatics, and antidotes in poisoning by alkalies. *Incompatible* with acids generally are: Alcohol with strong acids; alkalies, alkaloids; benzoates and borates with strong acids; bismuth and ammonium citrate, bicarbonates, bromids of weak bases, carbonates, chlorids of weak bases, glucosids, iodids of weak bases, metallic salts with organic acids, pancreatin, potassium and sodium tartrate, potassium tartrate, salicylates, silicates.

ACIDS, SWALLOWING.—Of the corrosive acids, sulphuric, nitric, and hydrochloric are the most frequently swallowed. Carbolic and oxalic acids are of more import from their toxic effects than from their corrosive action. Oil of vitriol, or strong sulphuric acid, is sometimes mistaken for other substances, and swallowed. It has been administered with murderous intent. It is much more disastrous than the diluted acid.

The symptoms are very prominent. Marks of the corrosive may be seen about the mouth, and white spots may be seen on the mucous membranes. There is agonizing pain in the stomach, heat, and great thirst. Vomiting may ensue, and it will be acid. The patient soon sinks into collapse, which becomes great if perforation of the stomach has taken place.

The prognosis is grave, and depends greatly on the amount of fluid in the stomach at the time of swallowing the acid.

Treatment.—No violence, as the stomach-pump, or emetics must be used. Any alkali but a carbonate must be administered at once. Large quantities of water, milk, and mucilaginous drinks should be given. The plaster from the wall or ceiling, pulverized and suspended in water, is a ready antidote when magnesia or lime-water is not obtainable. If there is much collapse, stimulating measures are indicated. Rectal administration of stimulants is of great value. Perforation is serious, and often does not occur for several days. Operation is of little avail. See Poisoning.

ACNE (Acne Vulgaris; Pimples). Definition.—Acne is an inflammatory disease occurring in and around the sebaceous glands, characterized by papules, tubercles, or pustules, affecting chiefly the face, and running a more or less chronic course.

Acne is an extremely common disease, comprising over 7 percent of all dermatoses.

Symptoms.—The forehead, cheeks, and chin are the regions usually affected, although the chest, shoulders, and back are not infrequently involved. The lesions are papular, pustular, or nodular, or a combination of these may be present. Comedones, or black-heads, and oily seborrhea often coexist, the former frequently giving rise to acne lesions. The primary manifestations are the size of a pinhead or of a pea, bright or dark red, discrete papules appearing at the orifices of the sebaceous glands and hair follicles. These vary in number from 2 or 3 to several dozen. After a period of a few days or weeks the lesions become pustular and discharge or undergo absorption, being followed by reddish stains or, in some cases, by scars. A new crop succeeds the old, the affection continuing thus for months or years.

According to the predominating lesions, various forms of acne are distinguished:

Acne punctata is represented by small conic elevations with central sebaceous openings filled with dark-colored points.

Acne papulosa consists of small, reddish, acuminate papules.

Acne pustulosa is characterized by pustules resulting from suppuration of the papular lesions.

Acne indurata is a pustular acne in which the lesions are large and have markedly infiltrated

bases. They are nodular, deep-seated, and often painful.

Acne artificialis is a papular or pustular eruption produced by the internal administration of the iodids and bromids or the external use of tar (**tar acne**).

Acne cachecticorum is an acne occurring usually upon the trunk and extremities of strumous and cachectic individuals. The lesions are large, indolent, violaceous, scar-leaving pustules.

The subjective symptoms in acne are extremely mild. Itching and burning are usually absent, but in some cases exist in a mild degree. The large indurated lesions are often painful, or, rather, tender to the touch.

The course of acne is chronic, the disease, untreated, tending to continue for months and years. In girls periodic aggravation occurs with great constancy before, during or after each menstruation. Spontaneous improvement takes place between the ages of 25 and 30.

Etiology.—Puberty is the most potent predisposing cause, the vast majority of cases of acne occurring between the ages of 15 and 25; after 30 acne is uncommon. The great glandular activity occurring at this period is easily subjected to pathologic perversion.

Dyspepsia and constipation play an important rôle in the causation of this disease; uterine disease, menstrual irregularities, anemia, and general debility are also provocative in many cases. The bromids, iodids, and tar may call forth an acne.

Pathology.—An acne lesion consists of a perifolliculitis and a folliculitis due to the irritation of retained and decomposed sebum. Recent experiments by Fleming have shown that the primary lesion is not due to the staphylococcus but to a bacillus. There is engorgement of the surrounding vessels and an intense cell-infiltration. The process ends in resorption or suppuration, with or without destruction of the follicle.

Diagnosis.—The diagnosis of acne is, as a rule, unattended with difficulty. It may in some cases be confounded with the papular or pustular syphiloderm. Herewith is appended the differential diagnosis:

Acne.	Papulopustular Syphiloderm.
1. Often with associated comedones and oily seborrhea.	1. Concomitant signs of syphilis present.
2. Occurs at age of puberty.	2. Occurs usually later.
3. Limitation of lesions to face.	3. Distribution general.
4. Course chronic, with exacerbations.	4. Course acute.
5. Lesions acutely inflammatory.	5. Lesions are new growths.
6. Lesions light or dark red.	6. Lesions brownish-red or ham-colored.
7. No tendency to ulceration.	7. Tendency to ulceration.

Prognosis.—Some cases respond rapidly to treatment; others are refractory. Very few cases are incurable. Success depends upon the detection and removal of the cause. The average case requires months for a cure. Severe cases may be followed by scarring.

Treatment.—Constitutional and local remedies are both of importance—the former to prevent the formation of new lesions, and the latter to cause the disappearance of the old.

Vaccine Therapy.—Acne offers one of the most promising fields for vaccine therapy, preferably with autogenous vaccine. See Vaccine Therapy (Staphylococcus). A mixed vaccine of polyvalent staphylococci and acne bacilli has been used with marked success in some cases.

Constitutional Treatment.—There are no specifics. Treatment must be directed toward the correction of systemic errors.

Dyspepsia and constipation frequently call for treatment. For the former, the bitter tonics, mineral acids, and alkalies may be used, according to the exigencies of the case. Constipation may be overcome by diet, abdominal massage, and the various laxatives. A pill of aloin, strychnin, and belladonna, blue mass or calomel, cascara sagrada, the salines, etc., are all useful.

The following is an admirable combination for coexisting anemia and constipation (Startin):

℞.	Iron sulphate,	gr. xvj
	Magnesium sulphate,	ʒ j
	Dilute sulphuric acid,	♏ j
	Peppermint water,	ʒ iv.

Tablespoonful in a goblet of water a half hour before breakfast.

The laxative mineral waters, such as Hunyadi Janos, Friedrichshall, and Saratoga waters, may also be employed.

In cases attended with much pustulation, the sulphid of calcium, in 1/10 to 1/2 grain doses, 4 times daily, is said to be serviceable. Iron preparations are of value in cases complicated by chloranemia. Cod-liver oil and the hypophosphites are indicated in strumous and rachitic patients. Small doses of arsenic, strychnin, and bichlorid or mercury are of value in individuals with lowered nerve-tone.

Hygienic measures, such as cold baths, outdoor exercises, and regular life are, of course, not to be neglected.

In many cases dietary restriction is necessary. Highly seasoned foods, pastries, candy, ice cream, salt meats, and alcoholic beverages are to be avoided; nothing should be eaten between meals.

Local Treatment.—The object of local treatment is to hasten the disappearance of existing lesions and to stimulate the sebaceous glands to healthy action.

The nature of the remedies to be employed depends upon the degree of inflammatory reaction present. In the vast majority of cases stimulating applications are indicated. Occasionally, however, the face is hyperemic and tender, and requires the use of sedative lotions and salves.

Before the local remedies are applied, the face should be thoroughly washed with soap and hot

water, with a view to opening up the follicles. For this purpose ordinary soap may be employed, or, in sluggish cases, soft soap or the tincture of green soap. This is advantageously followed by mopping the face for 5 minutes with very hot water. Comedones are to be removed either by pressure of the fingers or the use of the comedo expressor or a watch-key.

Salves and pastes are most conveniently applied at night. Lotions, used alone or in conjunction with ointments, may be sopped on frequently during the day.

Sulphur is by far the most generally useful and efficient remedy. It may be used in the form of a powder, ointment, paste, or lotion. When the lesions are deep-seated and the face is dry, ointments are to be preferred; when superficial and the face is oily, lotions are indicated.

Incorporated in a paste, sulphur may be used as in the following formula:

℞. Precipitated sulphur, ℥ j to ij
Lassar's Paste { Starch, Zinc oxid, Petrolatum, } each, ℥ ij ℥ iv.
Rub in at night.

One of the most efficient lotions is known as the "compound zinc sulphid lotion." Its formula is as follows:

℞. Zinc sulphate, Potassium sulphid, } each, ℥ j
Rose-water, q. s. ad ℨ iv.

(The ingredients are to be dissolved separately, heated, and then mixed. A double decomposition takes place, with the precipitation of a whitish powder. The potassium sulphid should always be fresh.)

Another useful formula is that devised by Kummerfeld:

℞. Precipitated sulphur, ℥ iv
Pulverized camphor, gr. x
Pulverized tragacanth, gr. xx
Lime-water, ℥ ij
Rose-water, ℥ ij.

When oily seborrhea coexists, the following may be employed:

℞. Precipitated sulphur, ℥ j
Ether, ℥ iv
Alcohol, ℥ iijss.

The *mercurials* are often serviceable in the treatment of acne. Care must be taken in changing from the sulphur to the mercurial treatment, or vice versa, that there is an intermission of a few days, and that the face is thoroughly cleansed, to avoid the disagreeable though temporary blackish discoloration resulting from the formation of the sulphid of mercury. The following is a much used formula:

℞. Mercuric chlorid, gr. ss to ij
Emulsion of almonds, ℥ iv
Compound tincture of benzoin, ℥ j.

In addition to the above remedies, resorcin (20 to 40 grains to 1 ounce), beta-naphthol (10 to 30 grains to 1 ounce), and ichthyol (1 to 2 drams to 1 ounce) may all be found useful.

In indurated acne benefit will often accrue from the use of mercurial or ichthyol plaster worn during the night. In obstinate cases incision of the lesions with expression of their contents may be resorted to.

ACNE ROSACEA. Definition.—Acne rosacea consists of two processes—an acne and a rosacea. The latter is a chronic hyperemic disorder of the face, particularly of the nose and cheeks, characterized by redness, dilatation of blood-vessels, and in some cases connective-tissue hypertrophy. The acne lesions are secondary.

Symptoms.—The disease has three stages. In the first stage there is simply a diffuse hyperemia of the part, coming on after meals, after drinking hot beverages, on exposure to cold or heat, and at the menstrual period. Oily seborrhea is often present. After some months or years the second stage develops. In this the redness is more permanent, due to enlarged capillaries and venules, which are visible coursing through the skin. At the same time papular and pustular acne lesions appear. This is the usual clinical picture of acne rosacea.

In exceptional cases the disease progresses to a third stage, which is characterized by further capillary enlargement, and hypertrophy of the sebaceous glands and connective tissue. A lobulated or bulbous enlargement of the nose takes place, sometimes reaching the size of a fist (**Rhinophyma**; **Acne hypertrophica**).

The course of the disease is chronic, lasting over a period of years.

Etiology.—The disease occurs in both sexes, but is usually worse in men. The most frequent causes are chronic gastrointestinal disturbances, anemia, menstrual and uterine disorders, continued exposure to cold winds, and the excessive use of alcoholic beverages, tea, etc. The inordinate use of tea is as fertile a cause in women as is the abuse of alcohol in men.

Pathology.—There is at first a dilatation of vessels, followed by permanent enlargement, and ultimately connective-tissue overgrowth. In hypertrophic cases the corium is greatly thickened and the sebaceous glands somewhat enlarged.

Diagnosis.—The tubular syphiloderm and lupus vulgaris may in some cases simulate acne rosacea, but the presence of hyperemia, with enlargement of vessels, and acne papules and pustules occurring upon the nose and cheeks and running a chronic course, renders the diagnosis easy. Both syphilis and lupus tend to ulcerate.

Prognosis.—Cases of modern severity may be much benefited, or even cured, by judicious treatment. When connective-tissue hypertrophy has

taken place, the prognosis is more guarded. The disease exhibits no tendency to spontaneous improvement, as is seen in simple acne.

Treatment.—Internal and external remedies are both of importance. The cause or causes of the disease must be assiduously investigated. When the stomach is at fault, the diet should be carefully regulated. Condiments, alcohol, tea, and all sorts of stimulating articles are to be prohibited.

Due attention must be paid to the condition of the bowels. In the various forms of dyspepsia, nux vomica, the stomachic bitters, mineral acids, alkalies, etc., are to be prescribed.

Some cases require the use of iron, strychnin, cod-liver oil, and similar tonics.

Local Treatment.—The sulphur preparations used in the treatment of simple acne are valuable also in rosacea. Excellent results often follow the use of the compound zinc sulphid lotion and Kummerfeld's solution. See ACNE.

When permanent dilatation of blood-vessels has taken place, it may be necessary to resort to the use of electrolysis, scarification, or slitting with a knife. In acne hypertrophica the thickened tissues may be pared off with a knife.

ACONITE.—Aconite root is also called "monkshood" or "wolfsbane." It possesses a bitter, pungent taste, and causes numbness and tingling when applied to tongue and lips. The aconite of the U. S. P. is derived entirely from the root.

Action.—It first stimulates and then paralyzes the sensory nerves, causing tingling, burning, numbness and finally anesthesia; also successively stimulates and paralyzes all the parts of the heart's organism, and there is always in the end a complete fall of blood-pressure from paralysis of the heart and vessels. The peripheral vessels and the pupil are dilated. Clonic convulsions may be excited, but the motor nerves are not affected until after the sensory nerves. Moderate doses usually have the effect of quieting the respiratory movements, but large amounts paralyze the respiratory center in the medulla, and this paralysis begins early and progresses rapidly. The temperature is markedly reduced by aconite. Profuse diaphoresis is commonly caused by it, but it has only a moderate diuretic effect.

Therapeutics.—Externally, neuralgia; myalgia; gout; chronic rheumatism; prurigo; pruritus; papular eczema; herpes zoster; chilblains. Internally, in fevers and in the early stages of acute inflammatory affections, especially of the organs of respiration, when the type of the disease is not adynamic. It is contraindicated in typhoid and other continued fevers of an asthenic character and also in inflammatory conditions of the gastro-intestinal mucous membrane. In conditions in which there is high arterial tension, chiefly of cardiac origin, aconite is a remedy of great value; it may also be of service in simple nervous palpitation of the heart, epistaxis and congestive dysmenorrhea, and to relieve the pain of aneurysm.

Small divided doses (1 minim every 15 minutes) of the tincture act better than a full dose given at once. The dose of the root is from 1/2 to 2 grains.

In simple fever:

℞.	Tincture of aconite,	ʒ iij
	Spirit of nitrous ether,	ʒ iv
	Solution of ammonium acetate,	ʒ vj
	Syrup of lemon,	q. s. ad ʒ iij.

Mix into solution and take 1 teaspoonful every 3 hours. Water may be added.

In threatened abortion:

℞.	Tincture of aconite,	ʒ vj
	Tincture of belladonna,	ʒ ij
	Rose-water,	ʒ iv.

Rub 2 drams over the groins, sacrum, etc.

Externally, aconite is useful in the treatment of myalgia, neuralgia, rheumatism, and other painful affections.

℞.	Tincture of aconite,	ʒ iij
	Essential oil of mustard,	ʒ j
	Glycerin,	ʒ j
	Rectified spirits,	q. s. ad ʒ vj.

Two teaspoonfuls should be rubbed into the affected parts night and morning.

	Tincture of aconite,	ʒ iij
	Camphor,	ʒ ij
	Chloroform,	♏. xl
	Oil of cajuput,	ʒ ij
	Tincture of capsicum,	ʒ ij
	Rectified spirits,	q. s. ad ʒ vj.

Apply locally. Oil of origanum may be added as a scent.

Poisoning.—The root is sometimes mistaken for horseradish root and eaten. Aconite root does not emit the pungent odor of horseradish when scraped or broken, and the scraped surface of horseradish retains its white appearance, whereas aconite root is brown, is more conic in shape, is destitute of the pungent odor, and speedily acquires a pink color when scraped or exposed to the air. When liniments containing aconite are swallowed, the symptoms of poisoning occur.

The general symptoms of poisoning are weakening of the heart's action, disturbances of respiration, paralysis of sensation on the surface of the body, and a numbness or drawing of the skin. The great cardiac depression, the difficulty of respiration, the numbness, tingling, and burning in the mouth usually serve to distinguish the nature of the case. If 12 hours are passed and life remains, recovery is generally rapid and complete, as death usually occurs in from 4 to 5 hours. The fatal dose of the root is about 60 grains.

The treatment of poisoning by aconite consists in placing the patient prone, with the feet higher than the head, to promote circulation in the base of the brain; the maintenance of bodily heat by warm blankets, hot bottles, or bricks; hypodermic injections of ether, alcohol, and digitalis, the last

named of which is the physiologic antagonist of aconite, but is slow in its action. Artificial respiration may be employed if breathing fails, or 3 to 5 drops of amyl nitrite may be inhaled from a kerchief or cloth a few times, since large amounts depress the heart. From 1/20 to 1/10 grain of strychnin will stimulate the heart and respiration. Emetics should not be used when the symptoms are severe, for vomiting may arrest cardiac action. If vomiting does occur, the head should be turned to the side. The stomach should be washed out with a siphon rubber tubing. Strong black coffee or tea, and brandy or whisky are serviceable.

Preparations. Fluidextractum A.—An alcoholic preparation of which each drop represents nearly 1 grain of the powdered drug. Dose, 1 minim.

Tinctura A.—Has of aconite 10, alcohol and water to 100. Average dose, 10 minims.

Tinctures of aconite-root vary greatly in strength. In Fleming's tincture 79 parts of aconite are used in preparing 100 of the tincture, in that of the B. P. 5, in the French 20, the German 10, while the Linimentum Aconiti (B. P.) is really a very strong tincture, of the strength of 1 to 1 1/2. Probably the best and safest preparation for ordinary use is a 10 percent tincture, of which the maximum single dose for an adult is stated in the German Pharmacopeia at 9 minims, and the maximum daily dose at 35 minims.

The best rule for the administration of aconite is to give minim doses of the official tincture every 15 minutes until the desired effect is produced.

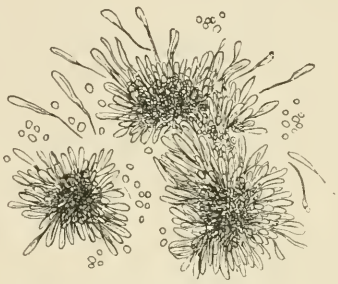
Aconitina, *Aconitine,* is a white, prismatic powder, readily soluble in alcohol or chloroform, nearly insoluble in water. It is difficult to obtain it of constant strength, some samples being nearly inert, others extremely active. As it occurs commercially it is a mixture of several alkaloids and should not be used internally in practical medicine (Wood). The *Aconitine Crystalisée* of Duquesnel is a nitrate of aconitine, and is probably the most active preparation on the market (Squibb). Average dose, 1/400 of a grain.

ACRODYNIA.—This disease is also called epidemic erythema; it is a rare disease, characterized by gastrointestinal symptoms, redness of the conjunctiva, edema of the face, formication, pricking pains in the palms and soles, hyperesthesia followed by anesthesia of these parts, and an erythematous eruption preceded by blebs, chiefly on the hands and feet, but spreading over the limbs and trunk. This is followed by exfoliation and dark brown or black pigmentation, greatest in the warm regions of the body. Wasting of the limbs, with edema, cramps, pareses, and spasms, may be present, and in the old or feeble death may follow. The disease is probably due to some noxious constituent of, or defect in, the diet. The treatment should be directed to the regulation of the digestive and assimilative organs, and to the relief of the local inflammations by soothing lotions and ointments.

ACROMEGALY.—See Akromegaly.

ACTINOMYCOSIS (Lumpy Jaw).—Actinomycosis is a parasitic disease occurring in the lower animals and in man, due to the ray fungus, and characterized by deep subcutaneous tumors or swellings that break down and suppurate.

The face and neck are the parts usually involved, the parasite gaining entrance to the tissues around carious teeth. The onset of the disease is insidious, weeks or months elapsing before the appearance of cutaneous manifestations. The lesions consist of deep-seated tumors or swellings that, approaching the surface, become red or livid in color, and, breaking down, discharge a bloody sero-pus containing characteristic yellow granules. These granules are made up almost exclusively of fungus. Sinuses with uneven nodular edges persist for an indefinite period. The disease is due to the presence of a characteristic microparasite, the *ray fungus* (*Actinomyces bovis*), which is composed of fine mycelial threads and club-shaped bodies. The most frequent and most curable form is that in which the abscesses form about the jaws and teeth. The best mode of staining the threads is by Gram's method. To stain the clubs as found in man is difficult; the best results have been obtained with orange rubin or eosin.



Actinomyces—The Ray Fungus.]

Treatment.—The administration of large doses of potassium iodid has proved successful in many cases, and should be given thorough trial. Locally, irrigation with corrosive sublimate solutions are advised. The X-ray has proved of value, both when used alone and also when used in conjunction with the administration of the iodids. In obstinate cases the parts should be thoroughly curetted. When the parasite has found a nidus in the lungs or digestive tract, all treatment has proved useless.

ACTOL. Silver Lactate.—A white, inodorous and tasteless powder, which coagulates albumin and is soluble in 20 of water. It lessens putrefaction in the bowel and constipates to some extent. A solution of 1 in 1000 destroys pathogenic microbes within 5 minutes. For gargles, mouthwashes, etc., solutions of 1 in 8000 to 1 in 4000 are used, though stronger ones do not irritate.

ACUPRESSURE.—An operation formerly used to stop hemorrhage or aneurysm by a needle compressing the tissues, on each side, above or below the vessel. For an aneurysm it presents no advantage over ligature, and the method has become almost obsolete. In wounds of the scalp and in

bursting of varicose veins, acupressure is of particular value.

ACUPUNCTURE.—Puncture of the skin or tissues by one or more needles for relief of pain, the exit of fluid or of coagulated blood in an aneurysm, etc. It is now chiefly employed in lumbago and sciatica, and has been used as a means of counter-irritation in neuralgia; as a stimulant, to evacuate or disperse fluids from various parts of the body; for the relief of chronic muscular pains and stiffness of the joints; in the treatment of ununited fracture; in the treatment of aneurysm; for the radical cure of hernia of the bowel. The spleen has been acupunctured for malarial hypertrophy.

In lumbago acupuncture is made over the erector spinæ muscles, and in sciatica along the course of the nerve; it is performed thus: The patient is placed prone on his face, the tender spots are found, and from 1 to 6 needles are pushed vertically to the depth of from 1 1/2 to 2 inches, and allowed to remain for from 1/2 of an hour to 2 hours. The needle should actually penetrate the nerve in sciatica.

The beneficial effect is supposed to be due to the escape of the fluid from the nerve-sheath.

The ordinary acupuncture needle is a three-cornered pyramidal instrument, and this form is more convenient than a round-pointed, conic one, as it permits the escape of fluids more readily. The punctures should be made in rapid succession, and be sufficiently deep to allow a free escape of the fluid.

ADALIN.—A hypnotic belonging to the same class as Veronal; it is soluble in alcohol, but not in water, and is almost tasteless. Dose 15 grains.

ADAMS-STOKES SYNDROME.—See Heart Block.

ADDICTION PSYCHOSES.—See Drug Addiction.

ADDISON'S DISEASE.—See Suprarenal Disease.

ADDUCTION OF THE EYES.—The power of the internal recti muscles, measured by the maximum ability to preserve singleness of the image with prisms placed bases toward the temples. It varies from 15° to 40°. See Eye-muscles (Anomalies).

ADENITIS.—Inflammation of a (lymphatic) gland. See Lymphatics (Diseases).

ADENOIDS.—A term applied to a hypertrophy of the adenoid tissue that normally exists in the nasopharynx. It is diagnosed by anterior or posterior rhinoscopy or by palpation with the forefinger behind the palate. Adenoid growths bleed easily, and the examining finger will be found covered with blood. This hypertrophy is associated with the following characteristic symptoms: Vacant expression of the child (see Face in Diagnosis), aprosexia, open mouth, noisy breathing, more or less impairment of the hearing, a hacking cough, a peculiar muffling of the voice, and an enlargement of the tonsils. The vegetations exert an injurious influence on physical development. The most important predisposing cause is youth. Adenoids are met with in all classes of life and in all climates.

Treatment consists in the early and complete removal of the growths.

In adults the operation may be done under cocain anesthesia. A general anesthetic allows more thorough manipulation.

When performed under an anesthetic, these operations should never be undertaken without ample assistance. The instruments devised for this operation are many. Each instrument has some merit, and there is no one suitable to every case; hence it is well to have various-shaped instruments at hand. The forceps most used are the Hooper, Gradle, Quinlan, and Lowenberg; the curets, Gottstein and Hartmann. The head being dependent over the edge of the table and supported by the assistant, the jaws are held open with a mouth-gag, the forceps is introduced, and all tissue within its grasp is removed. A smaller forceps follows this one; then the curet is used, followed by the forceps, to detach any tissue loosened by the curet, and the finger now sweeps all over the postnasal space to ascertain if it is clear. The patient is turned over on his face and the blood allowed to flow out, and the nose and throat are well sprayed with the iced antiseptic solution.

Gottstein Curet.

The patient is now placed in bed, the directions are given for a low diet, and a spray of the iced antiseptic solution in the nose and throat used once every hour. Every case operated upon should be kept in bed and under observation for 24 hours, but this rule is not usually followed in clinics. After the first 24 hours the spray is used less frequently and no longer iced. After the third day warm saline washes with some antiseptic added may be used by means of a nose-cup.

The operation may be performed upon children without anesthesia, and even without an instrument, the index-finger of the right hand being used instead.

The child sits in the lap of an assistant with its head leaning against his right shoulder; he embraces the child with his arms, holding its body and its hands firmly, while its feet are grasped and the knees secured by the assistant. Then, passing his left arm around the head of the child, the operator holds the mouth-gag in place with his left hand, while his right hand remains free to remove the growths, which, together with the blood, fall into a basin held in the hands of a second assistant. Some of the most satisfactory cases require no treatment beyond the operation itself, which may not consume more than 30 seconds.

ADENOMA.—A tumor that has sprung from a gland or is formed after the type of a secreting gland. See Tumors.

ADEPS.—See Lard.

ADIPOSIS DOLOROSA (Dercum's Disease).—A chronic condition characterized by painful and tender masses of fat irregularly distributed throughout the body; the hands and feet are not involved.

It attacks mostly women. It is probably a neuritis accompanied by fat deposition. Atrophy with sclerosis of the thyroid gland has been found, and in one instance a tumor of the pituitary body. There may be mental weakness, and increasing muscular weakness is observed. Hyperesthesia alternating with anesthesia may be noted in various areas. The fatty areas increase in size, soften, but do not pit on pressure.

Treatment.—Thyroid extract may prove of value. For the pain, aspirin, phenacetin and salipyrin may be used.

ADOLESCENCE.—Youth, or the period between puberty and maturity, usually reckoned as extending in males from 14 to 25 years, and in females from 12 to 21 years.

At puberty, which usually occurs at about the fourteenth year, certain characteristics develop in both the male and female. In the male, the voice becomes stronger and has a lower note while the sexual organs undergo a marked increase in development. The mental faculties are very alert and in the receptive stage for the acquisition of knowledge. As adolescence comes on, these transformations are more rapid, instability and frivolity giving place to determination and reflection.

In the female care should be exercised in properly instructing the girl in regard to the menstrual period, which makes its appearance at this time. Overwork and nervous excitability must be avoided. School-life requires regulation, and the best hygienic conditions should be enjoyed. Constipation is prone to occur, and may lead to a high grade of anemia if allowed to persist. A sufficient amount of outdoor exercise is absolutely essential in both sexes, as well as wholesome food in proper amount and at the proper intervals. See PUBERTY.

ADRENAL DISEASE.—See SUPRARENAL DISEASE.

ADRENALIN (Adnephrin, Adrin, Epinephrin, Suprarenalin).—The chief active principle of the suprarenal gland and the most powerful hemostatic and astringent known. It has been found to be of great value in all conditions in which adrenal extract is indicated. It is generally used in the form of the chlorid which is marketed in a 1 to 1000 solution. This solution is diluted for local medication to 1 in 5000, or 1 in 10,000. In the production of local anesthesia it is often added to cocain (or holocain, etc.) to increase the effect of the latter and to prevent intoxication. Its powerful angiostenotic properties are utilized for bloodless operations on the nose and throat, in epistaxis, menorrhagia, and other forms of hemorrhage, in asthma, laryngitis, conjunctivitis, coryza, etc. Its prompt and powerful stimulation of the heart and vasomotor system will be found invaluable in collapse during anesthesia and surgical shock, in opium and morphin poisoning, and in sudden failure of the circulation. Dose, internally, 5 to 10 minims of the solution. See SUPRARENAL EXTRACT.

ADVANCEMENT.—See EYE-MUSCLES (Operations).

AEROPHAGIA.—Swallowing of air occurs as a symptom of various gastric neuroses associated with atony of the stomach walls, and especially in hysteria. It must be differentiated from belching of gas resulting from fermentation of stomach contents which, however, rarely produces any considerable quantity of gas. Aerophagia, when not due to organic disease or reflex causes, readily yields to simple therapeutic measures tending to improve the general condition.

AEROTHERAPY.—See PNEUMOTHERAPY under TUBERCULOSIS (Pulmonary).

AFRICAN LETHARGY.—See SLEEPING SICKNESS.

AFTER-BIRTH.—The popular designation of the placenta, cord, and membranes; also called the secundines. See PLACENTA.

AFTER-COMING HEAD.—See FETUS (Breech Presentation, Version).

AFTER-MILK.—The last milk taken from the breast at any one milking; also called strippings. It has a high specific gravity compared with foremilk, and is particularly rich in fat.

AFTER-PAINS.—Intermittent and painful contractions of the uterus, caused by efforts to expel portions of membranes, placenta, and blood-clots retained in its cavity after miscarriage or labor. They rarely occur except in multiparæ, and usually disappear after the first 3 or 4 days of the puerperium.

Diagnosis.—They may be confounded with the beginning pain of pelvic inflammation. The following table will enable one to make a differential diagnosis:

AFTER-PAINS.	PAIN OF PELVIC INFLAMMATION.
Cramp-like and intermittent.	Constant; as a rule, localized to one side of the pelvis.
Not affected by pressure.	Intensified by pressure.
Attended by discharge of blood-clots or portions of membranes.	Lochial discharge lessened or suppressed.
Uterus becomes hard at time of pain.	Uterus boggy, tender, and subinvoluted.
Pulse normal.	Pulse rapid.
Temperature normal.	Temperature elevated.

Treatment.—If the pains are severe enough to make the patient distinctly uncomfortable, they can usually be readily relieved by the administration of 1 dram of the camphorated tincture of opium combined with 1/2 of a dram of the fluid extract of ergot. If this mixture, given every 2 or 3 hours, fails to relieve the patient, a hypodermic injection of morphin acetate (1/4 of a grain) should be substituted.

AGALACTIA.—See BREAST (Defective Secretion of); MILK (Mother's).

AGAR-AGAR.—A substance derived from sea weeds in the East Indies. It is used as a demulcent and in constipation. In the stomach and intestines, by absorption of water, it is converted into an indigestible jelly which increases the bulk of the feces. Dose, 75 to 240 grains mixed with food. See BACTERIOLOGY.

AGARIC ACID.—An odorless powder. It is used to arrest colliquative sweats. It is one-

twentieth as active as atropin and does not influence other secretions. Dose, 1/12 to 1/3 grain; it should not be given hypodermically.

AGE.—The length of time a being has existed; also a certain stage in life. The period of life is divided into a succession of ages, as follows: (1) *Infancy*, from birth to the appearance of the temporary teeth; (2) *childhood*, from the cutting of the first permanent teeth to puberty; (3) *youth*, from puberty to the attainment of the full stature—that is, 18 or 19 for girls, 21 to 22 for boys; (4) *maturity*, covering the interval from youth to the climacteric; (5) *old age*, or period of decline. Other divisions may be made: as, *e. g.*, those of embryonic life, of immaturity, of maturity, of senility, etc. See Adolescence, Anatomic Age, Infant, Old Age, Puberty, etc.

AGE OF CONSENT.—See Rape.

AGORAPHOBIA.—A fear of open places, usually associated with symptoms of greater importance in neurasthenia and in persons of neurotic inheritance. The condition may be developed rapidly or gradually. It is characterized by a feeling of alarm or terror that the individual experiences when in a certain space—upon the street, especially when the stores are shut, in a church, theater, vehicle, on a bridge, or in looking at an extended façade or flying perspective. Such persons feel better when with some one, or when they are near some object, as a carriage, or when carrying an umbrella or a stick.

The treatment should regard the general health in the broadest sense, and particularly strengthen the nervous system. Active mental employment and pleasing social and moral surroundings will do much to relieve and finally cure the malady.

AGRAPHIA.—Inability to express ideas in writing. In some cases not a single letter can be formed; in others, words, and a number of words—without meaning however—can be written. This defect may occur alone or associated with defects of speech. It is a disease of the motor speech-center whereby the power of writing is abolished, even when the hand-center is intact and the movements of the arm are unimpaired. See Aphasia.

AGUE.—See Malarial Fever.

AGUE-CAKE.—Enlargement of the spleen due to malaria.

AGURIN.—Theobromin sodium acetate, said to contain 60 per cent. of theobromin; it is equally as active a diuretic as diuretin though more soluble, and is well tolerated by the stomach. It is said to have greater power of sustaining the diuresis produced than theophyllin though inferior to the latter in diuretic power. Excellent results are recorded in dropsies and engorgements. It is said to be an efficient antistenocardiac remedy. Dose, 5 to 15 grains in wafers.

AINHUM.—A disease occurring in the tropics, chiefly affecting negroes, in which the little toes are slowly and spontaneously amputated at about the digitoplantar fold. The process is very slow, does not affect other toes or parts, is unaccompanied by any constitutional symptoms, and its cause is unknown. It sometimes attacks the great toe. Called also "dactylolysis spontanea."

AIR.—Atmospheric air consists of a mixture of 77 parts by weight, or 79.19 by volume, of nitrogen, and 23 parts by weight, or 20.81 by volume, of oxygen; with 3.7 to 6.2 parts by volume of CO_2 in 10,000 parts. One hundred cubic inches weigh 39,935 grains. The pressure of the air at sea-level is about 14 3/4 pounds upon the square inch.

AIR-BATH.—Therapeutic exposure to air that may be heated, condensed, or variously medicated. See Bath.

AIR, COMPRESSED.—See Pneumotherapy under Tuberculosis, Pulmonary; and Lungs, (Surgery).

AIR-EMBOLISM.—See Veins (Injuries).

AIR, LIQUID.—Liquefaction occurs at − 140° C. (− 220° F.) at a pressure of 39 atmospheres, but may be brought about at a higher pressure by lowering the temperature beyond the above-mentioned level. Liquid air is now manufactured commercially and has been employed in medical practice.

Physiologic Action.—Aside from a slight antibacterial power, manifested in a reduction of the virulence of bacterial colonies rather than actual destruction, liquefied air acts (1) as a cold application, (2) as a counterirritant, (3) by virtue of the hyperemia which follows its application, and (4) as an escharotic.

Clinical Uses.—As a cold application to freeze the tissues for the purpose of inducing local anesthesia and analgesia (application to the spinal extremity of a nerve in neuralgia and herpes zoster). The hyperemic effects are utilized in the treatment of furuncles and carbuncles. One application of liquid air is said to abort a boil. Lupus vulgaris and lupus erythematosus, as well as epithelioma, have been treated in this way with some success though it is not as satisfactory as carbon dioxid snow (*g. v.*). It is also said to be an effective means of removing nævi without pain and without leaving a scar. For the destruction of polypi and other benign growths it may be used in the same way as other cauterizing agents.

The fluid is supplied in Dewar's bulbs and, according to White, is applied with a certain amount of pressure on a swab of wool. See Carbon Dioxid Snow.

AIROL.—Bismuth oxyiodogallate, or, practically, dermatol with the addition of iodin. It is employed as a substitute for iodoform in similar doses and preparations. It is not without toxic effect in large doses. Calomel is incompatible with it.

AIR-PASSAGES, FOREIGN BODIES IN.—See Larynx.

AKROMEGALY. Definition.—A disease characterized by abnormally large development of the extremities and of the face, the bony as well as the soft parts being involved.

Etiology.—It is a disease of early adult life, usually commencing before 30. Heredity need not be considered, for although it is slightly more frequent in women, they are likely to become sterile early. Various diseases have preceded, but none have been proved to cause, its appearance.

Morbid Anatomy.—Akromegaly is a true hypertrophy of the bones. In well-marked cases nearly

all bones may be affected, although the enlargement of the bones of the extremities and of the face is more evident. In the long bones the greatest growth is at the ends and at the points of insertion of muscles and tendons. The spongy bones are all more or less thickened, while flat, thin bones, the cranial excepted, may become thinner in their plates. The spongy ends of long bones may show a condensing osteitis, and ossification may be found in articular cartilages and tendons, and by this process cranial sutures may be obliterated. The dilatation of the antrum is believed to be the cause of the apparent enlargement of the superior maxilla. The marked growth of the lower jaw, which is lengthened and widened, particularly at the symphysis, favoring a prominent mental process, gives rise to a prognathous outline that is quite pathognomonic of the disease. The features gradually assume the type characteristic of the disease, obliterating racial distinctions. Inasmuch as the blood-vessels are usually changed—either narrowed, from a thickening of the intima, or dilated, from thinning of the remaining coats—thus modifying the nutrition of the tissues, various degenerations are found. There may be enlargement of the brain and nerves and thickening of the endocardium and pericardium. There may be increase of connective tissue in the liver, or sclerosis and fatty change in the nerves. The heart is generally enlarged. Chronic nephritis and renal cysts have been observed. The liver, kidneys, and suprarenal capsules are often increased in size. A very constant finding is a diseased pituitary body, which may be enlarged, diseased, or the seat of a cyst, glioma, adenoma, or small-celled sarcomatoid growth. There may also be enlargement of the thyroid and thymus glands, or atrophy of the former.

Pathology.—Since the pituitary body is so constantly found to be diseased, the disease is inferentially one of the ductless gland system, and not of neurotic origin (von Recklinghausen), nor a trophoneurosis (Lancereaux), nor of the vascular system (Klebs). The secretion of the pituitary body is qualitatively changed.

Symptoms.—These are due to local changes in the pituitary body or around the sella turcica, or to connective-tissue changes in the organs of the body, to the resulting vascular and nervous degenerations, and to growth in the bones. Kyphosis is common, resulting from involvement of the spinal column. There may be atrophy of the muscles. The eyeballs are often prominent and exophthalmos may be observed. Of the special symptoms, headache occurs very frequently, also pain in the extremities. The voice becomes altered by reason of changes in the tongue and larynx. The special senses are often impaired. Visual impairment is nearly always present and may progress to total blindness from optic atrophy; narrowing of the visual fields in all degrees, or hemianopsia and optic neuritis due to pressure, are frequent. In a number of cases bitemporal hemianopsia, due to pressure of the hypertrophied pituitary body on the chiasm, has been noted. Various cutaneous manifestations (as hyperhidrosis, anesthesia, trophic disturbances), symptoms referable to the circulation (as dyspnea, asthmatic attacks, hypertrophy and dilatation of the heart, palpitation), modifications of the urine (as polyuria, albuminuria, and glycosuria), are not infrequent. Mentally, the patients are dull, and they often suffer from a sense of fatigue. There is diminution of sexual desire, and in women menstrual disorders and early cessation of the menses.

Diagnosis.—This presents no difficulties. It is distinguished from progressive hyperplasia, which is congenital and usually unilateral, and involves the shaft of the bone. For its relation to giantism, see GIGANTISM. From osteitis deformans (Paget's disease) the distinction is simple. In hypertrophic pulmonary osteoarthropathy (Marie) the jaw is not enlarged, the articular surfaces of long bones are markedly thickened, kyphosis is not constant, and lesions of the respiratory organs are associated.

The earlier period of its onset, the oval face, the sausage-shaped fingers, and the yellow and wrinkled skin differentiate akromegaly from myxedema.

Prognosis.—The disease is of long duration and generally fatal. The symptoms may be stationary as regards severity. Death is usually unexpected. Considering the number of instances in which metabolism is disturbed, the patient's resistance to intercurrent febrile diseases is lessened.

Treatment.—As it is likely that the primary cause of the disease lies in the disordered secretion of the pituitary body, the hypodermic injection of extracts of this body is indicated. Marinesco reports that in 3 instances the headache diminished considerably, but not the pains in, nor the size of, the limbs.

Inasmuch as Osborne found evidence that the thyroid had attempted to furnish a new secretion, and at the same time a large amount of its own, to assist the pituitary body, thyroid extract is theoretically useful. Certainly, in a considerable number of cases the thyroid has been found to be atrophied—it may be from its hypertrophy by connective-tissue formation—which prevents it from performing its functions. Bramwell obtained success in one instance, but in a second, possibly a case of gigantism, great improvement followed the use of the pituitary after the failure of the thyroid extract.

Observing the diminution of red blood-corpuscles and hemoglobin, and the leukocytosis of the late stages, in addition to the thyroid extract Brown-Séquard recommended the simultaneous administration of extracts of spleen and bone-marrow, equal parts, daily injections. Of particular importance is the maintenance of as high a degree of nutrition as is possible.

The various symptoms must be treated as they arise with a view to relief only.

ALBARGIN.—A compound of silver nitrate with gelatin, containing from 13 to 15 percent of silver. It is used as a substitute for silver nitrate.

ALBINISM (Congenital Achroma; Congenital Leukoderma).—That condition of the skin in which there is a congenital absence of pigment, unaccompanied by textural changes in the skin, and involving its entire surface, including the pilary

filaments and the choroidal coats and irides of the eyes. It is usually associated with nystagmus, photophobia, and astigmatism.

ALBUMIN.—A proteid substance, the chief constituent of the body. Its molecule is highly complex, and varies widely, within certain limits, in different organs and conditions. It contains approximately the following percentages: Carbon, 51.5 to 54.5; hydrogen, 6.9 to 7.3; nitrogen, 15.2 to 17.0; oxygen, 20.9 to 23.5; sulphur, 0.3 to 2.0. Its exact composition and constitution are still unknown. Albumen (white of egg, often called albumin) is largely composed of it. Other varieties are called after their sources or characteristic reactions, as acid albumin, alkali albumin, muscle albumin, serum albumin, ovum albumin, vegetable albumin, etc. Normal albumin is the type of a group of proteids known as albumins. For the various tests for albumin see URINE (Examination). See also ALBUMINURIA.

ALBUMINOID DISEASE.—It is also known as **Lardaceous, Waxy, or Amyloid Degeneration.** A form of degeneration usually affecting simultaneously a number of the viscera, and occurring secondarily to some preexisting disease. Those viscera, most usually the seat of the change are, in the order of frequency, the spleen, liver, kidneys, intestine, and lymph-glands. (See SPLEEN, LIVER, NEPHRITIS.) The tissues around the capillary vessels are first affected; from these centers it spreads until the whole organ on section presents a pale, glistening, waxy, or bacon-like appearance. This is due to the infiltration of a peculiar proteid substance, lardacein, which, with iodin, gives a deep mahogany brown color, the characteristic test for the disease. The preexisting disorder is either some chronic suppuration, as in diseases of the bones or joints, or some wasting disease, like pulmonary tuberculosis, syphilis, etc. The only way in which the disease may be arrested is by thorough removal of the cause.

ALBUMINURIA.—The presence in the urine of albumin, a mixture of serum albumin and serum globulin in various proportions. True albuminuria must be distinguished from the presence of albumin due to an admixture with the urine of blood, pus, or other albuminous fluid. However, even under these circumstances it must be remembered that true albuminuria may be coexistent. Albumin in the urine may result from a number of causes: *e. g.*, from mechanic interference with the renal circulation; from congestion, lesions, and organic diseases of the kidneys themselves; from toxic substances in the blood, such as lead, in which case there is a granular form of nephritis; from changes in the blood due to various diseases, as anemia, purpura, scurvy, and sepsis; in pyrexia; in certain nervous disorders, such as tetanus, delirium tremens, apoplexy, Graves' disease, and epilepsy; in various functional disorders, as dyspepsia, high living, great exertion, etc., and during pregnancy. The etiology of albuminuria is still undetermined, but it is now recognized that it will be produced by any condition that interferes with the nutrition of the glomeruli or renal epithelium. **Cyclic albuminuria,** a condition also known as physiologic, simple, functional, or transient albuminuria, or the albuminuria of adolescence, in which a small quantity of albumin appears in the urine, especially of the young, at stated times of the day; hence the term "cyclic." The nature of this phenomenon is not positively known, but it is probably the result of some changes in the renal circulation. See NEPHRITIS, KIDNEY, URINE (Examination).

ALCOHOL.—Ethyl alcohol, C_2H_5OH. A liquid obtained by the distillation of fermented grain or starchy substance. It is used in pharmacy as a solvent for resins, and as a base for all tinctures. Commercial alcohol contains 91 percent of absolute alcohol, with 9 percent of water.

Action.—Alcohol is both refrigerant and rubefacient, and is also astringent, anhidrotic and slightly anesthetic. While it is antiseptic and disinfectant, it has comparatively little bactericidal action at the temperature of the body, and alcoholization actually predisposes to bacterial infection. It generally tends to promote digestion, sharpening the appetite and increasing the flow of gastric juice, but large quantities give rise to so much local irritation that nausea and vomiting result. In concentrated form it reflexly stimulates the heart and respiration and causes dilatation of the blood-vessels, particularly those of the skin. About 90 percent of the alcohol absorbed from the alimentary tract undergoes combustion. In doing so it gives up energy to the body, and is therefore to be considered as a food. Alcohol is generally regarded as a central nervous stimulant, which first excites and then depresses the cerebral and other cells. Narcotic doses usually cause a considerable reduction of temperature. Alcohol is somewhat diaphoretic and diuretic. The small percentage of it which is not oxidized in the tissues is excreted unchanged, principally by the lungs and kidneys, and to a slight extent in the sweat and milk.

Therapeutics.—Alcohol is employed as an evaporating lotion for sprains, bruises and local inflammations, and its rubefacient and astringent effects are also made use of in various conditions. Given internally, it may relieve gastric pain and is sometimes of service, especially in the form of champagne or of brandy, in small doses with ice or effervescent mineral waters, in checking nausea and vomiting. It is useful in diarrheal affections and in intestinal as well as gastric colic. Alcohol is of immense advantage in many cases of febrile disease, when during critical periods it sustains the vital powers by supplementing the insufficient quantity of nutriment which the system is capable of appropriating and at the same time stimulating the digestion, thus enabling the patient to dispose of an increased amount of food. It is also highly useful in arousing and supporting the flagging powers in sudden depression of the system, as in shock, syncope, severe hemorrhage, and poisoning by various drugs. In phenol poisoning and snake-bite it likewise has a direct antidotal effect. In certain chronic conditions it is of undoubted benefit, but the danger of the patient's contracting the alcoholic habit must always be taken into consideration (Wilcox).

Alcohol and Food.—W. S. Hall of Chicago gives the following table showing the differences between foods and alcohol:

Food.	Alcohol.
1. A certain quantity will produce a certain effect at first; the same quantity will always produce the same effect in the healthy body.	1. A certain quantity will produce a certain effect at first but it requires more and more to produce the same effect when the drug is used habitually.
2. The habitual use of food never induces an uncontrollable desire for it in ever-increasing amount.	2. When used habitually it is likely to induce an uncontrollable desire for more, in ever-increasing amounts.
3. After its habitual use a sudden total abstinence never causes any derangements of the central nervous system.	3. After its habitual use a sudden total abstinence is likely to cause a serious derangement of the central nervous system.
4. Foods are oxidized slowly in the body.	4. Alcohol is oxidized rapidly in the body.
5. Foods, being useful, are stored in the body.	5. Alcohol, not being useful, is not stored in the body.
6. Foods are the products of constructive activity, activity of protoplasm in the presence of abundant oxygen.	6. Alcohol is a product of decomposition of food in the presence of abundant oxygen.
7. Foods (except meats) are formed in nature for the nourishment of living organisms and are, therefore, inherently wholesome.	7. Alcohol is formed in nature only as an excretion. It is, therefore, in common with all excretions, inherently poisonous.
8. The regular ingestion of food is beneficial to the healthy body, but may be deleterious to the sick.	8. The regular ingestion of alcohol is deleterious to the healthy body, but may be beneficial to the sick (through its drug action).
9. The use of foods is followed by no reaction.	9. The use of alcohol, in common with narcotics in general, is followed by a reaction.
10. The use of food is followed by an increase in activity of the muscle cells and brain cells.	10. The use of alcohol is followed by a decrease in the activity of the muscle cells and brain cells.
11. The use of food is followed by an increase in the excretion of carbonic acid.	11. The use of alcohol is followed by a decrease in the excretion of carbonic acid.
12. The use of food may be followed by accumulation of fat, notwithstanding increased activity.	12. The use of alcohol is usually followed by an accumulation of fat through decreased activity.
13. The use of food is followed by a rise in body temperature.	13. The use of alcohol may be followed by a fall in body temperature.
14. The use of food strengthens and steadies the muscles.	14. The use of alcohol weakens and unsteadies the muscles.
15. The use of food makes the brain more active and accurate.	15. The use of alcohol makes the brain less active and accurate.

Alcohol Table.—Average percentage of alcohol contained in the following liquids:

Rum	60 to 75	Sauterne	11 to 18
Whisky	50 to 60	Burgundy	8 to 14
Brandy (British)	50 to 60	Moselle	8 to 12
Brandy (French)	50 to 55	Rhine Wines	7 to 16
Gin	48 to 60	Chablis	7 to 10
Port	15 to 18	Champagne	6 to 13
Marsala	15 to 21	Bitter Ale	6 to 9
Sherry	14 to 18	Cider	2 to 9
Madeira	14 to 17	Porter	4 to 7
Hungarian Wines	9 to 15	Beer	2 to 4
Claret	8 to 12	Ginger Beer	1 to 3

ALCOHOLISM.—Alcoholism is the term used to designate the physical and mental phenomena induced by the excessive use of alcohol.

Temulentia is a term signifying drunkenness; **mania-a-potu** is an acute mental derangement, occurring in those of strong neurotic tendencies; **delirium tremens** is an attack of delirium associated with tremors in persons with the numerous changes resulting from chronic alcoholism. Delirium tremens results in alcoholics suffering from some form of nephritis, preventing the elimination of some poison developed from the ingested alcohol. **Dipsomania, or oinomania,** is an alcoholic insanity in which an individual, at longer or shorter intervals, has paroxysms of alcoholic desires, between which he neither wishes nor craves alcohol.

Pathologic Anatomy. Acute Alcoholism.—The brain is the seat of an active hyperemia; the mucous membrane of the stomach and duodenum is markedly injected and covered with a ropy mucus slightly tinged with blood, and the gastric juice is altered in quality and quantity. The kidneys are also the seat of an active hyperemia.

Chronic Alcoholism.—In this condition of the economy there may be no organs or tissues that do not present morbid changes. The gastrointestinal mucous membrane presents the changes of chronic catarrhal inflammation; the liver, the first organ to receive the poison after the stomach, presents the changes of congestion, cirrhosis, or fatty degeneration; the kidneys show chronic congestion and often the changes incident to chronic interstitial nephritis. According to Hughes, the postmortem results found in 25 cases of delirium tremens dying in the Philadelphia Hospital were 14 with the changes of interstitial nephritis, 8 with chronic parenchymatous nephritis, and 3 with fatty kidney; all showed chronic gastric catarrh, and changes in the myocardium and in the aorta and arteries of the heart and brain. The muscular structure of the heart may undergo fatty degeneration and the vessels the senile changes of the aged. The brain structure presents the changes of sclerosis in various stages, and there may be chronic meningitis and pachymeningitis with hematoma. The nerves are altered, atrophied, and hardened, and the neuroglia, vessels, and ganglion cells of the spinal cord show similar changes.

Symptoms.—Acute alcoholism, resulting from the use of a large quantity of alcoholic fluid, occurs with symptoms of mild intoxication to drunkenness passing to acute delirium and acute coma. The condition begins with a period of exhilaration, passing to semidelirium and ending in acute coma, when the breathing is stertorous, the face bloated and congested, the lips are swollen and purplish, the pupils are contracted, the pulse is feeble and slow, the skin cold and clammy, the temperature depressed, and frequently the control of sphincters lost. An individual so affected is colloquially said to be "dead drunk."

The cases of ordinary drunkenness do not often pass beyond the stage of exhilaration ending in a mild coma or sleep.

Mania-a-potu, or acute alcoholic delirium, is the direct result of alcoholic excess in those engaged in a sudden debauch or who have drunk alcoholic beverages very "hard" for a comparatively short period. The individuals grow more and more

excitable, lose all desire for food, are unable to sleep, become the prey of horrible hallucinations —"the horrors"—finally terminating in mania that resembles delirium tremens in all save the tremor, which is absent.

Chronic Alcoholism.—The condition to which this term has been given constitutes a disease. It is the result of the continued use of alcoholic beverages until one or more of the morbid organic changes have occurred. These persons are markedly dyspeptic, with coated tongue, fetid breath, and early morning vomiting, straining, or retching, attended with much distress. There is a gradually developing muscular tremor, progressing to the ataxic gait, and insomnia. The face may become either pallid, flabby, and bloated, with an imbecile expression, or swollen, rough, and dusky, with swellings under the eyes, and yellow injected conjunctivæ. There is headache, vertigo, and attacks of hallucinations; the memory grows weaker, the judgment less accurate, the moral sense blunted, and the will-power weak and erratic. These and many other symptoms add to the distress of the individual, which he attempts to overcome by the use of more and more of the poison.

Delirium Tremens.—In the majority of instances delirium results from a prolonged debauch in an old drinker. It begins with an increased tremor, insomnia, irritable, excitable manner, followed by the characteristic hallucinations and illusions, during which snakes and all forms of repulsive reptiles are seen, causing the most intense horror and abject fear. There also occur illusions of smell and hearing. This marked excitement is followed by great depression, the skin is cold and clammy, the pulse feeble, the muscular system weak, the mind in a condition of coma-vigil, and a febrile condition, typhoid in character, develops. Uremic symptoms soon develop, the temperature suddenly bounding to 103° to 105° F., with albumin and casts in the urine.

The ordinary duration of an attack of delirium tremens is about 2 weeks in those recovering, although death may occur at any time from cardiac failure, uremia, or alcoholic pneumonia. Convalescence dates from the beginning of refreshing sleep, the patient awakening with a clear mind and desire for food. Should the delirium subside, the patient still continue to mutter and pick at the bed-clothing, the tongue become dry and cracked, and the regurgitation of dark brownish and bilious matter occur, the condition is critical, and an early fatal termination may be expected.

Dipsomania, or oinomania, is the inherited or acquired mental condition that craves the drinking of intoxicating liquors. This is a true mental disease. It manifests itself in periodic attacks of excessive indulgence in alcoholic drinking, or this symptom of this sad disease may be replaced by other irresistible desires of an impulsive kind, such as lead to the commission and repetition of various crimes, the gratification of other depraved appetites, robbery, or even homicide. Imbecility and dementia frequently result.

The paroxysms at first occur at long intervals, but gradually the intervals become shorter and shorter, until the individual entirely surrenders himself to alcoholic and other excesses.

Diagnosis.—Profound drunkenness or alcoholic coma may be and often is confounded with apoplectic and uremic coma. Von Wedekind suggests the following method for diagnosing drunkenness: "By simply pressing on the supraorbital notches with a steadily increasing force you may, with certainty of success, bring an unconscious alcoholic to his senses, and thus differentiate between alcoholic and other comas." In hospital practice one should always be on the lookout for fracture of the skull. It must be remembered that many such patients are given alcoholic drinks before reaching the physician. See Coma.

The symptoms of chronic alcoholism often bear a close resemblance to the following maladies: General paralysis, disseminated sclerosis, paralysis agitans, locomotor ataxia, cerebral and spinal softening, epilepsy, chronic dementia and nervous dyspepsia.

In individuals whose habits are unknown the question of diagnosis is attended with considerable difficulty. Anstie lays much stress upon the importance of the following 4 points, diagnostic of chronic alcoholism: Insomnia, morning vomiting, muscular tremor, and causeless mental restlessness.

Prognosis.—In acute alcoholism the prognosis is good if the patient is manageable.

In chronic alcoholism the organic changes, the direct result of the alcoholic habit, tend to shorten life by the production of fatty heart, Bright's disease, insanity, impotence, epilepsy, melancholia, and organic brain diseases. The danger in delirium tremens is heart failure or deepening coma. The association of chronic nephritis with delirium tremens, perhaps its cause, must always be taken into account in determining a prognosis. Acute lobar pneumonia is a very fatal complication of all forms of alcoholism.

Treatment.—In deciding upon a plan of medication in any of the varieties of alcoholism, the condition of the kidneys, heart, and vessels must be considered. And see Lambert Treatment for Narcotic Addiction.

Acute Alcoholism.—The treatment of a case of drunkenness requires no especial consideration, as the rapid elimination of the alcohol soon occurs if its ingestion ceases. Solution of ammonium acetate in large, frequently repeated doses assists the elimination of the poison. A full dose (half an ounce) of spirit of ammonia, in water, will often sober a "drunk."

In robust subjects the most rapid results are obtained by putting them to bed and administering a hypodermic of apomorphin hydrochlorid, 1/10 to 1/5 of a grain; after emesis the patient will usually go to sleep without further medication, and will awaken sober, but feeble. A combination of tincture of capsicum, 5 minims, tincture of nux vomica, 5 minims, compound tincture of cinchona, 1 dram, should be given every 3 or 4 hours, with koumiss, milk, beef-juice, or raw eggs *ad libitum*. The bowels should be relieved as speedily

as possible, and for this purpose use a mercurial, followed by a saline laxative. If the patient is too feeble for emesis, order solution of ammonium acetate, 4 drams, every 2 hours, and a wet pack; after this treatment, the acute effects of the alcohol speedily disappear. This is to be followed by a tonic course. For insomnia subsequent to acute alcoholism Brower usually prescribes a combination of sodium bromid, 15 grains, chloral hydrate, 15 grains, tincture of hyoscyamus, 15 minims, to be repeated in 1 hour, if necessary. Heat must be applied to the body if there is evidence of prostration and a cold and clammy skin.

For **mania-a-potu** the immediate and complete withholding of alcoholic beverages is essential to successful treatment. If the stomach will tolerate food—and it usually will—milk, diluted with lime-water, or Seltzer water, or hot beef-tea strongly seasoned with capsicum, should be frequently administered, together with such cerebral sedatives as potassium bromid, chloral, by the mouth or rectum, or the hypodermic use of morphin sulphate, 1/3 of a grain, with either hyoscin hydrobromid, 1/100 of a grain, or atropin sulphate, 1/100 of a grain. If the attack is associated with symptoms of cardiac depression, brisk friction, artificial warmth, stimulating enemas, and hypodermic injections of strychnin sulphate, 1/24 of a grain, repeated, or citrated caffein, 3 grains, repeated, or digitalis, are indicated. "If chloral is inadmissible by reason of weakness of the circulation, paraldehyd may be substituted, in doses of from 1/2 to 1 dram, repeated at intervals of from 1 to 2 hours until quietude is produced" (J. C. Wilson). Act on the bowels and kidneys in all cases.

For the **collapse** following a lethal dose of alcohol the stomach should be immediately emptied by emetics or the stomach-tube or pump, and the organ washed out with warm water or coffee, the patient placed in the recumbent posture and surrounded by artificial warmth, hot friction to the lower extremities, the use of artificial respiration or of faradism to the thorax, inhalations of ammonia, hypodermic injections of digitalis, strophanthus, or atropin. "The flagging heart may be stimulated by occasionally tapping the precordia with a hot spoon—Corrigan's hammer" (J. C. Wilson).

An attack of acute alcoholism or mania-a-potu may often be aborted with trional, 30 grains, repeated in 2 hours, or chloralamid, 30 to 40 grains, repeated.

Chronic Alcoholism.—The symptoms of chronic alcoholism are the direct result of the continuous action of a single toxic principle, and no success of even a temporary kind may be expected unless the poison be withdrawn. The rapidity with which this can be accomplished is a question for the skill, judgment, and experience of the physician to determine; the chief obstacle to its success will be moral rather than physical. Next to the disuse of alcohol is the question of diet. Much progress will be made as the appetite and digestion improve, and hence great attention should be given to it. The general health will also be benefited by fresh air, exercise, mental occupation, cold or tepid sponging, and an occasional hot bath at bedtime. For the combination of symptoms of spirit craving, morning vomiting, muscular tremor, mental restlessness, and insomnia, no drug is comparable with strychnin nitrate, either hypodermically twice daily or, what is preferable, by the stomach, to secure its local action on the mucous membrane. If insomnia is persistent in spite of the foregoing treatment, the temporary use may be made of such remedies as chloral, paraldehyd, or trional, 30 grains, repeated. In many cases it is desirable, for its mental effect, if for no other, to administer what the patient terms a substitute for his alcoholic beverages. The following is a good combination for that purpose:

℞. Tincture of nux vomica, ℥ ss
Tincture of capsicum, ℥ j
Fluidextract of lupulin, ℥ iij
Compound infusion of gentian, ℥ jss.

A dessertspoonful 3 or 4 times daily, well diluted.

For the anemia, loss of strength, and mental debility, benefit may follow the use of syrup of the hypophosphites with strychnin.

Delirium Tremens.—The patient should be isolated, have a skilful, sensible nurse, alcohol entirely withdrawn or the quantity greatly reduced, supplied with an easily digested nutritious diet, and remedies used to combat the excited nervous system. For the last purpose no one combination is comparable with hypodermic injections of morphin sulphate, 1/4 of a grain, with atropin sulphate, 1/120 of a grain, or hyoscin hydrobromid, 1/100 of a grain, repeated occasionally, as needed; or trional, chloralamid, or paraldehyd; chloral in the following combination also acts well if the stomach is not too irritable:

℞. Chloral, ℥ ss
Tincture of capsicum, ℥ ss
Peppermint water, ℥ vss.

A tablespoonful every 2 hours until sleep is produced; alternated with a cup of hot beef-tea, to which has been added a bolus of capsicum, 20 grains.

Care is necessary that a condition of coma is not produced by the remedies mentioned.

In patients with irritable stomachs a sedative mixture consisting of potassium bromid, 40 to 60 grains, and chloral hydrate, 20 grains, may be advantageously administered by rectum and repeated according to indications.

For depression and cardiac weakness, the internal use of any one of the following drugs is serviceable: Strychnin sulphate, citrated caffein, spirits of chloroform, ammonium carbonate, tincture of strophanthus, or digitalis.

The treatment of delirium tremens in the young differs from that in the old. In first attacks in young, strong subjects, withdrawal of forms of alcohol, light and easily assimilated food, moderate purgation, and 1/12 to 1/8 of a grain of

tartrated antimony are useful. If sleeplessness supervenes, 30 grains of potassium or sodium bromid, with 20 grains of chloral hydrate, may be given every 4 hours, in combination. Sulphonal, 30 grains, may be used. Sedatives must not be pushed. An experienced attendant should be present. Means of self-destruction should be removed. Restraints of a mechanic nature are not permissible. A padded room is of great service. In older cases a mild purge may be given, and at short periods, light and very nourishing food should be administered. Sedatives must be carefully watched. Laudanum, 30 to 40 minims, may be given at bedtime or to allay restlessness.

Dipsomania.—The management of these cases is similar to that previously mentioned for chronic alcoholism, although the strychnin treatment should be given the preference in doses of 1/30 to 1/15 of a grain hypodermically three times daily.

Strict attention must be given to the skin, bowels, and kidneys. If the heart is not depressed, the cautious use of hot-air bath or hypodermic injection of pilocarpin hydrochlorid, 1/3 of a grain, repeated at the onset of the mania, is advised.

ALEPPO BOIL.—A disease of the tropics characterized by crops of papules which ulcerate and remain open for months despite all treatment.

ALEURONAT.—A vegetable albumin used as a substitute for wheatbread in diabetes mellitus.

ALEXANDER'S OPERATION.—An operation devised for the cure of backward displacement of the uterus. It consists, as now performed, in laying open the inguinal canal, forcing the round ligament from its attachments and drawing it forward until the fundus of the uterus is felt to impinge against the anterior abdominal wall. The excess of ligament (2 or 3 inches) is now removed, and the remainder is stitched to the floor and pillars of the inguinal canal. The inguinal canal is obliterated, as in Bassini's operation for the radical cure of hernia, and the wound is closed. See Uterus (Retrodisplacements).

ALEXIA.—Word-blindness. A form of aphasia and a special type of psychic blindness, in which the patient is unable to recognize ordinary written or printed characters. **Musical alexia**, or musical blindness, is a pathologic loss of the ability to read music. See Aphasia.

ALIMENTATION.—See Dietetics, Infant Feeding, etc.

ALKALI.—The term includes the hydrated oxids of the alkali metals; these are electropositive, strong bases, uniting with acids to form salts, turn red litmus blue, and saponify fats. A **caustic alkali** (usually potash) is one so concentrated as to possess caustic properties. Potash and soda are called **fixed alkalies**, because they are permanently solid; soda is called a mineral, potash a vegetable, and ammonia a volatile, alkali. See Antacids.

ALKALIES, SWALLOWING.—Similar symptoms are produced by both potash and soda. Pearl-ash, or potassium carbonate, and soap-lees, or sodium carbonate, are the alkalies usually swallowed. An acrid caustic taste is experienced in swallowing, and there is burning heat in the throat, extending down the gullet. When vomiting does occur, the vomitus is mixed with dark, brown-colored blood and with flakes of mucous membrane. Local effects depend chiefly on the causticity of the fluid. Purging, with colicky pains in the abdomen, a cold and clammy tongue, and a feeble and quick pulse exist. After a time the tongue, lips, and throat swell and become soft and red. Saltpeter (potassium nitrate), potassium bisulphate, potassium bitartrate, potassium alum and sulphid, and even common salt (sodium chlorid), in large doses, have acted as poisons.

Treatment.—At once administer dilute acids, such as vinegar and water, lemon, orange, or lime juices, and such oils as form soaps with the alkalies. Opium should be freely given if there is much pain. The stomach-pump should not be used unless the case is seen early. The quantity required to destroy life is variable, the concentration rather than the quantity influencing this point. Three ounces of a strong solution of potassium carbonate have killed a boy in 3 hours. See Poisoning.

ALKALINITY.—The living body secretes materials that have an acid reaction (gastric juice, urine) and also materials that are alkaline (saliva, pancreatic juice, bile, etc.). In this way should one secretion become excessive, it becomes neutralized by the action of the one of opposite reaction, and thus the normal equilibrium is established. The medium of exchange throughout the body is the blood. This fluid normally has an alkaline reaction, and even maintains this reaction in nearly all pathologic conditions. Ralfe states that the alkalinity of the blood is maintained by the constant passage into it of the alkaline salts of the food and of alkaline carbonate derived from the oxidation of the lactic, oxalic, and uric acids furnished by the disintegration of the tissues. A sympathetic relationship exists between the acid secretions and the alkaline; thus, the saliva becomes more alkaline during gastric digestion, while the acidity of the urine is considerably lessened. It has been shown that a similar relationship exists between the elimination of carbonic acid by the lungs and the acidity of the urine, the latter falling as the former is increased, and vice versa. The alkalinity of the blood serves a good purpose in four ways: (1) It aids in maintaining the albumin in a liquid state; (2) it renders the serum more germicidal; (3) it increases the absorptive power of serum for gases; (4) it aids in oxidation. See Acidity.

ALKALOIDS.—All nitrogenous vegetable compounds of basic and alkaline character or their derivatives, from which bases may be isolated. They are the chief constituents of the active principles of poisons or the vegetable drugs, employed as medicines. Those alkaloids containing no oxygen are generally liquid and volatile; such are nicotin and coniin. The others are solid, crystallizable and nonvolatile. For the putrefactive alkaloids see Ptomains. Tannin is the best *antidote* for alkaloids in general, as it forms an insoluble tannate. Potassium permanganate is also serviceable; it should be administered in form of a solution 1 : 1000 to 1: 500.

ALLSPICE.— See Pimenta.

ALMOND (Amygdala).—There are two varieties, called *Amygdala amara,* or bitter almond, and *Amygdala dulcis,* or sweet almond. They are identical botanically, but differ in taste and in the presence of amygdalin. This is important, for hydrocyanic acid, a most violent poison, is produced by the reaction between amygdalin and emulsin in the presence of water. Amygdalin exists in the bitter, but not in the sweet, almond.

When the oil and the saccharin constituents of almonds have been removed, they may be made into good bread for diabetics, as they contain virtually no starch. The essential and the expressed oil of almonds have been recommended for the cough of phthisis, given in emulsion in a few drops. The emulsions of both the bitter and sweet almond are made in the same way, may be used for the same purposes in teaspoonful doses, and are especially serviceable in cough mixtures as a vehicle. In gonorrhea the emulsion used as a vehicle will help decrease the burning on urination. In excoriations, chapped hands, freckles, sunburn, etc., expressed oil of almonds is used locally in unguents and lotions.

An emollient and a soothing drink, useful in irritations of the stomach and intestines, and of the air-passages and pharynx, is the following:

℞. Sweet almonds, ℥ ss
Gum arabic, ℥ ss
White sugar, ℥ ij.
Rub up well by gradually adding—
Distilled water, ℥ viij.

Almond paste for the skin:

℞. Powdered bitter almonds, ℥ iv.
White of egg, ℥ j.
Beat well together to a smooth paste, gradually adding—
Spirit of wine, Rose-water, } each, ℥ ij.

℞. Sweet and bitter almonds, of each, ℥ ij
Spermaceti, ℥ ij
Oil of almonds, ℥ ss
Windsor soap, ℥ ss
Rose-water, ℥ j
Oil of rose, Oil of bergamot, } each, gtt. xij.

To either of the foregoing, powdered camphor, 2 drams, may be added. Oil of bitter almonds may be substituted for the oil of roses and the oil of bergamot.

Almond bread is a variety of bread made from almond flour, for use by diabetics. It is made as follows: Take of blanched sweet almonds 1/4 of a pound; beat them as fine as possible in a stone mortar; remove the sugar by putting in a linen bag and steeping for a quarter of an hour in boiling water acidulated with vinegar; mix this paste thoroughly with 3 ounces of butter and 2 eggs. Add the yolks of 3 eggs and a little salt, and stir well for some time. Whip the whites of 3 eggs and stir in. Put the dough thus obtained into greased molds and dry by a slow fire.

Oil of bitter almond is volatile, of aromatic odor, bitter, burning taste, slightly soluble in water, but freely so in alcohol and ether. Its dose is from 1/4 to 1 minim in a mixture. It contains from 2 to 4 percent of hydrocyanic acid which may be removed by distillation with caustic potash. **Bitter almond water** is a weak solution of the oil of bitter almond in distilled water. Its dose is indefinite; average, 1 dram. Oil of mirbane, or nitrobenzol, closely resembles oil of bitter almonds, and is used for flavoring. It contains no hydrocyanic acid, but is a dangerous poison when inhaled, even in small quantities.

Spirit of bitter almond, or essence of bitter almond, contains of the oil 1 part, dissolved in 80 parts of alcohol and water enough to make 100 volumes. Its dose is regulated according to the quantity of alcohol desired. Syrup of almond contains spirit of bitter almond 1 percent; dose, 1 dram.

Expressed oil of almond is made from bitter or sweet almond; dose, 1 ounce.

ALOES.—The inspissated juice of the leaves of *Aloe vera, A. Chinensis, A. Perryi,* etc. Its properties are due to a neutral principle, *aloin;* a tonic astringent, useful in amenorrhea, chronic constipation, and atonic dyspepsia. It is an emmenagog and anthelmintic. Dose, 1 to 6 grains.

Aloes is of a persistent bitter taste, and is slow in its action. Plethoric persons, pregnant women, patients with fever or with irritation or catarrh of the intestine, especially of the rectum, should not be given aloes. While beneficial in subacute or chronic constipation, aloes must not be used continually. In hemorrhoids from muscular relaxation, aloes is of great benefit. It is of value in amenorrhea from atony of the sexual system, constipation, or anemia. It is slowly purgative, affecting chiefly the large intestine, and is a powerful hepatic stimulant. In small doses it is stomachic and tonic. As an anthelmintic, it is given by the rectum. It is especially useful in dyspepsia, constipation, amenorrhea, hypochondriasis, hepatic congestion, flatulency, and mesenteric disease, ascarides, etc.

For constipation:

℞. Extract of aloes, Powdered rhubarb, Powdered ipecac } each, gr. xij.
Mix and divide into 12 pills. Take 1 or 2 as needed.

In amenorrhea:

℞. Pill of aloes and iron, ℥ j
Oil of savine, Oil of rue, } each, ♏ iij
Powdered capsicum, gr. viij.
Mix well and divide into 24 pills. Take 1 pill 3 times daily.

Preparations.—Dose, 1/2 to 2 grains. **A. Purificata,** *Purified Aloes*—prepared from aloes by melting and mixing with one-fifth its weight of alcohol, straining and evaporating; soluble in alcohol. Dose, 1 to 5 grains. From it are prepared the following preparations. **Extractum A.,** *Extract of Aloes*—prepared by mixing 1 part of

aloes with 10 parts of boiling water, standing 12 hours, decanting, straining, and evaporating. Dose, 1/2 to 5 grains. **Tinctura A.,** *Tincture of Aloes*—has of aloes 10, glycyrrhiza 20, diluted alcohol to 100 parts. Dose, 10 to 60 minims. **Tinctura A. et Myrrhæ,** *Tincture of Aloes and Myrrh*—aloes 10, myrrh 10, glycyrrhiza 10, alcohol and water to 100 parts. Dose, 10 to 60 minims. **Pilulæ A.,** *Pills of Aloes*—each has aloes and soap, 2 grains each. Dose, 2 pills. **Pilulæ A. et Ferri,** *Pills of Aloes and Iron*—each pill contains gr. j each of aloes, sulphate of iron and aromatic powder, with confection of rose. Dose, 2 pills. **Pilulæ A. et Mastiches,** *Pills of Aloes and Mastic* (*Lady Webster's Pill*)—each pill has of aloes, gr. ij; mastic, gr. ss; red rose, gr. ss. Dose, 2 pills. **Pilulæ A. et Myrrhæ,** *Pills of Aloes and Myrrh*—each pill contains of aloes, gr. ij; myrrh, gr. j; aromatic powder, gr. ss; mixed with syrup. Dose, 2 pills. **Pilulæ Laxativæ Compositæ,** *Compound Laxative Pills*—each pill contains of aloin, gr. 1/5; strychnin, gr. 1/128; belladonna extract, gr. 1/8; ipecac, gr. 1/16; with glycyrrhiza and syrup. Dose, 2 pills. **Aloes** is a constituent of pilulæ rhei compositæ and tinctura benzoini composita. Incompatible with *Aloes* are mercury nitrate, silver nitrate; with *aloin* are alkaline hydrates, bromin-water, ferric chlorid, lead acetate (basic), tannic acid.

ALOIN.—A neutral principle found in aloes. It forms fine needles, possesses a very bitter taste, and acts as a strong purgative. Dose, 1/2 to 2 grains. See ALOES.

For chronic constipation.

℞.	Aloin,	gr. iv
	Strychnin sulphate,	gr. 1/3
	Extract of belladonna leaves,	gr. iij

Make 20 pills. Take 1 at night.

ALOPECIA (Baldness; Calvities). **Definition.**—Alopecia is a physiologic or pathologic deficiency or loss of hair, either partial or complete.

Congenital Alopecia.—This commonly manifests itself either as a scanty growth, a development only in certain localities, or as a retarded appearance of the hair. In rare cases there may be complete absence of the hair, due to arrested development of the follicles. In such cases hereditary predisposition is usually present, and there is likely to be, in addition, delayed or defective dentition.

Senile Alopecia.—As its name indicates, this form of baldness is observed in the aged. With the atrophic skin changes that accompany senility there takes place a gradual thinning of the hair, beginning upon the vertex of the scalp, the frontal and the temporal regions, and slowly leading to a more or less complete baldness of the scalp.

Premature Alopecia.—This form of alopecia occurs chiefly in individuals between the ages of 20 and 35. It may be either idiopathic or symptomatic.

In the idiopathic variety the scalp presents no abnormal condition. At first only a few hairs fall from time to time, being replaced by a shorter and finer growth. Later these fall, and are followed by still finer hairs. In this manner the entire hair of the scalp may be lost. The affection occurs in both sexes, although much less frequently in women than in men. Heredity appears to be a strong predisposing factor.

The **symptomatic** form results from various local and general diseases. Rapid falling of the hair (*defluvium capillorum*) follows acute diseases, such as typhoid fever, smallpox, etc. Full regeneration of the hair follows the restoration to health.

Rapid and extensive loss of hair occurs with great frequency in the early stages of syphilis. The most prolific cause of premature alopecia is chronic dry seborrhea (**dandruff**) of the scalp. This affection, after a long duration, leads to atrophy of the hair follicles.

Other local diseases, such as lupus erythematosus, erysipelas, psoriasis, eczema, tinea tonsurans, tinea favosa, etc., may all produce more or less marked alopecia.

Prognosis.—In congenital and senile alopecia treatment is of little or no avail. In idiopathic premature alopecia the prognosis should be extremely guarded. In symptomatic alopecia, particularly when there is a removable cause and no hereditary predisposition, the prognosis may be considered more favorable.

Treatment.—Internal treatment is to be employed whenever the condition depends upon a systemic cause. Such tonics as iron, strychnin, phosphorus, arsenic, and cod-liver oil may be prescribed with advantage.

Local treatment is of great importance, particularly when dandruff is present. It consists in the proper cleansing of the scalp and the stimulation of the sebaceous glands to healthy action.

The tincture of green soap makes an admirable shampoo for the removal of epithelial and sebaceous débris. This may be advantageously followed by such a hair wash as:

℞.	Resorcin,	ʒ ij
	Salicylic acid,	gr. xxx to ʒj
	Castor oil,	ʒ ss to jss
	Alcohol, q. s. ad	ʒ vj
	Oil of bergamot,	ʒ j.

Rub into the scalp each night.

When the scalp is accessible, ointments may be used:

℞.	Precipitated sulphur,	gr. xxx to ʒj
	Petrolatum,	ʒ ss
	Oil of bergamot,	♏xxx.

The following is the composition of a popular French hair tonic:

℞.	Hydrochlorid of quinin,	ʒ j
	Tannic acid,	ʒ iij
	Alcohol (70 percent),	1 1/2 pints
	Tincture of cantharides,	ʒ ijss
	Pure glycerin,	ʒ ijss
	Eau de cologne,	ʒ x
	Vanillin,	gr. ij
	Powdered sandalwood.	ʒ j.

This preparation, after being well mixed and shaken, is allowed to stand for 4 days, and is then filtered. It is rubbed into the scalp daily for the purpose named.

The following also have been recommended for baldness:

℞. Aromatic spirit of ammonia, ℥ j
Glycerin, ℥ ss
Tincture of cantharides, ℥ j
Rose-water, ℥ vij.
Apply to scalp morning and evening.

℞. Tincture of cantharides, ℥ jss
Tincture of capsicum, gtt. xx
Glycerin, ℥ ss
Cologne water, ℥ j.
Use on the scalp at night.

℞. Fluidextract of jaborandi, Tincture of cantharides, Glycerin, each, ℥ ss
Vaselin, ℥ jss.
Apply locally with a sponge morning and evening.

ALOPECIA AREATA.—Alopecia areata is a disease of the hairy system characterized by the more or less sudden occurrence of round or oval, circumscribed, bald patches, in rare cases coalescing and producing total baldness.

Symptoms.—The disease is usually limited to the scalp, but may affect the beard, eyebrows, eyelashes, and, in rare instances, the entire cutaneous surface.

As a rule, one, two, or more patches are present upon the scalp. They are circumscribed and rounded, and vary in size from that of a coin to that of the palm of the hand. The skin is smooth, soft, of a dead-white color, and totally devoid of hair. Occasionally, the patches are pinkish, as a result of slight hyperemia. The follicular openings are contracted and less prominent than in the healthy scalp. The skin is thin, soft, and pliable to the touch. In the beginning the patches are level or slightly elevated, while later they are sometimes slightly depressed.

The course of the disease is extremely variable. In some cases the bald patches develop suddenly in the course of a few hours. In other cases the hair loss is gradual, extending over a period of a few days or weeks. The areas then spread by peripheral extension until they attain a certain size, when they remain stationary.

The duration of the disease varies greatly. Recovery seldom occurs in less than a few months, while many cases last several years. In young individuals the hair almost invariably returns sooner or later. In adults the baldness may persist and prove refractory to all treatment.

When regrowth occurs, the patch is first covered by fine, downy, whitish hairs, which are either shed or later converted into coarse and pigmented hairs.

As a rule, there are no subjective symptoms.

Etiology.—The disease is said to have its origin in a functional nerve disturbance, interfering with the innervation of the hair follicles. It has been known to follow psychic shocks (fright, etc.), injuries to the scalp, and section of nerves.

French writers insist upon the parasitic nature of alopecia areata, and cite epidemics of this disease in support of its contagious character.

It is probable that there are two varieties; the one neurotic and the other parasitic.

Pathology.—The affected hairs show an atrophy of the shaft and the bulb. The skin changes are at first mildly inflammatory, later atrophic.

Diagnosis.—Alopecia areata is most likely to be confounded with tinea tonsurans.

Alopecia Areata.	Tinea Tonsurans.
1. Rapid onset.	1. Slow, insidious onset.
2. Patches are: (*a*) Totally devoid of hair. (*b*) Pale or whitish in color. (*c*) Smooth and soft. (*d*) Follicles contracted.	2. Patches are: (*a*) Covered with broken off stumps. (*b*) More or less reddened. (*c*) Rough and scaly. (*d*) Follicles prominent; "gooseflesh" appearance.
3. Absence of fungus.	3. Tricophyton fungus present.
4. Common in adolescence and adult life.	4. Occurs almost exclusively in childhood.

Prognosis.—In children recovery almost invariably takes place. In young adults the prognosis is guardedly favorable, while in advanced age it is unfavorable. The duration of the disease is uncertain and relapses are not uncommon.

Treatment.—The internal treatment consists of the use of such tonics as iron, quinin, strychnin, cod-liver oil, phosphorus, and arsenic. Duhring considers arsenic to be "especially serviceable."

The local treatment has for its object the stimulation of the scalp and the consequent increased blood supply to the follicles. Among the many medicaments that have been advised are alcohol, cantharides, capsicum, the essential oils, turpentine, carbolic acid, ammonia, sulphur, iodin, mercury, beta-naphthol, etc.

The following lotion will be found of value:

℞. Tincture of cantharides, Tincture of capsicum, each, ℥ jss
Castor oil, ℥ ij
Cologne water, ℥ j.
Brush in vigorously once or twice a day.

Instead of lotions, ointments such as the following may be employed:

℞. Beta-naphthol, gr. xxx
Petrolatum, ℥ ss
Oil of bergamot, ♏ xxx.
Rub in thoroughly twice a day.

The faradic current applied with a wire-brush electrode is often useful. In obstinate cases blistering may be resorted to. See also Phototherapy.

ALPHOZONE.—Succinic dioxid. A germicide and antiseptic. It is said to be of value in local infections in which the substance can be brought in contact with the diseased surface. It is used in solutions of 1 : 1000 for general external use; as a nasal douche 1 : 3000 is preferred.

ALTERATIVES.—Certain remedies that alter the course of morbid conditions in some way not yet understood, perhaps by promoting metabolism. They certainly modify the nutritive processes, and thereby cure many diseases of chronic type. *Mercury* and *iodin* are the most prominent agents of this class, the former being endowed with the power of breaking up newly deposited fibrin and of disorganizing syphilitic deposits, while the latter acts energetically upon the lymphatic system and promotes absorption. *Arsenic* also is almost specific in many chronic skin affections, and has remarkable power over chronic pulmonary consolidations, probably producing fatty degeneration and softening of the effusion, so that it may be absorbed or expectorated.

The principal alteratives are: arsenic, antimony, gold, mezereum, sulphur, sulphids, mercury, colchicum, guaiacum, sanguinaria, xanthoxylum, calcium chlorid, iodin, iodids, stillingia, sarsaparilla, cod-liver oil, phosphorus.

Alteratives are indicated when excessively active cell-growth exists, and are contraindicated whenever there is a tendency to tissue break-down, or when that condition exists.

Cases of frontal headache, general malaise, and depression of spirits, with symptoms of biliousness, or the appearance of urates or oxalates in the urine, are improved by purgative doses of mercurials, taraxacum, nitric or nitrohydrochloric acids. In gout, colchicum and potassium salts are used. In nervous debility, as in neuralgia and chorea, phosphorus and arsenic are employed.

Arsenic is generally used in diseases of the skin of the dry variety; antimony finds marked usefulness in forms of inflammation of the bronchial mucous membranes. Mercury is alterative in small doses that do not purge, and it is also of use to break up newly deposited fibrinous masses, as in iritis and pericarditis. In the secondary stages of syphilis it counteracts the effects of the syphilitic virus upon the soft tissues. The iodids and iodin are useful in glandular swellings, and affect the lymphatic system. Alteratives stimulate the absorbent system, and in this way assist in the removal of fibrinous deposits and syphilitic growths. The iodids are most serviceable in the third stage of syphilis, although used in the secondary one.

ALTHÆA.—Marshmallow. The root of *A. officinalis*, a plant of the mallow family. It consists of about one-third of vegetable mucus and starch, together with 2 percent of the alkaloid *asparagin*. Its decoction is employed as a mucilaginous drink. *Asparagin* possesses sedative and diuretic properties, and is useful in ascites and gout. Dose, 2 to 3 grains in water.

ALUM.—Any one of a class of double sulphates formed by the union of one of the sulphates of certain nonalkaline metals with a sulphate of some alkaline metal. The standard (or common commercial) alum, the official **Alumen** (U. S. P.), is the aluminum-potassium sulphate, $Al.K.(SO_4)_2+12H_2O$. It is a powerful astringent and styptic in medicine, and is extensively used in the arts. It has a sweetish astringent taste, and an acid reaction; it is soluble in 9 parts of water, in 0.3 of boiling water, and is insoluble in alcohol. It is a good emetic, and is one of the best remedies in the treatment of lead colic. In ophthalmology alum is used in solution of from 1/2 of a grain to 10 grains to the ounce, dropped freely into the eye in cases of conjunctival disease. It is sometimes applied in solid stick, known as the **alum pencil**, which may be applied without everting the lid. Alum is employed by bakers to whiten their bread, but the effect upon the system is probably injurious. Ordinary **Ammonia alum** is the same as the foregoing, except that the potassium is replaced by ammonium. It was formerly official and is extensively used on account of its cheapness. What is known as *concentrated* or *patent* alum is the normal aluminum sulphate (*alumini sulphas*), which is not a true alum. **Alumen exsiccatum** is exsiccated or burnt alum. **A. Ammonioferric** (*Ferri et Ammonii sulphas*) (U. S. P.) is strongly styptic, and is useful in leukorrhea. Dose, 3 to 15 grains. There are other alums but they are of little interest to the physician. The dose of alum is about 7 1/2 grains. As an emetic for a child 1 dram may be used. *Incompatibles* are: Alkaline hydrates, borax, carbonates, galls, kino, lead acetate, lime-water, magnesia, magnesium carbonate, mercury salts, phosphates, tartaric acid, potassium chlorate. **A. Whey,** a preparation obtained by boiling 2 drams of alum in a pint of milk, and straining. It is used as an astringent and internal hemostatic in wineglassful doses.

In sweating of the soles of the feet:

℞.	Powdered burnt alum,	ʒ v
	Powdered salicylic acid,	ʒ ijss
	Powdered starch,	ʒ xv
	Talcum powder,	ʒ xx.

Use fresh daily.

In erythema, intertrigo, and eczema:

℞.	Alum,		gr. xx
	Zinc sulphate,		gr. x
	Glycerin,		ʒ j
	Rose-water,	q. s.	℥ iv.

In onychia:

℞.	Powdered burnt alum,	gr. iij
	Zinc sulphate,	gr. ij
	Lead subacetate,	gr. ij
	Water,	℥j.

ALUMINUM.—Al = 27. Quantivalence III. A silver-white metal distinguished by its low specific gravity, about 2.6. **A. Hydroxid,** $Al(OH)_3$, a tasteless white powder, feebly astringent; insoluble in water or alcohol, but soluble in strong alkaline or acid solutions. Dose 3 to 20 grains in powder or mixture. **A. and Potassium Sulphate,** $Al.K(SO_4)_2$, (see ALUM), a valuable astringent used

in catarrh, leukorrhea, gonorrhea. Dose, 5 to 10 grains. In teaspoonful doses, an emetic. **A. Sulphate**, $Al_2(SO_4)_3+16H_2O$, an antiseptic and astringent; used as a lotion in 5 percent solution.

ALUMNOL.—An antiseptic and astringent. Though precipitating gelatin and albumin, the precipitate is soluble in an excess of either, so that when it is used on purulent discharges they do not clog up cavities, and desirable penetration below the surface is accomplished. *Incompatible* with it are albumin, alkalies, gelatin, and silver nitrate. Alumnol does not irritate or cause pain, and is employed dry and in solution as a dressing for wounds and ulcers, acute inflammatory diseases of the skin, and acute and chronic inflammations of mucous membranes. In 1 to 3 percent solution it makes a good injection for gonorrhea, and a 4 percent solution is used to check the lacrimal discharge during an examination of the eye.

ALVEOLAR ABSCESS (Parulis).—This occurs from suppuration in connection with the fangs of a carious tooth. The chief features are throbbing pain, with protrusion of the tooth and swelling of the soft structures around the jaw. When not disturbed, it may discharge around the tooth, but more often it appears as gum-boil, having worked itself through the side of the jaw. It may burst into the nose, and, especially when the molars are involved, it has a tendency to break through the face. A chronic sinus is then likely to ensue, the orifice being surrounded by sprouting granulations. Consequences may be even worse; necrosis is not uncommon and pyemia has occurred.

Treatment.—Water, as hot as can be borne, should be used to wash the mouth. The gums should be lanced or leeched. Poultices are discountenanced. Extraction of the tooth when much diseased, or antiseptic repair of the opening is advised. The abscess sac may come away with the fang, and, if not, a free incision through the swollen portion of the gum, the edge of the knife being turned toward the bone, is to be made. If a sinus ensues, probing will usually show a sequestrum of bone or an old fang left, which must be removed.

ALYPIN.—A local anesthetic. It is represented to be less toxic than cocaine and of equal value but having no mydriatic or cycloplegic effects. Dose, 10 percent solution, externally; 1 to 4 percent solution, hypodermically.

AMAUROSIS AND AMBLYOPIA.—*Amaurosis* is a term that, from its vagueness, is happily becoming obsolete, signifying partial or total loss of vision. When partial, the term *amblyopia* is now used; when complete, Blindness (*q. v.*). The word is still sometimes used to express blindness when the cause is unknown or doubtful. Properly speaking, amblyopia means subnormal acuteness of vision, due neither to dioptric abnormalism nor to visible organic lesion.

Amblyopia ex anopsia is a term applied to partial or total blindness in an eye from disuse. It is of common occurrence in anisometropia and in strabismus. The individual with a squinting eye naturally has double vision; in order to obtain monocular vision he must either turn the axis of the squinting eye or learn to mentally suppress the image of that eye. If for anatomic reasons rotation is impossible, or if there is such difference of refraction that images of different distinctness and size are observed, the mental suppression of the image is the only alternative, and progressive amblyopia results.

Treatment is successful directly in proportion to the youth of the patient. It consists in restorative measures, such as correction of refractive error, tenotomy, and subsequent exercise of the weak eye.

Toxic amblyopia may be due to such conditions as provoke supersaturation of the blood with toxic ingredients: as, for instance, in disease of the kidney we may have, accompanying the resultant uremic poisoning, amblyopia, or even total blindness of both eyes, appearing sometimes suddenly and sometimes after a day or two of gradually failing vision. If the patient survives the attack of uremia, the blindness may completely disappear in a few days.

Diabetic amblyopia is distinguished by its association with the ordinary symptoms of diabetes.

Amblyopia from **malarial fever** and **quinin** has been reported, and in rare cases complete blindness has intervened. Quinin itself has produced it. See Optic Nerve, Atrophy.

AMAUROTIC FAMILY IDIOCY.—A rare, generally fatal family disease, occurring during the first year, lasting less than two years. It seems to be confined to the Hebrews. It is characterized by feeble mental development, progressive muscular weakness and failing vision terminating in idiocy, paralysis and blindness through optic atrophy. There is no available treatment; proper nourishment and hygienic surroundings are the best that can be suggested.

AMBLYOPIA.—See Amaurosis.

AMBRINE.—See Petrolatum.

AMBULANCE.—In Europe, the surgical staff and arrangements of an army in service. In the United States, a vehicle to transfer sick or wounded. An ambulance should accommodate 12 seated patients, 2 sitting with the driver and 10 inside on leather-padded seats. These seats should be made so as to fold up and be hooked to the sides when the floor of the ambulance is needed for patients on stretchers, 2 being accommodated. Running-gear should be strong but very elastic, and rubber tires are a serviceable and surgical improvement. A hanging foot-board is usually attached to the rear of the vehicle, and bunkers for drugs and dressings are placed under the driver's seat or beneath the wagon body. A two-wheeled cart is a recent innovation, and is designed to carry 4 persons sitting up or 2 patients lying down, and is drawn by a horse or mule. Railway cars may be converted into ambulances, care being taken to lessen jars and roughness in travel.

AMENORRHEA.—The absence of menstruation. Two varieties of amenorrhea have been described: one is termed **primary amenorrhea**, and is applied to those cases in which menstruation has never appeared; the other is termed **secondary amenorrhea**, and is applied to those cases in which

menstruation has ceased after having once been established.

Causes.—The causes of amenorrhea are various. It may be the result of imperfect development of the sexual organs or of some local uterine condition or general constitutional disease. Chronic diseases, such as phthisis, anemia, obesity, and chlorosis, are not infrequently associated with amenorrhea. It is frequently noted after the acute febrile diseases, as pneumonia and typhoid fever. Insanity and other nervous conditions may be causes. Change of climate is another frequent cause. It may be a symptom of pregnancy.

Symptoms.—The molimina of menstruation are often present, although there is no discharge of blood. There may be a feeling of fulness in the pelvis; there is frequently headache and flushing, and there may be nausea.

Treatment consists in the determination of the cause of the condition and its proper correction. If it is the result of some acute or chronic disease, no special treatment is demanded. If it is due to defective development of the genital organs, an effort may be made to stimulate them. Dilatation and curettage, followed by hot vaginal douches and pelvic massage, may prove beneficial. The general health must receive attention. Outdoor exercise, with plenty of fresh air and sunshine, must be prescribed. Iron and arsenic will frequently give good results. The diet should receive careful attention and the bowels should be well regulated. Oxalic acid given in 1/4-grain dose 3 times daily is probably the best emmenagog. See Emmenagogs.

℞. Extract of ergot,
Powdered aloes,
Dried sulphate of iron, } each, ʒ ss.
Oil of savin, ♏viij.
Make 30 pills. Dose, 1 pill 3 times a day.

AMETROPIA.—Ametropia exists when an imperfect image is formed upon the retina, due to defective refractive power of the media, or to abnormalities of the form of the eye. In *myopia* the anteroposterior diameter or the power of the refractive media is too great; *hypermetropia* (or *hyperopia*) is the exact reverse of the last; *astigmatism* is due to imperfect curvature of the cornea or of the retina, or to inequality of refracting power in different parts of the lens; *presbyopia* is due to inelasticity of the lens, producing insufficient accommodation; *aphakia*, or absence of the lens, produces both insufficient refracting power and loss of accommodation. See Hyperopia, Myopia, Astigmatism, Presbyopia, etc.

AMMONIUM.—A hypothetical compound radicle having the composition NH_4. It exists only in combination. It occurs most commonly in the form of *ammonia gas*, NH_3, which, dissolved in water, is the water of ammonia (NH_4OH) of commerce. The salts closely resemble those of the elements potassium and sodium. The chief commercial source of ammonium salts is the ammoniacal liquor from gas-works and bones. Many of the salts and aqueous solutions of the gas are official. In medicinal doses the salts of ammonium act as stimulating expectorants. In large doses they injure the structure of the red blood-corpuscles, and produce rapid emaciation by impairing digestion and increasing tissue waste when long continued.

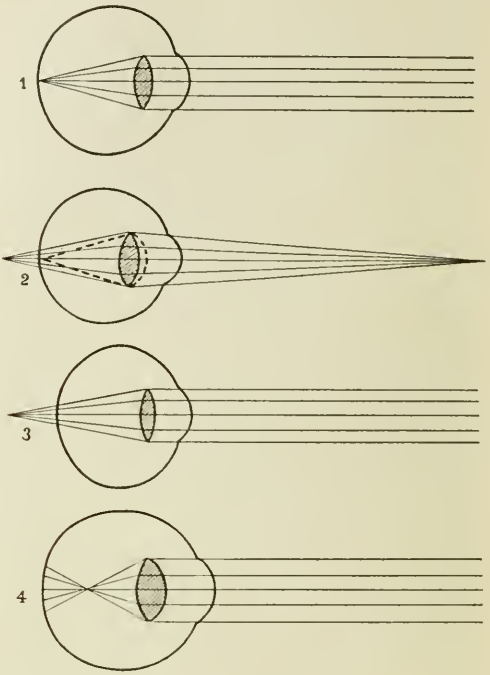


Diagram showing—1, normal (emmetropic) eye bringing parallel rays exactly to a focus on the retina; 2, normal eye adapted to a near point; without accommodation the rays would be focussed behind the retina, but by increasing the curvature of the anterior surface of the lens (shown by a dotted line) the rays are focussed on the retina (as indicated by the meeting of the two dotted lines); 3, *hypermetropic* eye; in this case the axis of the eye is shorter, and the lens flatter, than normal; parallel rays are focussed behind the retina; 4, *myopic* eye; in this case the axis of the eye is abnormally long, and the lens too convex; parallel rays are focussed in front of the retina.—(Kirkes' Physiology.)

Physiologic Action.—The gas ammonia is intensely alkaline and irritant to mucous membranes; when inhaled, it produces spasmodic cough and a sense of suffocation. Its prolonged inhalation will induce violent inflammation of the air-passages and edema of the glottis. It stimulates the nasal branch of the fifth nerve, exciting the vasomotor center by reflex action, and thus raising the arterial tension. Applied to the skin and allowed to evaporate, it has a slight rubefacient effect, but if evaporation is prevented, it penetrates the epidermis and has a powerfully vesicant action. Ammonia water swallowed undiluted may quickly cause death by suffocation, from the action of its vapor upon the air-passages; if not, it may excite gastroenteritis accompanied by coma, differing in the latter respect from potassium or sodium poisoning. After absorption, it stimulates both the respiration and the circulation by direct action

on their respective nerve centers. Ammonia exists normally in the circulation, where it keeps the fibrin in solution, and thus maintains the fluidity of the blood. It increases the glycogenic function of the liver, and is converted finally into urea. It is a powerful irritant to muscular tissue, causing tetanic contraction and subsequent rigor mortis when directly applied. Ammonium salts all stimulate and finally paralyze the spinal cord, motor nerves, and muscles.

Therapeutics.—Ammonium acetate is used in the spirit of Mindererus, a mild diuretic, inferior to sweet spirits of niter, and an antacid, in gastric indigestion. Dose, 1 to 2 fluidrams. A solution of the acetate is an active diaphoretic if the body is warm, and a diuretic if it is cool. A wineglassful will counteract many of the immediate effects of alcohol. **The solution of the acetate** is especially beneficial in the exanthemata, influenza, coryza, anomalous febrile conditions of children, acidity, and vomiting; also in acute alcoholism, and in erysipelas when there is feeble circulation, cyanosis and delirium. It is frequently combined with spirit of nitrous ether, as a diuretic and diaphoretic in febrile affections.

As a mild diaphoretic:

℞. Solution of ammonium acetate, ʒ iij
Camphor water, ʒ j
Syrup of orange, ♏ xx.
Make into a drink.

In bronchial catarrh:

℞. Solution of ammonium acetate, ʒ j
Wine of antimony, ʒ ij
Syrup of tolu, ʒ vj
Water, ʒ iv.
Make into a mixture and take a sixth part every 4 hours.

Ammonium benzoate is used chiefly as a diuretic and to acidify the urine, in which it is excreted as hippuric acid. It is serviceable in catarrh of the bladder and when the urine is loaded with phosphates, and is stimulant to the liver. Dose, 5 to 20 grains in water.

Ammonium bromid is a white granular powder, of salty taste, markedly pungent, soluble in water and the oral secretions. Large doses cause abdominal burning and gastroenteritis. It may be used in place of potassium bromid, but it is not so depressing, though more likely to disturb the stomach. The dose is from 10 to 30 grains. It is incompatible with spirit of nitrous ether.

In hysteria of females, epilepsy, nervous startings, and spasmodic contractions:

℞. Ammonium bromid, ʒ ij
Potassium bromid, ʒ iv
Aromatic spirit of ammonia, ʒ vj
Camphor water, enough to make ℥ vj.
Mix into solution and give a dessertspoonful to a tablespoonful every 4 hours.

In sick headache, except when from biliousness:

℞. Antipyrin, gr. xxv
Citrated caffein, gr. x
Ammonium bromid, gr. xxv.
Make into 5 powders, and take one as needed.

Ammonium carbonate is of much use in combination with the ammonium chlorid in bronchitis mixtures, acting as a stimulating expectorant. It is a rapid respiratory and cardiac stimulant. It also stimulates gastric secretion, is emetic, and may prevent iodism when administered conjointly with potassium iodid. The carbonate is used internally in the eruptive fevers, delirium tremens, continued fevers, pneumonia, etc., when much depression exists; as a stimulating expectorant in chronic bronchitis, in the bronchopneumonia of children, and in cardiac asthma. It is highly recommended in scarlet fever in doses of 3 to 5 grains every 1, 2, or 3 hours, all acid drinks or fruits being prohibited while it is being administered. With 10-minim doses of tincture of capsicum in an ounce of some bitter infusion it is exceedingly efficient, in 5- to 10-grain doses, for the sinking sensations and craving for stimulants experienced by subjects of alcoholism. It may be used as an emetic in bronchitis, when the tubes are choked with mucus and the circulation of the patient is weak; it may also be employed by inhalation, and administered internally, for similar purposes as ammonia water. Ammonium carbonate is best given in syrup of acacia.

In indigestion with acidity:

℞. Ammonium carbonate, ʒ ss
Sodium carbonate, ʒ j
Infusion of quassia, ℥ vj.
Mix into a solution and take a sixth part at a dose.

In certain obstinate skin-diseases:

℞. Ammonium carbonate, ʒ ijss
Syrup of sarsaparilla, ℥ viij.
A tablespoonful from 1 to 4 times a day.

In diabetes mellitus:

℞. Ammonium carbonate, ʒ ss
Rum, ʒ v
Simple syrup, ʒ v
Distilled water, ℥ iij.
Half to be taken night and morning.

Ammonium chlorid (formerly muriate) stimulates the mucous membranes and increases the secretion of mucus, but does not stimulate the respiration or cardiac action. It may be used as a spray and in fumes by heating: *e. g.*, in an iron spoon. In the treatment of gastric and intestinal catarrh in children, in subacute hepatitis, in chronic torpor of the liver, and even in cirrhosis and hepatic abscess, it has been useful. It is best given in licorice syrup or water to mask the taste. If given in pill form, it should be accompanied by some liquid diluent given at the same time to protect the stomach membranes.

The chlorid has high repute in catarrh of the stomach, with anorexia, bad taste in the mouth, flatulence, coated tongue, etc.—in short, the symptoms of so-called biliousness; also, in chronic congestion of the liver, jaundice from catarrh of the bile-ducts, nervous and sick headaches, myalgia, amenorrhea, muscular rheumatism, and neuralgia. In the last-named affection it should be given in 30-grain doses several times a day. It is also efficient in bronchial catarrh without fever, and in chronic bronchitis when the secretion is scanty and tough. It is remarkably efficient in sobering a victim of acute alcoholism; administered to one on the verge of delirium tremens, in doses of 1/2 of a dram in half a pint of water, swallowed at one draft, it is said to restore the patient's faculties so quickly as to astonish those who have never seen it so employed. Locally, in solution, it has been well employed in inflammatory swellings, as sprains, inflamed joints, orchitis, etc., as a lotion; also, to allay itching in prurigo, to remove ecchymoses and glandular enlargements.

For the "tight" cough of bronchitis:

℞.	Ammonium chlorid,	gr. v
	Extract of licorice,	gr. ij
	Cubebs, powdered,	gr. ij
	Codein,	gr. j.

Make 20 pills.

One every 2 hours until relieved.

In pleurisy, pneumonia, etc.:

℞.	Ammonium chlorid,	ʒ ij
	Extract of licorice,	ʒ iij
	Antimony and potassium tartrate,	gr. ij
	Distilled water,	℥ viij.

Make into a mixture, of which from a teaspoonful to a tablespoonful is to be given each second hour. Omit the antimony when a sufficient effect has been produced on the disease.

In albuminuria:

℞.	Ammonium chlorid,	gr. x
	Tincture of iron chlorid,	♏ xv
	Water,	ʒ j.

To be taken twice a day.

Ammonium iodid may be used as a substitute for the potassium iodid salt, and is quite alterative. For enlarged tonsils it may be used as a local application. Given with glycerin to make a solution of 30 grains' strength, it may also be applied once daily with a swab or camel's-hair brush for the same difficulty, particularly if struma is an underlying cause. If exposed to the air, decomposition will result in this solution.

Ammonium liniment has 35 parts of ammonia water, 57 of cotton-seed oil, 5 of alcohol, and 3 of oleic acid.

Ammonium spirit is a 10 percent solution of the gas in alcohol. Dose, from 10 minims to 1 dram, diluted.

Aromatic spirit of ammonia contains ammonium carbonate, water of ammonia, oil of lavender, lemon, and nutmeg, alcohol, and water. It is used in ammoniated tinctures of guaiac and valerian. Dose, 15 to 60 minims.

Ammonium valerate corresponds in action to its titular base. Dose, 7 1/2 grains.

Ammonium Salicylate.—Dose, 4 grains.

Ammonia water is an aqueous solution of ammonia, containing 10 percent by weight of the gas. It is colorless, of pungent odor, acrid taste, and strong alkaline reaction. Stronger ammonia water contains 28 percent by weight of the gas. Dose, from 5 minims to 1/2 of a dram. **Ammonia in strong solution** may be used as a rubefacient and vesicant, and its vapor, by cautious inhalation, in syncope and the results of shock. Locally, it is a good application to bites of the less venomous reptiles and to insect stings.

Incompatible with *Ammonia* preparations are acids, acid salts; with the *Aromatic Spirit* are acids, acid salts, lime-water, aqueous fluids; with the *Acetate* are alkaline carbonates, potassium and sodium hydroxids; with the *Benzoate* are acids, liquor potassæ, ferric salts; with the *Carbonate* are acid salts, alkaloids, alum, salts of copper, iron, lead and silver, magnesia, magnesium sulphate, mercurous and mercuric chlorids, potassium bitartrate and bisulphate, tartar emetic, zinc sulphate; with the *Chlorid* are alkalies and their carbonates, alkaline earths, lead and silver salts.

Poisoning.—When ammonia is inhaled in excess, give vapors of hydrochloric acid by inhalation to form the chlorid. If ammonia is swallowed, give vegetable acids and demulcents to protect the mucous membranes. Cardiac sedatives, as aconite, veratrum, digitalis, etc., are indicated as physiologic antagonists.

AMNESIA.—Defect of memory. Loss of memory for words. See APHASIA.

AMNII, LIQUOR.—An alkaline fluid of low specific gravity, containing water, albumin, creatin, certain salts, urea, and epithelium, and varying in amount from 1 pint to 1 quart at term. Its **origin** is unsettled; it is partly of maternal origin, the result of transudation through the placenta; partly from the amniotic cells; and later in pregnancy it is somewhat increased in amount by fetal excretions, mainly urine. Its **function** is largely protective. It distends the uterus, thus affording room for free movement, growth, and development; it affords an equable temperature for the fetus and receives its secretions; it protects the mother from injury due to exaggerated fetal movements, and at birth performs a most valuable part in the dilatation of the cervix.

Color.—Normally, the liquor amnii is light amber in color and somewhat opaque. It may be dark, from the presence of meconium or disintegrated blood.

Putrefaction.—This is a rare condition, and is usually associated with death and decomposition of the fetus. Occasionally, the child will be born alive, even though the liquor amnii be intensely putrid in character. Sometimes gas is produced in this process of putrefaction, which accumulates in the uterus, giving rise to the condition known as **physometra.**

Hydramnios (Dropsy of the Amnion).—An excessive amount of liquor amnii. This is said to exist when 2 quarts or more of fluid are present. Hydramnios is not an infrequent condition, occurring once in two or three hundred pregnancies. Two varieties will be described—the **acute** and the **chronic.**

The acute variety, in which the excessive secretion takes place in a few hours or days, is rare. Its **cause** is usually amniotitis or some form of traumatism, and it presents **symptoms** common to sudden distention of the abdomen—pain, some fever, rapid and irregular pulse, and great difficulty in respiration.

Treatment should consist in the immediate evacuation of the fluid by puncture of the membranes, through the external os. This will be followed by abortion, which should be treated in the usual manner.

The chronic variety is that usually met with. It begins at the third or fourth month of gestation and steadily increases, causing, as a rule, little or no difficulty.

The causes of this condition have been ascribed to both fetus and mother. The fetal causes are: (1) Obstruction to the fetal circulation, causing excessive transudation of serum; (2) excessive secretion of urine; (3) excessive excretion from fetal skin, as occurs in nevus and in elephantiasis congenita cystica. The maternal causes are: (1) General anasarca; (2) exaggerated hydremia; (3) multiparity.

The diagnosis of this condition is attended by no unusual difficulty, the history of pregnancy, the abnormal distention of the abdomen, and the great movability of the fetus being the important factors. Extreme cases may be mistaken for ascites, ovarian cyst, or multiple pregnancy.

No **treatment** is required, as a rule, except rest and the application of an abdominal binder. Should marked pressure symptoms appear, particularly if circulatory or respiratory in character, the membranes should be ruptured and the uterus evacuated.

Postpartum hemorrhage is not an uncommon complication of these cases, and therefore every precaution should be taken for its prevention.

Oligohydramnios.—A deficiency in the amount of liquor amnii. This is a rare condition, occurring once in three or four thousand pregnancies. It is disadvantageous, because the uterus is not distended, and therefore the child is likely to be injured or deformed. Labor may be unusually prolonged and difficult (**dry labor**).

AMNION.—The innermost of the fetal membranes; it is continuous with the fetal epidermis at the umbilicus, forming a sheath for the umbilical cord and a sac or bag in which the fetus is inclosed. It contains 1 pint to a quart of liquor amnii.

Development.—The inner layer is derived from the epiblast, the outer from the mesoblast. The cavity formed by the inner folds is called the **true amnion,** and contains the liquor amnii; that formed by the outer folds is called the **false amnion,** and contains the allantois, the umbilical vesicle, and occasionally a fluid resembling the liquor amnii.

Function.—To secrete and contain the liquor amnii. The amnion and chorion, containing the liquor amnii, and projecting through the os uteri early in labor, are popularly known as the bag of waters.

Inflammation (Amniotitis).—This is usually attended with exudation, either serous or plastic. Plastic exudation occurring in the first few months of gestation may give rise to bands of adhesion—**fetoamniotic bands**—that may cause premature separation of the placenta, fetal deformities, or even amputation of fetal extremities.

Abnormal Tenuity.—This sometimes gives rise to rupture, with the formation of parchment-like rolls of amnion inside the chorion.

Rupture.—If both amnion and chorion should rupture, abortion will usually follow. If rupture occurs at a point remote from the internal os, more or less constant dribbling of the liquor amnii may continue for weeks or months before delivery (**amniorrhea, amniotic hydrorrhea**).

AMŒBA COLI.—See DYSENTERY (Amebic).

AMPUTATION.—Amputation consists in cutting off a limb or its subdivisions in the continuity of the bone structure or at the articulation. The latter is often called disarticulation. The term amputation is misapplied not infrequently to removal of the mamma, penis, cervix uteri, etc.

Classification.—Amputation is classified, according to the time of its performance, into **immediate, primary,** and **secondary.** Immediate amputation is practised during the shock, and, therefore, within a few hours after the receipt of the injury; primary, after recovery from shock and before the occurrence of inflammation, usually within 24 hours after the receipt of the injury; secondary, at any time after the expiration of the limits of the latter period. Immediate and primary amputations are more fatal than secondary. The great benefits arising from antiseptic practice in severe injury have lessened the number of deaths from immediate and primary amputations, and at the same time increased the favorable outcome of the secondary.

The chief aims of amputation are the saving of the life of the patient and the securing of a serviceable extremity. Consequently, amputation should not be performed, if practicable, until shock is over, and then only with the scrupulous use of antiseptic and bloodless methods. When an extremity requires removal, surgical ability and mechanic ingenuity combined may secure greater benefits than can be derived from either alone; therefore, the attainment of the surgeon and the skill of the mechanic should both be utilized.

Indications.—It is impossible to give more than a general idea of the indications for amputation. Injuries of the upper extremity are much less liable to be followed by gangrene than those of the lower limb, on account of the freedom of collateral circulation. Before deciding upon amputation, we must consider whether both arterial and venous circulations are cut off, whether the tissues are devitalized, whether it is possible to prevent suppuration and septic infection, whether the limb can be made useful again, and whether the age and

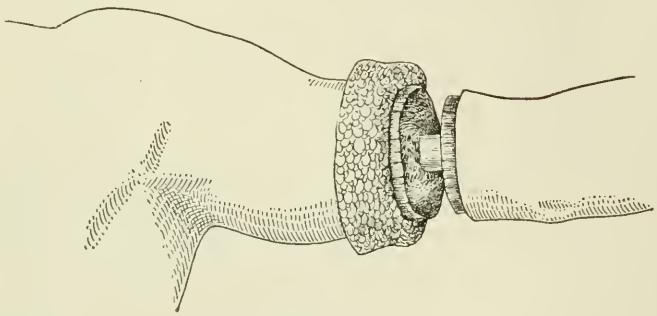
physical condition admit of saving the limb. The conditions for which amputation is usually performed are compound fractures and dislocations, extensive lacerated and contused wounds, gangrene, malignant tumors, and, occasionally, incurable and distressing deformities.

The instruments, etc., required for amputations are a tourniquet, rubber bandages, knives of several sizes, both single and double edged, saws, retractors, cutting bone forceps, strong forceps to hold bone fragments, tenacula, hemostatic forceps, dissecting forceps, scissors, needles, sutures, ligatures, needle-holder, drains, splints, and dressings. For the major joint amputations large steel pins are needed, around which to make compression. Abundance of hot water should be at hand to check oozing.

The chief points in planning an amputation are: (1) To sacrifice as little as possible; (2) to provide an ample covering of skin; (3) to arrange the flaps so that their weight shall keep them in position; (4) to make sure there is free exit for any fluid that may accumulate; (5) to keep the scar away from the line of pressure; (6) to provide a satisfactory stump.

The various methods can be reduced to three: (*a*) The circular; (*b*) the old flap operation, in which all the tissues down to the bone are included; and (*c*) the modified flap operation, in which the covering is formed of skin alone, all the other structures being divided on a level with the end of the bone.

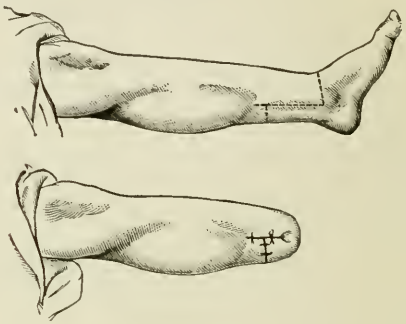
The Circular Operation.—The limb is divided by a succession of circular sweeps; the first through the skin; the second (after the skin has been retracted) through the superficial muscles; the third through the deep muscles and the periosteum; and the fourth, when all the tissues are drawn back, through the bone. It is practically limited to the arm, and cannot be used over conic parts, as the skin cannot retract, or where the bone would lie in the center of the stump, for in that case it would abut upon the cicatrix. If the limb is injured on the one side only, it may be very wasteful; and in cases of disease in which the tissues are hard and brawny, or the skin tied down by adhesions, it is impracticable. When this operation is indicated, the covering of skin is good, without much muscle, drainage is satisfactory, and the scar very small.



Circular Amputation.

The Old Flap Operation.—This may be performed either by transfixion, cutting from within outward, or by dissection, separating the soft tissues from the bones in an upward direction; the flaps may be anteroposterior, lateral, and equal in length, or one may be much longer than the other. With the exception of one special modification (Teale's amputation), the old operation is seldom performed on any part but the extremities; the flaps are heavy and thick, containing a large amount of muscle; the vessels may easily be slit, or wounded higher up than they are divided; the surface of the wound is very large, and the nerves are contained in the flaps.

In Teale's amputation (which is reserved almost entirely for the lower third of the lower limb) the anterior flap, which contains all the tissues dissected up from the bones, is square and equal in length and breadth to half the circumference of the limb at the spot at which the bones are to be divided. The posterior flap is of the same breadth, but only one-fourth of the length. The bones are divided at the line from which the flaps spring, and the long flap is folded around the end, and united behind it to the posterior one, the cut surfaces facing each other. The flaps are measured out and marked down first, and the two lateral incisions made before the transverse ones. The drainage is admirable, and the stump left very soon becomes serviceable, if care is taken to keep the larger vessels and nerves in the shorter flap.



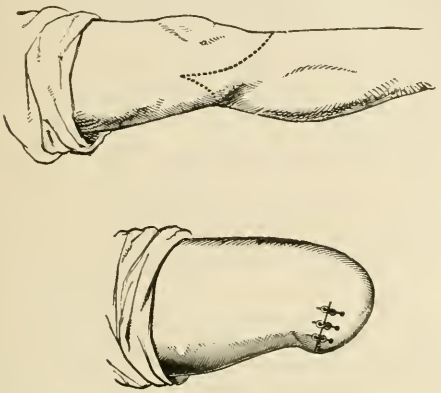
Teale's Amputation.

The Modified Flap Operation.—In this, one flap (or sometimes both) is formed from the skin and subcutaneous tissue only; the rest of the structures are divided by a circular sweep at the same level as the bone. It is a method capable of far wider application than any other, and may be modified in a number of different ways.

In Carden's operation, for example (which, though first devised for the knee, may be employed in amputating many other parts), a rounded or semioval flap is reflected from the front of the limb, and all the structures divided down to the bone, this being sawed through slightly above the plane of the muscles. This leaves an almost flat

stump, covered with integument; the edges of the wound are dependent, and the cicatrix lies well out of the way. In other cases (amputation of the forearm, for instance) both flaps may be formed in this way, of equal length or not, according to the amount of tissue available; or lateral flaps may be cut, as in the leg, or a kind of hood dissected up, as in Stephen Smith's method.

The position of the surgeon in performing an amputation is always such that he can raise the flap with his left hand, without crossing with the



Carden's Amputation, with Short Posterior Flap.

right; usually, therefore, he stands on the right-hand side of the limb. The number of assistants required depends naturally upon the part to be removed; one holds the limb, and afterward supports the stump in a convenient position; another assists the surgeon in retracting the flaps, sponging, and tying vessels; and a third may be required to control the main artery. When it is possible, the patient should be carefully prepared; the bowels opened; the urine examined, the pulse, respiration, and temperature noted; and the limb thoroughly cleansed, and, if necessary, shaved. The last meal should be a light one, and should precede the operation by at least 3 hours. The anesthetic, of course, requires a special assistant.

During the operation the bed should be thoroughly warmed, and hot bottles, pillows, etc., arranged so that the patient may be placed in a comfortable position at once, with the stump slightly raised and secured against any accidental movement or spasmodic contraction of the muscles. Unless the patient is thoroughly covered up, the loss of heat during an operation (especially under ether) adds seriously to the shock.

The stump is the product of amputation, and should be an agent of comfort and usefulness to the patient. **Stumps may be classified,** practically, as good and bad, the latter being subdivided into conic, irritable, etc. The technic of amputation aims to secure a sound, unirritable stump, with good circulation and ample leverage. The first three of these qualities depend mainly on the length, form, vascular supply, and sensibility of the flaps; the last depends on the length of the bone. The skin of a healed stump should be freely movable, except at the site of the scar; therefore, the flaps should be long enough to more than provide both for structural and reparative shrinkage. Short and adherent flaps of pressure-bearing stumps are exceedingly prone to attacks of annoying and crippling affections. Integument normally exposed to pressure, and, therefore, automatically constructed to receive it, as that of the palm of the hand and of the sole of the foot, makes the best flaps.

The proper length of flaps should be carefully considered. When two are made, each should equal not less than one-fourth of the circumference of the limb at the point where the bone is to be divided, and any decrease in the length of one flap should be attended by a proportionate increase in the length of the other. The greater the retractile tendencies of a flap, the longer it should be made. Flaps into which portions of long muscles enter, and those formed in part or wholly of skin from certain aspects of the extremities, contract the most markedly. The length of the flaps controls to a notable degree the site of the cicatrix. In the construction of flaps it should not be forgotten that the contractility of integument and subcutaneous tissue is lessened by inflammatory infiltration, overdistention, old age, and by natural and acquired thickness, and that the divided borders of stiffened and thickened tissues are difficult of approximation.

The cicatrix should be so located, when practicable, as not to be subjected to undue pressure or friction; therefore, in pressure-bearing stumps, the best situation is at the side; in others, at the end. However, if the flaps are ample to provide for a freely movable integumentary covering at the end, the location of the scar there is a matter of but little importance.

The arteries should be cut transversely, tied securely in sound tissue, and at a suitable distance from the origin of collateral branches.

The ends of tendons should be divided on a line with the borders of the flaps; for if too long, they interfere with union, and if cut too short, their open-mouthed sheaths may harbor deleterious products. For this latter reason the sheaths ought to be closed at once with stitches, which, if desirable, may include the divided ends of the tendons.

The nerves should be severed so high that the ends will not become involved in the process of repair; in single long flaps they may be removed entirely.

The periosteum should not be bruised or lacerated, but be cut through neatly at the point of bone section.

The bone should be sawed carefully and transversely, and not be denuded of periosteum at any part, otherwise necrosis and delayed union may follow.

Oozing should be arrested by the application to the surface of hot sterilized water, or by other means.

Unite the flaps without tension, with interrupted sutures, and so as to provide for drainage; adjust antiseptic dressings carefully and uniformly to

the stump and so confine them in place with bandages as to support the flaps and obliterate dead spaces. Drainage agents may be required for a brief time. Proper support of the stump in an elevated position is commended.

A good stump should be symmetric and insensitive, and should have a good circulation, good leverage, and a narrow, movable cicatrix uninfluenced by the skin traction incident to weight-bearing. However, serviceable stumps need not possess all of the attributes.

A bad stump is the antithesis of the preceding, and the logical sequel of thin, short, or ill-nourished flaps. A cold or edematous or hypersensitive stump, due to improper care, bad habits, defective local or general circulation, constitutional dyscrasia, or defective surgical technic, is soon likely to be the seat of ulceration, sloughing, eczema, cuticular hypertrophies, and even periosteal and bony inflammation.

A so-called **painful stump** is usually dependent on the irritation caused by abnormal bony growths, by a bulbous enlargement of the end of a nerve, by the involvement of the nerve extremities in a normal or abnormal fibrous formation.

The Conic Stump.—The end of this stump is the end of the bone, covered or not, as the case may be, with thin, adherent skin, or skin with destructive changes involving, perhaps, even the bone itself. Flaps scanty from the first—from sloughing, from unusual contraction, from low bone division, or from excessive epiphyseal growth—characterize the conic stump. The last of these causes is manifestly, though infrequently, effective in young subjects only, especially after amputations near the knee or through the humerus, when the remaining epiphyses of the respective bones are left unimpaired. These cases not infrequently require repeated amputation to remove the infirmity.

The Best Method of Amputation.—No single method of amputation is applicable to all cases. Each case demanding amputation must be estimated upon its own individual merits. Structural changes of the soft parts, causing induration ulceration, or devitalization, which limit or abrogate the necessary technic of one or more methods of practice, require that another conforming with the demands shall be selected. The method best suited to an individual instance is one that can be quickly and easily done without needless sacrifice of healthy tissue, and that provides good drainage, suitable and well-nourished flaps, and a narrow, properly located cicatrix. Transverse section of the vessels and a minimum area of muscular exposure are significant desiderata in amputation.

The circular method meets the foregoing conditions more fully than any other. However, the flap methods are especially applicable to instances of unequal availability of the soft parts, and also to any portion of an extremity. The availability of a method of amputation is based chiefly on the safety and utility of the measure. Therefore, the seat of the proposed operation is a matter of vital and practical importance: vital, because the nearer to the trunk the amputation is made, the greater the rate of mortality; practical, because the shorter the bone is cut, the less will be the leverage of the stump. It is often difficult, indeed, for these reasons, to determine the proper site for amputation. The exchange of suitable leverage for the sound tissues needed for primary union lessens permanently the functional use of a stump. On the other hand, the preservation of the leverage at the expense of the health of a stump may be bad practice. Bone leverage when sacrificed cannot be regained; but a painful ulcerated stump may be cured by care and simple operative measures, and, at the worst, by reamputation, which will entail no greater sacrifice of bone than if originally performed. If the amputation is done for disease instead of for injury, then, indeed, the need of primary cure is of much greater significance; therefore, the comparative importance of leverage is correspondingly lessened.

The mortality of amputation, while controlled significantly by the influence of age, sex, causation, site of amputation, etc., is influenced to a marked degree in each of the foregoing instances by the technic employed. Amputations of a comparatively similar nature performed in the preantiseptic period, which gave them a mortality rate of about 30 percent, now give less than 5. Operations performed on those from 20 to 40 years of age are twice, and from 40 upward thrice, as fatal as at 20 years and under. Amputation for disease is from 10 to 15 percent less fatal than for injury, and in the latter secondary are nearly twice as fatal as primary amputations. Amputations at the upper extremity are less fatal than corresponding ones at the lower, and in either instance the mortality increases as the trunk is approached. For example, the mortality in amputation of the arm is 9 times greater than in amputation of the finger; and that in amputation of the thigh is 10 times greater than in amputation of the toes.

Special Amputations.—The phalanges of the digits of the hand and foot are better amputated by making long palmar and plantar flaps cut from without than by transfixion, as by the latter method the tendons and the vessels may be split and the flaps themselves be unsymmetrically formed, particularly at the bases, where, especially in amputation at the joints, they are made too thin and narrow, thus inperiling their nutrition and unfitting them for properly covering the ends of the bones. The open mouths of the tendinous sheaths should be closed at once with a stitch, to prevent them from harboring infecting agents, which may cause extended and serious inflammation of their structures. If the stitch includes the divided end of the tendon, better fixation of the latter to the end of the stump will be secured.

Amputation of the second, third, and fourth fingers and toes at their bases is best done by making the racket flap; and amputation of the first and fifth by a short internal and a long external flap, so fashioned as to place the injured integument in the position of greatest functional requirement. In amputation of the digits of the hand and foot, especially of the thumb and great toe, any needless sacrifice of bone must be avoided, in order that their functions may be preserved as

much as possible. The amputation of a finger with the head of its metacarpal bone lessens the power of the grasp, but adds, for a time at least, to the symmetry of the part. The first, second, and fifth metacarpal bones are more useful for prehensile purposes than for cosmetic reasons; and, therefore, their integrity should be respected accordingly. The first and second metatarsal bones are of the greatest importance functionally, and consequently should not be needlessly shortened. In amputation at the carpus and tarsus, as in operations of the phalanges, long palmar and plantar flaps, made by cutting from without, are the best, and for similar reasons. Lisfranc's amputation at the foot is serviceable, indeed, but its modifications, except those of Baudens and Stokes, are of doubtful utility in traumatic cases. Amputations through the tarsus (Chopart's Forbes', etc.) so lessen the leverage and destroy the power of the flexors that a reasonable doubt as to their utility is frequently properly entertained. Moreover, the present usefulness of prosthetic agents when fitted to a suitable stump (Syme) now affords excellent and comfortable service with a fair degree of symmetry.

Subastragaloid amputations and their modifications are ingenious and serviceable as independent means of support, but they are difficult and tedious of performance, invested with a relatively high rate of mortality, and are comparatively ill suited to artificial means of locomotion. However, those who cannot avail themselves of the benefits of mechanic remedies may find practical relief in a healthy stump constructively unsuited to mechanic aid. Amputation at the ankle-joint, with (Pirogoff) or without (Syme) osteoplastic method, is to be commended, more especially the latter. Syme's amputation is a beneficent conception, for when properly practised, it is easily performed, heals promptly and without complications, has a comparatively low rate of mortality and a high grade of usefulness, both with and without mechanic aid. Pirogoff's amputation is ingenious, and often relatively serviceable, especially when not supplemented directly by mechanic aid. In the former operation the flap may slough if its vitality is impaired, by old age, diseased or injured vessels, harsh treatment, and too free dissection. In the latter the bone fragment may necrose, slough, or fail to unite, and its relation with the leg may become distorted by muscular action or pressure. The various modifications of this amputation promise but comparatively little, indeed, in the direction of final efficiency, and rarely lessen the number or degree of the complications of the original method of practice.

Amputation at the ankle and wrist-joints by circular or lateral flaps is highly objectionable at the former site and opposed by some at the latter. The natural bulbous end of the extremity and the feeble circulation of these flaps at the ankle interfere with the proper adjustment to the stump of an artificial appliance. The best point of amputation at the lower third of the leg is at the beginning of the upward expansion of the limb—about 3 or 4 inches from the lower ends of the bones. Amputation at the wrist-joint gives a bulbous stump also, which is, however, better suited to the application of an artificial appliance than when at the ankle-joint. Besides, in the former the insertions of the long supinator and the broad pronator muscles remain unimpaired, with an obvious advantage to functional activity. However, the higher rate of mortality in disarticulation, the feeble circulation of the flaps, and the exposed portion of the stump to the effects of cold and moisture, are important reasons for amputation above the styloid processes.

Amputation at the lower one-third of the arm or of the leg may be done by the circular, elliptic, or lateral flap methods, with a satisfactory outcome. The circular is more frequently employed than any of the others, and in the leg the cutaneous flap is often supplemented with a periosteal lining raised from the subcutaneous surface of the tibia, while still adherent to the overlying tissues. The flaps are then so apposed as to cause the periosteal surface to come in contact with the divided end of the tibia.

Amputation at the upper one-third of the arm or of the leg is better accomplished by musculocutaneous than by cutaneous flaps. When double, the flaps are located antero-posteriorly or laterally; when single, preferably at the outer aspect of the leg and the anterior of the arm. The racket flap, with the handle at the posterior surface and extending well upward for drainage purposes, will provide a serviceable stump when practised at any part of the leg.

Amputation at the knee-joint is best done by the method devised by Dr. Stephen Smith. The flap is substantially of the racket variety, with the handle located posteriorly. The operator must adhere closely to the prescribed manner of action, or the flap will be found inadequate to properly cover the end of the femur, requiring, perhaps, the removal in turn of the patella, and even of the condyles. The reversal of this method—bringing the handle of the racket in front—in amputation for senile gangrene is practised by Dr. Smith, with the view of forming flaps endowed with the greatest vascular supply.

Amputations at the knee-joint and the elbow-joint by the circular and long anterior flap methods are practised. In the former anteroposterior coaptation should be made, for obvious reasons. In the latter method the flap at the elbow is formed by transfixion, is musculocutaneous and vigorous; at the knee, however, the opposite characteristics obtain, especially in elderly and debilitated subjects. The anterior elliptic method of amputation is practised at both of these joints, more especially at the elbow, and here with notable satisfaction. In amputation at the knee-joint and the lower end of the femur, fluid accumulations in the synovial space beneath the quadriceps tendon, which communicates with the joint cavity, must be prevented by drainage or by pressure, to obviate the possible inflammation, perforation, and extravasation incidental to their presence.

Amputation through the condyles of the femur is less satisfactory than disarticulation at the knee-

joint. The stump of the latter is more serviceable and better suited for weight-bearing than the former. However, when the decision rests between amputation and excision of the knee, the flaps of Carden, Gritti, and Stokes will aid in deciding, and are well suited for the purposes of execution. The osteoplastic elements of the last two and of similar methods embody ingenious and commendable theoretic suggestions that, unhappily, are frequently marred by the failures that follow their adoption. The methods of amputation of the thigh and of the humerus would not differ from each other in any essential degree but for the important muscular and flexion peculiarities of the stump of the former, because the relations of the hard and soft parts are similar in all practical respects. Oval, cutaneous, and musculocutaneous flaps, made at diverse aspects of the limbs, and in the latter method by transfixion or cutting from without, are employed, and especially the latter, at the hip. The simple circular incision (Celsus) and the circular and the unequal integumentary flap methods, with single complete transverse division of the muscles, and that with repeated incomplete transverse divisions alternating with retraction, forming thereby a truncated, cone-shaped cavity, with the end of the bone at the apex, are each admirably suited to amputation of the arm, and to the thigh as well, when proper allowances to meet its important peculiarities are made. The periosteal flap may be readily employed with equal facility in either of the circular methods; and, too, may be utilized with propriety in other varieties of amputation at these situations.

Amputation at the hip and the shoulder-joint—more decidedly the former—are procedures of grave significance. The magnitude of these amputations, the danger from hemorrhage, the extensive surface exposed to infection, and their proximity to the trunk, invest them with great importance. The first and the fourth of these evils are inflexible. The second and third—formerly dreaded the most—have yielded in great part to the beneficent control of advanced surgical technic. The second of these is now best met by the elastic compression methods devised by Trendelenburg and Wyeth, and by the digital pressure plan proposed by McBurney. The third is lessened much, at the hip, by the ingenious incisions of Furneaux Jordan and Dieffenbach; at the shoulder by those of Spence; and the evils of infection are supplanted by the good results of antiseptic practice.

Further descriptions of the special amputations are given under the special headings, Arm, Hip-joint, Shoulder, etc.

AMUSIA.—Pathologic loss or subnormal ability to produce or comprehend music or musical sounds; an abnormality as regards music analogous to aphasia as regards the faculty of speech. In **motor amusia** the music is understood, but there is loss of the power of singing or of otherwise reproducing music. In **paramusia** there is faulty and imperfect reproduction of music. In **sensory amusia** there is musical deafness, or the loss of the power of comprehension of musical sounds. See Aphasia.

AMYGDALA.—See Almond.

AMYGDALITIS.—See Tonsillitis.

AMYL NITRITE.—A liquid containing about 80 percent of *amyl nitrite*, $C_5H_{11}NO_2$, together with variable quantities of undetermined compounds. It occurs as a clear, yellowish liquid, of ethereal and fruity odor, aromatic taste, and neutral or slightly acid reaction, extremely volatile, insoluble in water, but freely soluble in alcohol, ether, chloroform, and benzin. It is produced by the action of nitric or nitrous acid upon amylic alcohol, and when impure, may have nitric or hydrocyanic acid in it. Dose, internally, 1/4 to 1 minim dissolved in alcohol; by inhalation, from 2 to 5 minims; but larger doses are probably safe.

The effect of an ordinary inhalation of amyl nitrite on man is very transitory, excepting the headache, which may last several hours. Of all the nitrites, this is the most prompt but least enduring in action, and is best administered by inhalation. It causes sugar to appear in the urine, and increases the quantity of urine voided. Mixed with blood it forms methemoglobin, which is not so readily deoxidized as hemoglobin, and under its influence the blood in the body becomes of a dark chocolate color, both in the arteries and in the veins.

Therapeutics.—The inhalation of amyl nitrite is a useful palliative in angina pectoris, epilepsy, tetanus, and many of the respiratory neuroses, as spasmodic asthma, whooping-cough, laryngismus stridulus, etc. It is indicated in the pale-faced form of migraine; in the cold stage of intermittent and pernicious remittent fevers, to prevent internal congestion; also in convulsions, including the puerperal form. In chloroform anesthesia when death has threatened it has been effectively used, and also in poisoning by strychnin, to relieve the convulsions. See Nitrites.

Incompatibles are alcohol, antipyrin, and potassium hydroxid.

AMYLOID DEGENERATION.—See Albuminoid Disease.

AMYOTROPHIC LATERAL SCLEROSIS (Charcot's Disease).—A degeneration of the pyramidal tracts of the spinal cord and atrophy of the motor cells in the anterior cornua and medulla oblongata. It is a disease of middle age. The cause is unknown.

Symptoms.—There is muscular wasting, with loss of power, spastic contractions, diminished electrical excitability and exaggerated reflexes. When the medulla is involved, bulbar symptoms appear. Sensation is normal and the sphincters are rarely affected.

Diagnosis.—It is distinguished from pure **progressive spinal muscular atrophy** by the exaggerated reflexes and muscular rigidity, and from pure **lateral sclerosis** by the muscular atrophy.

Prognosis is unfavorable.

Treatment is of no avail. Rest in bed, hot bathing, massage and electricity may be employed.

ANALGEN.—A white, tasteless, crystalline powder, almost insoluble in water, soluble with difficulty in cold alcohol, but more readily in hot alcohol and dilute acids. It melts at 406.4° F.

It is employed as an analgesic, antineuralgic, and antipyretic, in doses of from 7 to 15 grains. Unof.

ANALGESIC.—See ANODYNE.

ANAM ULCER.—A form of phagedena such as is common in hot countries. It begins with an inflammation starting from a small abrasion of the skin, generally on the foot and leg, with sloughing of the inflamed skin, producing a sharp-cut ulcer that spreads slowly, preceded by an area of inflammation. Its course is remarkably slow, and its resistance to treatment obstinate. Syphilis and anemia are predisposing factors.

ANAPHRODISIACS.—Agents that allay the sexual desire and lower the sexual function. They lessen the excitability of the nerves of the genital organs by depressing the genital centers in the brain and cord, and by lessening the local circulation.

The principal anaphrodisiacs are bromids, potassium iodid, camphor (at last), opium (at last), lupulin, cocain, tobacco, digitalis, conium, belladonna, stramonium, gelsemium, nauseants, purgation, venesection, ice (locally), cold baths, vegetable diet.

A few drops of a 4 percent solution of cocain upon the glans penis will destroy all the erection-power for a quarter to half an hour.

Anaphrodisiacs are used to lessen the sexual passions in nymphomania, satyriasis, and allied conditions. Local lesions, such as irritation of the external genitals, prurigo of the external organs, excoriations of the os uteri, balanitis, the presence of worms in the vagina or in the rectum, should be suspected and, if found, appropriate treatment given.

In nervous or overexcitable sexual conditions:

℞.	Potassium bromid,	gr. xxv
	Tincture of hyoscyamus,	ʒ ss
	Spirit of chloroform,	♏ x
	Water, enough to make,	ʒ jss.

To be taken in two drinks.

ANAPHYLAXIS.—The condition resulting from serum treatment. An individual who has been treated by serum is from that moment sensibilized as regards that serum with the consequence that later injections even a year afterward may cause complications much more alarming than the original. (See SERUM THERAPY AND VACCINE THERAPY.)

ANASARCA.—An accumulation of serum in the areolar tissues of the body. If associated with effusion of fluid into serous cavities, it is called *general dropsy*. If the affection is local, it is called *edema*. This local form is generally the result of some mechanic obstruction to the flow of blood in the part. See EDEMA, HEART-DISEASE, NEPHRITIS.

ANATOMIC AGE. Its Value in the Grading of Early Life.—Up to the present time the age of an individual has been computed by years. Chronologic age will probably always hold good in all civilized communities from a legal point of view. When, however, the question of age is brought to bear upon our school systems whether in classifying and grading children as to their studies, or in pitting them against one another in athletic sports, it becomes a very serious question as to whether chronologic age is a wise division during the formative period of early life. Again, when the important questions of labor and choice of a vocation are brought before us, and we have to determine at what age a child shall be allowed to work, and what the degree of work should be according to the chronologic age, the decision becomes momentous; and we can at once see that a chronologic division for this purpose is not only insufficient but clearly pernicious. Weight and height have long been known to be very inadequate factors for determining chronologic age and this has lately been especially and conclusively shown by Crampton.

It behooves us then to look at the question of age in early life, first, from a legal point of view, manifestly chronologic; secondly, as regards athletics, manifestly anatomic; thirdly, educational as regards school grades, manifestly physiologic and anatomic; and fourthly, as regards child labor and vocation, manifestly a combination of chronologic, physiologic, and anatomic conditions. Legal chronologic age does not enter into this discussion. Anatomic age must be carefully studied before school grades, child labor, and vocation can be dealt with intelligently. From a medical point of view the physiologic and anatomic conditions can for the present be considered as one since the normal physiologic development of the various functions probably corresponds to and keeps pace with the normal anatomic development.

The great importance of an exact knowledge of anatomic development as expressed by the bones and joints to avoid overstrain at a time of life when this avoidance is of prime necessity, should be impressed forcibly upon the public in general, and especially upon those who have charge of the athletic grading of boys and girls, whether in football, basketball, or general gymnastics. Having determined what the anatomic growth is at different stages of development during the growing period, we can then apply this knowledge to the broad questions of education, labor and vocation.

If an anatomic classification can be made it will make no difference in its practical application whether the individual child is healthy or unhealthy, normal or abnormal, is of one race or another, or of one physical parentage or another, except so far as boys and girls, as will be explained later, can be separated normally in their anatomic development. That is, with such an anatomic classification, we can practically work out our problems of early life irrespective of whether the individuals are boys or girls and whether the girls menstruate early or late. This anatomic classification is also clearly valuable for the purpose of adapting children from birth through adolescence to their proper healthy surroundings and to a life suited to their individual strength and capacity.

An extended study of the joints by means of the Roentgen ray has shown that it is the development of the ossific centers of the tarsal and carpal bones and of the epiphyses, which in the most practical way represents step by step the various degrees of development from birth to the comple-

tion of growth. It seems also to be true that a practical knowledge of the normal anatomic changes of these parts, which take place in early life, may lead to the solution of many important problems connected with the safeguarding of the developmental period of infancy, childhood and adolescence.

In the process of development from birth to adolescence the normal changes which take place

This hand represents a stage of development denoted by the presence of all the carpal bones with the exception of the pisiform. The lower epiphysis of the radius is present but not that of the ulna.—(*Rotch.*)

in the bones of the wrist and hand correspond so closely to those of the other joints that in the great majority of individuals the wrist and hand may be accepted as a fairly correct index to the general development. It is true that in their progressive development the ossific centers of the elbow, shoulder, knee and ankle present somewhat finer shades of growth in the sense of more rapid changes, but for clearness of definition and for readiness of topographic interpretation they do not compare with the wrist and hand.

It is quite evident that some more reliable means for determining physical development, resisting power, and fitness for especial work or vocation is needed beyond what we have had in the past. Rotch's work has shown that the carpal bones and the epiphyses of the hand and wrist provide us with such means. There are, however, certain facts connected with the appearance and growth of the carpal bones and epiphyses which must first be understood and appreciated before the practical lesson which they teach can be made use of. (1) The ossific centers of the carpal bones beginning with the os magnum and unciform and ending with the pisiform appear in regular order in the process of development and thus mark off distinct periods. (2) The ossific centers of the

This hand represents a stage of development denoted by the presence of all the carpal bones and the lower epiphyses of the radius and ulna.—(*Rotch.*)

epiphyses, in like manner, appear in regular succession, increase in size, form lines of ossification and finally unite. These two sets of ossific centers mark clearly the entire development of the individual from birth through infancy, childhood, and adolescence to the completed development of the adult. (3) The early periods of development, perhaps two-thirds of them, are marked by the *appearance* of the ossific centers and the later third by the progressive massing of the carpal bones and the gradual *union* of the epiphyses of the entire wrist and hand. (4) For practical purposes the *appearance* of the epiphyses of the metacarpal bones and of the phalanges is not especially adapted to or indeed necessary for forming part of an index for the first two-thirds of development, but it is the ossification and *union* of these epiphyses and those

ANATOMIC AGE

of the radius and ulna which is of great importance in marking the latter third of development up to its completion. (5) A rule which almost invariably holds good is that those epiphyses which appear first are the last to unite. A notable instance of this is the lower epiphysis of the radius which appearing very early in childhood is the last to unite and in its distinct gradations of ossification presents a most valuable index of development up to the completion of epiphyseal growth. The gradual narrowing and shortening of the line of ossification until it disappears are very significant of the passing of adolescence into adult life. Another instance of this rule is that the epiphyses of the terminal phalanges of the hand, appearing later than those of the metacarpal bones and the

This hand represents a stage of development denoted by the greater massing of the carpal bones and the ossification of the terminal phalanges.—(*Rotch.*)

first and second phalanges, unite first. (6) It has been found that the external appearance of the hand, whether large or small, broad or long, does not indicate the development of the bones, and that the Roentgen picture alone can show the degree of development. (7) The work of Pryor and Rotch proves conclusively that girls in their development begin to show ossific centers earlier than do boys. It has long been known that at puberty girls develop more rapidly than boys do, for instance in weight, and that the girl develops in her sexual functions much sooner than the boy, the former becoming a woman some years before the latter becomes a man. From the very beginning of life, however, the female shows an earlier epiphyseal development than does the male and she completes her epiphyseal development and becomes in that sense an adult perhaps one or two years earlier than the boy.

Without reference, therefore, to chronologic age we can grade young human beings from birth to adult life by taking a Roentgen picture of the wrist and hand. The epiphyseal development shown by this picture, though only a factor in the general development, is one of the greatest importance. We must not, however, be misled by thinking that the development of the epiphyses always indicates the actual general physical strength of an individual. The muscles may be weak and not up

This hand represents a stage of development denoted by the ossification of the epiphyses of the metacarpal bones and of the first and second phalanges.—(*Rotch.*)

to the standard. On the other hand, the carpal bones and the epiphyses of the radius and ulna indicate what the development really is, and has been; and the muscular strength and endurance should be worked up to the degree of development shown by this anatomic index. In like manner, where there is an overbright brain and a corresponding lack of epiphyseal development the child should be taken from study and improved physically until its anatomic index equals its brain capacity. The bones of the hand and wrist, therefore, unfold to us an underlying evidence of development which can be used practically for grading early life, and this **"anatomic index"** can only be disclosed during life by means of the Roentgen ray.

Having determined the especial anatomic development, we can then determine what grade in

school, what kind of physical work, or what vocation is adapted to the individual's particular epiphyseal qualification.

In order to simplify the grading, Rotch has prepared a table, which, under the headings of letters, represents the different grades of development in sequence. These letters, however, are merely illustrative of a certain method and probably eventually will be changed when in the future it can be decided by still further observation

This hand represents a stage of development denoted by the ossification of the lower epiphysis of the radius.—(*Rotch.*)

whether a number of developmental periods, for instance, should be grouped together under one letter for practical purposes. It should be noticed also, as is seen in Table II, that older boys and younger girls can be grouped under one heading but a separate anatomic index of this kind for boys and girls is also being prepared.

Looking at the question from a purely developmental point of view, we can take the distinct differences in the progressive development and form from them a provisional anatomic index. Thus at birth the wrist and hand show no ossific centers of the carpal bones or of the epiphyses. As development progresses the carpal bones and the lower epiphyses of the radius and ulna appear in uniform succession so that each of these appearances can be designated by a letter and starting with "A" for the appearance of the os magnum and unciform bones we arrive at the letter "L" denoting the appearance of the pisiform bone, and "M" denoting the greater massing of all the carpal bones and the ossification of the epiphyses of the terminal phalanges. From this time on we can make use of the ossification and union of the remaining epiphyses for later grades of the anatomic index. Thus the letter "N" could be used to denote the ossification of the epiphyses of the

This hand represents a stage of development denoted by the almost complete union of the lower epiphysis of the radius.—(*Rotch.*)

metacarpal bones and of the first and second phalanges, and then the later and terminal stages leading up to completed development, shown by the different stages of ossification and final union of the lower epiphysis of the radius can, in like manner, be designated by "O", "P", "Q" and so forth.

Table I shows the order in which the ossific centers of the carpal bones and the lower epiphyses of the radius and ulna appear.

Table I

A. Os magnum, unciform.
B. Os magnum, unciform, lower epiphysis of radius.
C. Os magnum, unciform, radius, cuneiform.
D. Os magnum, unciform, radius, cuneiform, semilunar.
E. Os magnum, unciform, radius, cuneiform, semilunar, trapezium or scaphoid.

F. Os magnum, unciform, radius, cuneiform, semilunar, trapezium, scaphoid.

G. Os magnum, unciform, radius, cuneiform, semilunar, trapezium, scaphoid, trapezoid.

H. Os magnum, unciform, radius, cuneiform, semilunar, trapezium, scaphoid, trapezoid, lower epiphysis of the ulna.

I. Same as group **H** as to number of bones, but more advanced in development.

J. Same as group **I**, but more advanced in development.

K. Same as group **J**, but the pisiform bone appears just under the cuneiform and all the carpal bones and epiphyses are much more massed and further advanced in development.

L. Same as group **K**, but much more advanced in development; pisiform appears plainly at lower end of cuneiform.

M. Very much more advanced in development than **L**, and the pisiform bone almost as large as the cuneiform. All the bones of the wrist are much more developed than in any previous group.

Table II

Pryor's comparison of the wrist according to sex, showing how the girl presents at an earlier chronologic age the different stages of development.

	Sex.	Age Years.	
A	Female..	1/2	Magnum, unciform.
	Male...	1	
B	Female..	1 1/2	Magnum, unciform, radius (lower epiphysis).
	Male...	2	
C	Female..	2 1/2	Magnum, unciform, radius, cuneiform.
	Male...	3 1/4	
D	Female..	3 1/2	Magnum, unciform, radius, cuneiform, semilunar.
	Male...	4 1/4	
E	Female..	4 1/4	Magnum, unciform, radius, cuneiform, semilunar, and *one* of the following: *Scaphoid, trapezoid, trapezium.*
	Male...	5 1/4	
F	Female..	4 3/4	Magnum, unciform, radius, cuneiform, semilunar, and *two* of the following: *Scaphoid, trapezoid, trapezium.*
	Male...	5 3/4	
G	Female..	5 1/4	Magnum, unciform, radius, cuneiform, semilunar, scaphoid, trapezoid, trapezium.
	Male...	6 3/4	
H	Female..	6. 1/4	Magnum, unciform, radius, cuneiform, semilunar, scaphoid, trapezoid, trapezium, ulna (lower epiphysis).
	Male...	7 1/4	
I	Female..	7 1/2	Same as **H**, but more advanced.
	Male...	9	
J	Female..	8 1/2	Same as **I**, but more advanced.
	Male...	10	
K	Female..	10 1/4	Magnum, unciform, radius, cuneiform, semilunar, scaphoid, trapezoid, trapezium, ulna, pisiform.
	Male...	12 3/4	

The pictures are presented in order to more clearly illustrate the meaning of an anatomic index. The letters are simply empirical, and need not necessarily represent these especial degrees of development.

ANATOMIC NOMENCLATURE.—The expression **BNA** is a shorthand title for a list of some 4500 anatomical terms (*nomina anatomica*) accepted at Basle in 1895 by the Anatomical Society as the most suitable designations for the various parts of the human anatomy which are visible to the naked eye. The terms are all in correct Latin and have been selected by a group of the most distinguished anatomists in the world, working six years at their task, as the shortest and simplest available names for the different structures; the majority of the terms were already in use in the various text-books, but some of them were selected from anatomic monographs not considered in the text-books, and a few of them are brand-new, introduced into the list, where an examination of the literature and of anatomic preparations showed that none of the terms hitherto coined was satisfactory.

One name only is given to each structure, and the mass of synonyms which encumbered the text-books can thus be swept away. If one of the larger text-books of gross anatomy be examined, as many as 10,000 terms will be found employed, the half of which are synonyms, and if the anatomic terms used in the various standard text-books be collected into one list, the total number amounts to more than 30,000. It is no small achievement to have reduced the necessary number of terms in gross anatomy, as it is known today, to less than 5000—an achievement for which both students and teachers of the subject must be thankful. Even more important is the exclusion from the list of all obscure or ambiguous terms, each name employed having a definite and easily ascertainable meaning. The construction of the list has led, too, to the establishment of certain general principles regarding the formation and use of anatomic terms, and these principles promise to be of great service in simplifying terminology and keeping it uniform as anatomic science continues to develop.

As the six years' work of the Commission proceeded *certain principles of terminology* crystallized out and simplified the further revision. It was found, however, that while these principles were of value as general rules, none of them could be employed absolutely without exception. The more important decisions arrived at were the following:

(1) Each part shall have only one name.

(2) Each term shall be in Latin and be philologically correct.

(3) Each term shall be as short and simple as possible.

(4) The terms shall be merely memory signs and need lay no claim to description or to speculative interpretation.

(5) Related terms shall, as far as possible, be similar—*e. g.*, femur, arteria femoralis, vena femoralis, nervus femoralis.

(6) Adjectives, in general, shall be arranged as opposites—*e. g.*, dexter and sinister, major and minor, anterior and posterior, superficialis and profundus. The Commission was occasionally forced to deviate from these rules, but only when compromise appeared to be unavoidable was there any departure. In regard to the retention of personal names, the Commission compromised by giving each part an objective name and putting widely used personal names in brackets, thus leaving to time the final decision.

It is in books, and more particularly in atlases, that it is especially desirable that the BNA be used in its Latin form; and indications are already pointing to its general acceptance by American and British writers.

ANEMIA.—A reduction of the total volume of the blood, or of one or more of its constituents, cellular or chemical. Anemia as a temporary condition is observed after hemorrhage—acute anemia—and in a large number of different pathologic conditions; it occurs in the infectious fevers, in all reduced states due to whatever cause, and as a result of certain poisons, both chemical and metabolic. The term is also used to denote certain distinct diseases of the blood and blood-making organs, the so-called primary or idiopathic anemias—chlorosis, pernicious anemia, leukemia, splenic anemia, and Hodgkin's disease.

Anemia may be general or local. *Ischemia* is a form of local anemia and is the result of mechanic interference with the circulation of the affected part from vasomotor spasm, thrombosis, embolism, or the action of styptics.

Oligocythemia and *polycythemia* are used to denote respectively a reduction and an abnormal increase in the number of red blood cells. Increase of the leukocytes is spoken of as *leukocytosis* or *hyperleukocytosis*, while the opposite condition is known as *leukopenia*. *Oligochromemia* means a reduction in the percentage of hemoglobin.

Diminution of the total volume of blood in the body, *oligemia*, must of course occur after a large hemorrhage, but the condition cannot be recognized clinically, or at least distinguished from anemia in the sense of a reduction in the cellular elements or the hemoglobin, or both, hence the word is practically used in that sense only by the clinician.

Estimation of Total Blood Volume.—Haldane and Smith have devised a method based on the power of the erythrocytes to absorb carbon monoxid. Four minutes after a measured quantity of carbon monoxid has been inhaled, the blood is examined for the degree of saturation, and the total quantity calculated in the following manner: The quantity of carbon monoxid necessary to saturate the entire mass of the blood is first determined, this being the same as the quantity of oxygen required for saturation. The blood specimen is then compared with a specimen of ox blood having a known capacity for oxygen. Example: "A patient having absorbed 100 c.c. of CO, it is found that his blood is saturated 20 percent with this gas. The total capacity for CO, and therefore for oxygen, is 500 c.c. The patient's blood is further found to have the same color as an ox's blood, of which the capacity for oxygen is shown to be 20 volumes percent. The volume of the patient's blood therefore is $\frac{500}{20} \times 100 = 2{,}500$ c.c."

General Symptoms of Anemia.—Depending on the severity of the anemia some or all of the following symptoms are observed and are an indication for a blood examination with instruments of precision: Weakness, languor, loss of appetite, pallor of the skin and mucous membranes, headache, vertigo, palpitation of the heart, and dyspnea. Emaciation may or may not be present and is sometimes conspicuously absent; edema is always seen in severe forms; a soft, systolic, so-called hemic murmur is heard over the heart, the vessels in the neck pulsate visibly, and capillary pulsation may be present. The diagnosis cannot be made with certainty by clinical signs and symptoms, as these may be present (*e. g.*, pale face and lips, etc.) with a normal blood count; while, on the other hand, individuals in apparently normal health sometimes show a considerable degree of anemia.

The anemias are classified as (1) primary, essential, or idiopathic: chlorosis, pernicious anemia, leukemia, splenic anemia, and Hodgkin's disease; and (2) the secondary, or symptomatic.

ANEMIA, LYMPHATIC (Hodgkin's Disease).—See LYMPHADENOMA.

ANEMIA, PERNICIOUS.—A grave form of anemia characterized by great reduction in the number of erythrocytes, a relatively lesser diminution of the hemoglobin, leukopenia, and the presence in the blood of microcytes, macrocytes, poikilocytes, normoblasts and megaloblasts.

Etiology.—The cause is not known. It may follow prolonged exposure and fatigue, shock, mental strain, malaria, syphilis, alcoholism. Among predisposing factors believed to be responsible may be mentioned: pregnancy and lactation, and prolonged gastrointestinal disease leading to atrophy of the gastric tubules. Certain intestinal parasites, especially *ankylostomum duodenale* and *bothriocephalus latus*, are associated with a form of anemia which cannot be distinguished from the pernicious type, but which should properly be regarded as a secondary form. The disease is more common in Germany and Switzerland than in other localities, and relatively rare in America, although reports indicate an increasing prevalence in certain districts in the states of the Middle West. Males are more frequently attacked than females; Osler had 17 males and 10 females in a series of 27 cases. It is a disease of middle life and rarely develops before the age of 20. The most commonly accepted view assumes as the cause hemolysis due to absorption of poisons from the intestinal tract, produced either by bacterial action or perverted metabolism.

Pathology.—The internal organs often show a degree of fatty degeneration. The stomach may show atrophy of the gastric tubules. The liver is usually enlarged and fatty. The liver cells may be colored with iron (hemosiderin) pigment, and there is often pigmentation of the sympathetic ganglia. The spleen is often unaffected. The tubules of the kidneys are often pigmented with the iron stain. Hyperplasia of the red marrow of bone has been found by H. C. Wood.

Symptoms.—In addition to the general symptoms of anemia, which have been enumerated, the patients present a peculiar lemon-yellow waxy pallor of the skin and blanched mucous membranes; gastrointestinal disturbances, anorexia, nausea, vomiting and diarrhea are prominent features; palpitation and dyspnea are severe; a hemic murmur may be heard; hemorrhages occur into the skin and mucous membranes, and from the nose, stomach and intestines. Retinal hemorrhage is an occasional accident, and disorders of vision are common. Nervous symptoms may arise, such

as numbness or paresthesia or even paralysis. There is no emaciation, and many patients present, on the contrary, a well nourished appearance which is in striking contrast to the extreme pallor and general exhaustion which is progressive. The urine is dark, of low specific gravity, and contains an increased quantity of uric acid. The urinary findings, however, are not constant. Fever of irregular type is present; the evening temperature may attain 102° or even 103° F., and is followed by a morning remission.

Blood Changes.—If a puncture is made, the drop of blood appears pale and watery, and slips off the part as though containing an oily substance, and coagulates slowly. If placed under the microscope, one may notice the loss of characteristic rouleaux formation seen in normal blood.

A high color index is characteristic of pernicious anemia. The reduction of red blood cells may be very great; the number is usually below 2,000,000 and may not attain 1,000,000. The hemoglobin percentage is relatively in excess, and the leukocytes are diminished, usually below 5,000 to the cubic millimeter of blood. Osler found an average erythrocyte count of 1,500,000 with 30 percent of hemoglobin. Da Costa and Cabot in larger series of cases obtained 1,361,000 and 1,200,000 respectively, with approximately the same hemoglobin percentage.

In the stained preparations all varieties of abnormal erythrocytes may be found: macrocytes, microcytes and poikilocytes, nucleated cells (normoblasts and megaloblasts). An excess of the megaloblasts over the normoblasts is by most authorities regarded as pathognomic of pernicious anemia. Polychromatophilia, or irregularity in the staining of different parts of the cell, and basophilic degeneration occur. The leukocytes are diminished as a whole, while the lymphocytes usually show a relative increase; myelocytes are often found. See BLOOD (Examination).

Diagnosis.—Marked oligocythemia with a relatively high percentage of hemoglobin is not sufficient for a positive diagnosis, as these conditions may be present in any form of severe anemia. It is essential that megaloblasts and normoblasts be found in the peripheral blood in order to make a positive diagnosis.

Prognosis.—Unless the disease is due to some removable cause such as intestinal parasites, the prognosis is invariably fatal. Temporary remissions are not infrequent and are quite characteristic of the disease. The duration varies from a few months to several years.

Treatment.—The patient should be constantly in the open air, day and night, and should therefore, if possible, be removed to a mild and equable climate. Sea air and, in the early stages, sea bathing are beneficial; great altitudes must be avoided. Besides being supplied with plenty of fresh air and sunlight, the patient must be properly fed. Strict regularity must be enforced, and as much light, nourishing food provided as the digestive tract can assimilate. Milk and raw eggs are the most suitable articles of diet. Bone-marrow, either fresh or in the form of the glycerinated extract, is recommended, but has not proved of much value. The bowels should receive careful attention. Direct transfusion has been tried repeatedly during the past few years, but the results have been disappointing, although temporary improvement has been noted in some cases. Hypodermoclysis, an easier measure, answers the same purpose. Medicinal treatment consists in the exhibition of intestinal antiseptics, salol, betanaphthol, or strontium salicylate, which is a favorite in this disease. Iron is of little value; the most satisfactory drug is arsenic, regarded for a long time as almost a specific. It may be given either in the form of arsenic trioxid, in the dose of 1/60 to 1/40 grain, or as Fowler's solution in gradually ascending doses, with care not to exceed the physiologic limit of the drug.

The following formulas are recommended:

℞. Arsenic trioxid, gr. ss
Calcium glycerophosphate, ʒ j.
Divide into 20 capsules. One after each meal.

Strychnin, in doses of 1/30 of a grain, may be combined with the foregoing ingredients. Vallet's mass, in doses of 4 or 5 grains, may be beneficial, as:

℞. Arsenic trioxid, gr. ss
Strychnin sulphate, gr. 2/3
Mass of ferrous carbonate, ʒ ij.
Divide into 20 pills or capsules. One after each meal.

We may combine quinin, as:

℞. Arsenic trioxid, gr. j
Strychnin sulphate, gr. j
Quinin sulphate, ʒ jss
Mass of ferrous carbonate, ʒ ij.
Divide into 40 pills or capsules. One after each meal.

Cacodylate of sodium has been recommended as less irritating than other preparations of arsenic, being suitable also for hypodermic use. The dose is 1/2 of a grain, three times a day. Atoxyl is still another preparation of arsenic given in doses of 1/3 to 1/2 of a grain hypodermically every other day. Late in the disease, inhalations of oxygen have been recommended.

To eliminate the possibility of general infection the use of antistreptococcus serum has been suggested. See CHLOROSIS, LEUKEMIA, LYMPHADENOMA.

Aplastic Anemia.—An intractable, pernicious and rapidly fatal form of anemia occurring in young adults, characterized by hemorrhages into the mucous membranes and "aplastic" bone-marrow. It is distinguished from pernicious anemia by the low color-index, absence, or scarcity, of nucleated red cells and of poikilocytosis. Polychromatophilia is not marked. Though the leukocytes are normal in number, the lymphocytes are enormously increased while the polynuclear neutrophiles are reduced.

ANEMIA, PSEUDOLEUKEMIC, OF INFANCY.—See Pseudoleukemic Anemia of Infancy.

ANEMIA, SECONDARY (Symptomatic).—This type of anemia accompanies practically all chronic organic diseases; the acute infectious fevers; parasitic infections, which include malaria and syphilis, and particularly uncinariasis and bothriocephalus latus infection (see under pernicious anemia); toxemias and poisoning with certain metallic poisons. The following classification is practical for the clinician:

(1) Anemia from hemorrhage from any cause—acute anemia. This includes, besides traumatic and surgical hemorrhage, postpartum hemorrhage, hemorrhoids, purpura, hemophilia, menorrhagia and metrorrhagia, ruptured aneurysms. Parasites in the intestines, kidney, etc., may cause hemorrhage.

(2) Anemia from long-continued drain on the albuminous materials of the blood (Osler). This group includes a large number of organic and constitutional disorders: rheumatism, Bright's disease, tuberculosis, prolonged suppuration, the acute infectious fevers, as acute malaria, scurvy, rickets, chronic gastrointestinal disease, carcinoma and sarcoma.

(3) Toxic anemias. The metallic poisons that especially produce anemia are lead (basophilic degeneration of erythrocytes), mercury, arsenic, phosphorus, and the potassium salts, especially the chlorate. Another important group is formed by the anilin derivatives; the oxyhemoglobin in the blood is converted into methemoglobin. Anemia is caused by the toxins generated by specific organisms, such as that of tuberculosis, of syphilis, or of chronic malaria. Anemia also results from the absorption of metabolic poisons from the alimentary tract, *i. e.*, autointoxication, and, according to some authorities, pernicious anemia should on that account be classed under this head. Here also may be included for convenience the parasitic anemias.

(4) Anemia from malnutrition and inanition.

Symptoms.—The general symptoms described under *anemia* are present in variable degrees depending on the intensity of the blood changes. It should be emphasized, however, that a marked degree of anemia may be present without the classic subjective and objective signs, and that the final decision must be made by the blood picture.

Blood.—It is customary to distinguish two types of secondary or symptomatic anemia according to the relation existing between the number of red cells and the percentage of hemoglobin, known as the color-index. See Blood (Examination). Sometimes the erythrocyte count is high, say between 4,000,000 and 4,500,000, with a disproportionate reduction of the hemoglobin 60 to 70 percent, or even a greater discrepancy. This is spoken of as a *chloranemia*, or chloranemic type of anemia; the blood picture resembles that of chlorosis. Again, the color-index may be high, that is, the percentage of hemoglobin less reduced in proportion than the number of red cells, simulating the condition found in pernicious anemia; hence the term *anemia of the pernicious type*. The reduction in the different constituents of the blood varies within wide limits and, as has been stated, there is no constant correspondence between clinical symptoms and the blood findings. In the graver forms of secondary anemia changes in size and shape of the erythrocytes as well as in their staining properties—microcytosis, macrocytosis, poikilocytosis (in one word, anisocytosis), polychromatosis and basophilic degeneration—are not at all uncommon. Basophilic degeneration is observed especially in the anemia accompanying chronic lead poisoning, without, however, being pathognomonic of that condition. The occasional presence of nucleated red cells, both normoblasts and megaloblasts may render the diagnosis from pernicious anemia practically impossible by the blood count alone. Special features of the various etiologic forms of secondary anemia are discussed under the respective diseases.

A moderate degree of leukocytosis is generally present, the increase affecting the polymorphonuclear neutrophiles. Like the production of nucleated red cells (normoblasts) this is a regenerative phenomenon and tends to subside as the blood regains its normal constitution. A low leukocyte count, especially if the lymphocytes are relatively increased, is an unfavorable sign, occurring in grave forms of secondary anemia. See Blood (Examination).

Diagnosis.—The blood should be carefully examined, and a thorough search made for any exciting cause. Often a minute history of the case will unravel the obscure nature. A patient has been observed in a profound anemic state, and after excluding most of the causes, it was found that he had been a sufferer from internal hemorrhoids for years, upon which fact he had placed little importance. An operation gave complete relief.

Prognosis.—According to the definition of symptomatic anemia the prognosis of the anemia itself is always favorable, the final outcome depending entirely on the nature of the etiologic disease.

Treatment depends upon the cause. Aside from improving the general hygienic conditions, nutritious food and iron are indicated in full doses.

ANEMIA, SPLENIC.—See Splenic Anemia.

ANESTHESIA.—A condition of insensibility or loss of sensation due to pathologic conditions of the nerve-centers, of the conducting paths of the nerves, or of the peripheral terminations of the same, or to artificial impairment by means of anesthetics. Nitrous oxid, ether, and chloroform are the three agents chiefly used to produce general anesthesia. Artificial anesthesia may be effected in one of three ways: First, by benumbing the part by means of cold; second, by intercepting its nervous communications; third, by arresting the activity of the nerve-centers concerned in sensation.

Indications.—Besides its common use (to abolish pain during surgical operations, renal colic, etc.), anesthesia may be employed to produce muscular relaxation in hernia, dislocations, and fractures,

and to aid in examining tumors, joint-diseases, and malingerers, and to prevent the suffering of labor, chiefly in the second stage.

Anesthesia in labor has certain advantages: viz., first, it greatly modifies the intensity of the patient's suffering; second, it relaxes the soft structures, and thus facilitates the expulsion of the fetus. The disadvantages are: First, it diminishes the intensity of the uterine contractions to an appreciable extent; second, it is followed by nausea, vomiting, and headache if not administered in moderate amounts; and third, it predisposes to postpartum hemorrhage.

Contraindications for anesthesia are fatty degeneration or dilatation of the heart, renal and pulmonary disease, enlarged tonsils, cerebral tumor, and chronic alcoholism—particularly the first and last named.

Anesthesia is dangerous in cases of intestinal obstruction, with distention of the abdomen and a weak and failing pulse. After-sickness is much less common after ether than after chloroform, and this is of great importance in abdominal operations. The disadvantage of ether is that it is irritant to the respiratory mucous membranes, especially pronounced when inflammation thereof exists. It depends upon the administration whether ether produces extreme venous engorgement and leads to much oozing from the field of operation. The after-oozing is greater with chloroform than with ether. Anesthesia in empyema is extremely perilous.

Forms of Death from Anesthetics.—1. From sudden paralysis of the cardiac ganglia, early in the inhalation, by reflex action proceeding from some peripheral injury before complete anesthesia is produced. Thus, in the extraction of teeth, a small quantity of chloroform having been administered, the heart is enfeebled, and the action of the cerebral hemispheres suspended, but not those of the basal or medullary ganglia. If at this stage the fifth nerve is irritated by the intimate relation of its nucleus with that of the pneumogastric, reflex inhibition may be transmitted over the latter, arresting the cardiac ganglia. The stage of incomplete anesthesia is always a dangerous one in which to perform any operation around the distribution of the fifth nerve.

2. In the stage of rigidity, from tetanic fixation of the respiratory muscles, the blood backing up on the venous side and arresting the heart's action, respiration ceasing before the cardiac action is stopped.

3. In the stage of complete relaxation, by paralysis of respiration, or by paralysis of the tongue, causing obstructed respiration.

4. In the same stage, by paralysis of the motor ganglia of the heart.

5. From depression of the functions by chloroform narcosis and from shock, and may occur in the anesthetic state or afterwards.

ANESTHESIN.—The ethyl ester of paramidobenzoic acid; it occurs as a white powder, soluble in ether, alcohol, fatty and ethereal oils; insoluble in water. It is used as an anesthetic for minor injuries, painful skin affections and those of mucous membranes, carcinomatous ulcers, etc., as a dusting powder, also in throat and nose practice. Its anesthesia lasts longer than that of cocain, and it is much less toxic. The hydrochlorid is used internally in gastric hyperesthesia and ulcer, in doses of 5 to 7 grains. Doses of 30 grains have not proved toxic.

ANESTHETICS, GENERAL. Table of General Anesthetics.—The following are some of the substances, or agents, that have been used for general anesthesia: **Amylene**, C_5H_{10} a mobile liquid, thin, colorless, translucent; action rapid, producing partial anesthesia. It is used in Germany under the name of *Pental;* it is best administered by means of Junker's inhaler, which modifies its unpleasant odor; it should not be brought near a flame. **Carbon Tetrachlorid,** not so irritating to the organs of respiration, but far more dangerous than chloroform. **Chloroform,** by inhalation. Largely employed in general surgery. It seems to have a selective action upon the nervous system, and also exercises a direct influence upon the muscular tissues of the heart. It paralyzes the vasomotor system, and death results from cardiac paralysis. Chloroform should always be administered freely mixed with air. The *method of definite mixtures*, however, as recommended by Clover and by Bert, while admirable in theory, is not entirely practical. The *Lister method*, also known as the *Scotch* or *open method*, of administering chloroform, consists in pouring a small amount of the anesthetic upon a common towel arranged in a square of six folds, and holding this as near to the face as can be borne without inconvenience. Various inhalers have been devised for the administration of chloroform, the best of which are: *Clover's*, which consists of a large bag capable of containing a given volume of air, into which the vapor of a given quantity of chloroform is allowed to enter, the mixture being so arranged that the tension of chloroform vapor in the air is maintained below 4.5 percent; *Junker's* as modified by *Dudley Buxton*, which consists in the inhalation of air containing the chloroform vapor, the latter being taken up by pumping the air through a bottle containing half an ounce of the anesthetic; *Krohne and Sesemann* have modified the foregoing by doing away with the intermittent, jerky delivery of the vapor, and by adding to the face-piece an expiration valve guarded by a stiff feather, which rising in expiration and falling in inspiration, registers the force and strength of respiration (*feather respiration register*); *Sansom's* apparatus is a modification of *Snow's*, substituting a gutta-percha covering for the cold-water jacket of Snow; *Snow's inhaler* consists of a metallic cylindric vessel, containing two coils of blotting-paper, permitting free circulation of air, and surrounded by another cylinder containing water, the latter being for the purpose of equalizing the temperature. *Syncope* resulting from chloroform administration should be treated by lowering the head, artificial respiration, inhalation of nitrite of amyl, electric stimulation, and possibly acupuncture of the heart. **Electricity.** See ELECTRICITY, Anesthesia. **Ethene Chlorid,** formerly called *ethy*

lene chlorid, Dutch liquid, chloric ether, closely resembles chloroform, but is less of a cardiac depressant. It is considered safer than chloroform. Death results from paralysis of the respiratory centers. **Ethyl Chlorid** is a very rapid anesthetic, producing a narcosis which lasts from one to three minutes. It may be sprayed upon gauze or given through an inhaler. It can be used only for short operations. A few surgeons have used it to induce anesthesia before administering ether, but for this purpose it is undoubtedly less safe than nitrous oxid. It causes death by paralyzing the respiratory centers. **Ether,** by inhalation, is probably the safest known agent for the production of prolonged narcosis. Its action is directed largely to the nervous system, which becomes profoundly affected. It frequently causes spasmodic action and suspension of respiratory action. Death results from paralysis of respiration. It may be administered alone or in combination with nitrous oxid gas, in which case the patient is more rapidly narcotized. A variety of inhalers has been devised for its administration, as follows: *Allis's* is probably the best form of open inhaler. It consists of a metal frame so arranged that a flannel bandage can be stretched across and the whole surrounded with a leather case, which acts as a face-piece. *Clover's portable ether inhaler* consists of a dome-shaped receptacle pierced by a central shaft connecting with a rubber bag, into which the patient breathes. Moving with the face-piece is a metal indicator to register the amount of ether admitted. A water-chamber surrounds the ether vessel to regulate the temperature. *The cone* is much used in America. A towel is folded into the shape of a cone, a sponge is placed at the apex, and the ether poured upon this. *Hewitt's apparatus* may be used for giving gas and ether. In his inhaler the inspiratory and expiratory valves are placed in a little chamber near the face-piece; a free draft of air is permitted. *Ormsby's inhaler* consists of a leather face-piece, crowned with a cone-shaped wire cage covered with leather and joined to a soft leather bag, covered by a loose net to prevent excessive expansion. The wire cage contains a sponge on which the ether is poured. *Rendle* adds to a cone containing a flannel cap a mask for the face. *Rectal etherization* may be resorted to in operations about the face and throat. The ether vapor is introduced into the bowel, the process taking longer for complete anesthetization than by the usual method. **Ethidene Chlorid** is similar in its action to chloroform. Patients take a longer time to recover consciousness than when chloroform is used, but they experience fewer after-effects, and recover rapidly. Anesthetization occurs in from 3 to 5 minutes. **Hydrobromic Ether** (*bromid of ethyl*) produces unconsciousness and anesthesia in 1 minute, and complete muscular relaxation in 2 or 3 minutes. The heart's action is somewhat weakened. Return to consciousness after withdrawal of the ether is very prompt. Its use may be followed by vomiting. According to some observers, death results from cardiac failure, while others believe it kills by direct action upon the respiratory center. It is best administered by an Allis inhaler, and is of most service in minor surgery for short operations. **Hypnotism** (*q. v.*). **Nitrous Oxid,** by inhalation, is much used by dentists for extraction of teeth. It may be employed in minor surgical operations. There are but few after-effects, those most often observed being headache and malaise. Given in conjunction with oxygen under pressure its administration may be prolonged indefinitely in major surgical operations. *Clover's gas and ether inhaler* is intended for the administration of a mixture of these anesthetics; it is so arranged that gas can be given alone, or in combination with the ether. *Buxton's apparatus* is used for the administration of gas only, and possesses a special contrivance to filter the air. *Fontaine's chamber* is an apparatus devised to keep the patient under an atmospheric pressure equal to 26 inches mercury, so that the vapor inhaled would be 50 percent gas and 50 percent air, and asphyxia thus be prevented. The employment of *supplemental bags* has been advocated by Braine. The patient breathes into these bags, the gas supply being turned off and the expiratory valve closed. This method produces a more prolonged period of unconsciousness. Various accessory instruments, etc., are required in administering gas, such as gags, mouth-openers and mouth-props, spoons, etc. **Nitrous Oxid** is the safest of all anesthetics and the most agreeable to take. It requires the shortest time for induction. There is no stage of excitement. The patient comes out of the anesthetic at once and there are practically no after-effects upon any part of the body. The administration of nitrous oxid can be longer extended with impunity than that of any other anesthetic.

Danger-signals are (1) cyanosis, deep and continued; (2) slowing and depression of the pulse; (3) vomiting. Cyanosis calls at once for turning off the gas and turning on fully the oxygen.

In order to obtain satisfactory relaxation in the robust or in alcoholics, ether is given as a preliminary measure—by cone or open method—for 2 to 5 minutes, then nitrous oxid and oxygen alone are used. A preliminary routine dose of morphin (1/4 grain) and atropin (1/150 grain) is beneficial. Crile gives besides morphin, 1/150 grain of scopolamin or less two hours before operation in order to prevent appreciations of the operative trauma.

Nitrous oxid and ether can be used when ether is contraindicated, as in kidney disease. It has been used with satisfaction in advanced pulmonary disease. In the desperate cases in which operation under ether or chloroform is hazardous, nitrous oxid and oxygen anesthesia is a boon. It is dangerous chiefly in heart lesions. It is not suitable for the general practitioner because it requires special training to acquire the technic, but among expert anesthetists it is gaining fame rapidly and is being used in some clinics as the routine anesthetic.

Gatch has established the fact that rebreathing of the nitrous oxid and oxygen in periods of 2 minutes is innocuous and beneficial to respiration and circulation and materially reduces the cost of the anesthesia. Just enough oxygen should be given to keep the patient pink and prevent or overcome cyanosis.

Anesthetic Mixtures.—**A. C. E. Mixture:** alcohol, sp. gr. 0.838, 1 part; chloroform, sp. gr. 1.497, 2 parts; ether, sp. gr. 0.735, 3 parts. **Billroth's:** chloroform, 3 parts; alcohol and ether, each, 1 part. It is best administered by the open method. **Linhart's:** alcohol 1, chloroform 4. It is administered similarly to chloroform. **Martindale's:** a volumetric mixture, the ingredients of which evaporate almost uniformly; it consists of absolute alcohol, sp. gr. 0.795, 1 volume; chloroform, sp. gr. 1.498, 2 volumes, pure ether, sp. gr. 0.720, 3 volumes. **Medico-Chirurgical Society of London:** ether 3, chloroform 2, alcohol 1. **Methylene,** or **Bichlorid of Methylene,** a mixture of methylic alcohol 30 percent, and chloroform 70 percent. The so-called *"liquid of Regnauld"* consisted of 80 percent chloroform, 20 percent methylic alcohol. Methylene is not often used, several deaths from cardiac paralysis having followed its employment. **Nussbaum's:** ether 3, chloroform 1, alcohol 1. **Richardson's:** alcohol 2, chloroform 2, ether 3. **Sanford's**—the so-called *"chloramyl"*—is a mixture of chloroform and amyl nitrite in the proportion of 2 drams of the nitrite to the pound of chloroform. It is a dangerous mixture, both drugs depressing the heart. **M. S. Mixture:** ether 56 3/4, chloroform 43 1/4 by volume; it is said to be a true molecular solution, containing neither of its ingredients free. **Schleich's:** chloroform, petroleum ether, sulphuric ether, in varying proportions. **Scopolaminmorphin:** 1/64 of a grain of scopolamin (hyoscin), and 1/5 of a grain of morphin, are divided into three doses, which are injected hypodermically 2 1/2, 1 1/2, and 1/2 hour before the operation. The patient falls into a sound sleep which lasts for about 5 or 6 hours after the last injection. Inhalations of chloroform or ether may be necessary. Several deaths have been reported, and the method is not recommended. **Vienna General Hospital:** ether 9, chloroform 30, alcohol 9. **Vienna Mixture:** ether 3, chloroform 1. **Von Mering's:** chloroform, 1 volume; dimethylacetal, 2 volumes. It is said to produce no failure of respiration or heart, and no lowering of the blood-pressure. **Wachsmuth's:** one-fifth part of oil of turpentine is added to the chloroform. It is said to prevent any danger of heart failure.

Various methods have been suggested by means of which the influence of the anesthetic may be prolonged, or its dangers and sequels largely averted. The following are the most important: **Dastre-Morat's** consists in the injection of 1 or 1.5 c.c. of the following mixture: Morphin hydrochlorid, 10 centigrams; atropin sulphate, 5 milligrams; aq. destill., 10 grams. The atropin is said to lessen the after-sickness and abrogate salivation and bronchial secretion. **Forné's:** the preliminary administration of chloral before using chloroform, 2 to 5 grams an hour before. **Kappeler's:** a combination of chloral hydrate and ether, 40 grains of the former. The duration of anesthesia is prolonged and the recovery retarded, but the after-effects are more marked. **Nussbaum's:** injection of 1/6 to 1/2 of a grain of morphin previous to the administration of chloroform. Less of the anesthetic is needed, while the stupor is prolonged; vomiting is increased. **Obalinski's:** hypodermic injection of cocain, 2 to 5 centigrams of a 3 percent solution during chloroform anesthetization. **Trélat's:** administration of 2 to 4 1/2 grams of chloral hydrate, and 10 to 20 grams of syrup of morphin in 60 grams of water, repeating the dose in 15 minutes, and following by chloroform anesthesia.

Comparative Safety of Anesthetics.—A comparison of these agents in respect to their safety has been made by Dr. Richardson, who considers methylic ether to be the safest of all, and the others as follows:

Safe: Ethyl bromid, ethyl chlorid, ether, ethene (olefiant gas), ethene chlorid, methyl bromid, methyl chlorid, methyl ether, methene chlorid, methane (marsh gas), nitrous oxid.

Of doubtful value: Amylene, amyl chlorid, butyl chlorid, benzene (benzol), carbon disulphid, carbon dioxid, carbon tetrachlorid, methyl alcohol, methylal, spirit of turpentine.

Dangerous: Amyl hydrid, butyl hydrid, carbon monoxid, ethyl hydrid, chloroform, and ethene dichlorid are considered useful, but require care.

Mortality.—It has been estimated that with *nitrous oxid,* there is one death in 300,000 cases; with *ether,* one death in 15,000; with *ethyl chlorid,* one death in 12,000; and with *chloroform,* one death in 3,000.

Nitrous Oxid and Oxygen Anesthesia Compared with Ether.—Crile's recent investigations in cytolysis show that there is decidedly more destruction of chromatin after ether than after nitrous oxid. Again, there is no lowering of the phagocytic power after nitrous oxid, as after ether. Nitrous oxid does not reduce hemoglobin or cause any permanent blood change. There is no acetone or indicanuria as a result. Postanesthetic complications are absent, particularly shock; and nausea occurs in only 17 percent of cases as compared with 42 percent in ether.

Ether Compared with Chloroform.—When swallowed, ether is less irritant than chloroform to the mucous membranes, but its vapor is more so to the air-passages. It is more of a general stimulant, and less depressant to the heart and circulation. It does not clot the blood. Its vapor is very inflammable, less pleasant to inhale, slower in action, has a longer stage of excitement and a less profound narcosis, and causes a greater degree of vomiting. It is less dangerous than chloroform, death from the inhalation of ether occurring slowly and usually by paralysis of respiration—from chloroform, it is almost always sudden, and is generally believed to occur by paralysis of the heart. Ether has undoubtedly been the direct cause of a number of deaths, besides several which occurred some hours after termination of its anesthesia.

Attempts have repeatedly been made to estimate the comparative safety of the various anesthetics used for the production of general anesthesia. In 1879 the "Glasgow Committee" of the British Medical Association concluded in favor of ether, declaring that chloroform lowered the blood tension and depressed the action of the heart. In 1889 the Hyderabad Commission

arrived at the conclusion that chloroform produced an arrest of respiration before there was a stoppage of the heart. It is thought, however, that the climate—that of India—may have had some effect in producing this result, since in temperate climates the heart usually fails before there is a depression of respiration.

Ether should be administered in cases in which chloroform acts unsatisfactorily and in which dangerous symptoms repeatedly manifest themselves; in acute hemorrhage, as the vasomotor tone is stimulated while it is depressed by chloroform; in shock, when an anesthetic is necessary, ether is to be preferred. In general pulmonary emphysema it is far safer than chloroform. Children take ether remarkably well. The usual objection to it is its liability to irritate the respiratory mucous membrane. It is not more irritating, if properly administered, than chloroform. Old age is said to contraindicate ether, because of a pre-existing chronic bronchitis in many cases. Properly administered, it will not increase bronchitis. It is particularly indicated in old age, since it is a cardiac and vasomotor stimulant. In fatty heart, endocarditis, syncope, if an anesthetic must be used, ether, being less dangerous than chloroform, should have the preference. At night ether is preferable to chloroform being less irritating to those about the patient than chloroform. Its liability to catch fire can be obviated with a little care.

Chloroform is preferable to ether when, for any reason, the latter does not act well. The change to chloroform will be found desirable and satisfactory. Conditions of the urine, indicating nephritis, acute or chronic, as well as acute pulmonary affections, demand chloroform rather than supersaturation with ether by open inhalers. In alcoholics it is frequently desirable to begin the narcosis with chloroform and continue with ether after the patient is anesthetized. This may also be desirable in the excessively nervous and hysteric; the fumes of chloroform being, as a rule, more pleasant to inhale than ether. In obstetrics, when it is usually not necessary to carry the narcosis beyond the second degree, chloroform should be used, but in acute hemorrhage, as in placenta prævia, it should not be employed, ether being preferable. In operations about the face necessitating the use of the cautery, ether being very inflammable, chloroform should be chosen. It is true that if ether is administered with closed inhalers, care being taken that the ether-bottle is closed, this objection to ether may be overcome, as may also its use by night. In arterial disease when for any reason increased arterial tension is undesirable, chloroform will usually be found preferable to ether, as ether is a direct cardiac and vasomotor stimulant and increases liability to rupture.

Preparations for general anesthesia should include the removal of articles from the mouth, such as artificial teeth, candy or tobacco, etc.; looseness of the clothing about the neck and abdomen; the recumbent position, the head not being raised high. Articles needed in case of emergency are a mouth-gag, a pair of tongue-forceps, a hypodermic needle in working order, solutions of strychnin, atropin, brandy, and digitalis. An electric battery is a desirable article to have at convenient distance.

The loss of heat during anesthesia may be greatly prevented by carefully covering the patient with blankets and surrounding him with hot-water bottles. In prolonged operations the patient should be especially cared for in this manner.

Preparation of the Patient.—From 1 to 4 days preceding narcosis the patient should receive an active cathartic, as the mild mercurous chlorid or compound cathartic pill, in either case followed by a mild saline. He should be encouraged to drink as much water as possible, best accomplished by ordering a glassful at regular intervals during the day. If suffering from prolonged illness, and if hemorrhage or shock is expected, he should receive once daily an infusion of normal saline solution, preferably introduced into the colon through the canalized Wales' bougie. The quantity should consist of about two quarts, and should be given about the middle of the day in the recumbent position, in which the patient should remain until it is retained.

Strict oral hygiene should be insisted upon. The teeth should be put into good condition by a dentist, and the patient should use waxed floss silk regularly after food, and rinse the mouth with a mild antiseptic solution, such as peroxid of hydrogen, one teaspoonful to a wineglass of water, half strength Dobell's solution or a saturated solution of boric acid.

Preliminary preparation in emergency cases must, of course, be adapted to the exigencies of each case. If food has recently been taken, gastric lavage should always be employed, washing until all food-particles have been removed. Patients who are not directly under the observation of the surgeon should be instructed not to take any food for at least 5 hours preceding narcosis, and this food should be of a variety easily digestible. It may be said that failure to observe these principles has frequently caused loss of life.

Thorough examination of the patient should never be omitted. The condition of the heart, arteries, lungs, and the urine need especial attention. The last is particularly important when open inhalers are used and little effort is made to reduce the quantity of the anesthetic to a minimum. That nephritis can be produced or aggravated by the injudicious administration of ether by open inhalers and supersaturation there is no doubt. The same is true as well of pneumonia following etherization.

Hypodermic injections of from 1/8 to 1/4 of a grain of morphin have been given until a short time before anesthesia to steady the heart, prevent vomiting, and aid in bringing about anesthesia, but they are apt to mask the symptoms of dangerous narcosis and hence lead to fatal results. Milk and other foods that digest slowly are not suitable previous to anesthesia. Hot broth or beef-tea 3 or 4 hours before administration of the anesthetic

is the best plan. A nutritive enema may be given weak patients one-half hour before operation.

Enema for preanesthetic administration:

℞.	Yolk of egg,	j
	Beef-tea,	℥ j
	Milk,	℥ j
	Brandy,	℥ j
	Pepsin,	gr. x.

The brandy to be added after the food elements have been peptonized.

Preparation of the Table.—In private houses when a trained nurse is not in attendance, the anesthetist should see that the table is properly prepared for the comfort and safety of the patient. To this end fold a quilt or blanket lengthwise, twice, so that it will be 4 thicknesses; place this on the table; cover it with several thicknesses of newspaper, and over this throw a sheet. The blanket will be longer than the table and the extra length may be folded under at the head for a pillow; this will make the patient's head lie more comfortably than it would on a perfectly level table, and an ordinary pillow is usually too high. If an emaciated patient lies on a hard table during a protracted operation, decubitus may ensue. These pressure ulcerations are very difficult to cure and add to the gravity of the case. If there is a carpet on the floor of the room in which the operation is to take place, old newspapers may be spread on the carpet to protect it from damage. Such a precaution will be appreciated by the family, though they would not think of it unless mentioned.

In curetting and other vaginal operations where much water is used, the clothing sometimes gets saturated. If there is no appliance at hand, such as a rubber pad, to prevent this, it may be avoided in a large measure by placing some blocks of wood under the legs at the head of the table.

Administration of Ether.—If using an inhaler, about 1 or 1 1/2 ounces should be poured upon the gauze, the patient being encouraged to breathe deeply. This is exactly the reverse of chloroform administration. The cone should never be suddenly applied to the patient's face. As the upper air-passages become accustomed to the vapor, the cone should be gradually brought to cover the nose and mouth, excluding as much air as possible. Complete narcosis is generally effected in non-alcoholic patients in about 5 minutes. If ether is administered in this way, the unpleasant symptoms will rarely occur. The same attention to respiration, pulse, pupil, and the color of skin should be given as with chloroform. It should be well understood that ether should not be continuously administered. After the patient is anesthetized, the cone should be removed frequently, permitting him to breathe fresh air; when reapplying the cone a very small quantity of the anesthetic will suffice for further narcosis. It is frequently said that one cannot, with any accuracy, gage the amount of ether necessary for any particular narcosis. In reference to this it may be stated that a narcosis lasting 2 hours can, with a closed inhaler in nonalcoholic cases, be maintained with from 3 to 4 ounces.

Probably the best way to administer ether is by the drop method which consists in giving it drop by drop upon a piece of gauze or an Esmarch inhaler. See Intratracheal Insufflation of Ether.

Ether has been known to take fire 15 feet from a gas-jet; hence great care must be exercised in administering it at night. The container should be of tin, not of glass, and it should be securely corked in the intervals of use. The vapor is nearly twice as heavy as air, and if undisturbed, it will settle to the floor and flow along it for a considerable distance before diffusing into the air. Hence a fire low down, as in a stove, is more dangerous than a gas-jet high up.

Administration of Chloroform.—Vaselin should be applied to that portion of the patient's face immediately covered by the mask. It should be well understood, no matter what style of administration is used, that chloroform vapor should never exceed 4 percent of the air inhaled (Snow). This is best assured by giving the agent gradually, drop by drop, on several layers of gauze, through which air readily moves. Under no circumstance should the mask ever be saturated with chloroform. That so many deaths occur from chloroform is explainable largely by overdosage by this improper method. By dropping the chloroform just as the patient inspires, the quantity required will be greatly reduced. As soon as anesthesia is complete, the mask should be removed, permitting the patient to breathe the air. A little practice will teach one when to reapply the mask. The time to establish a complete chloroform narcosis in adults should never be less than 5 minutes. To anesthetize in less time than this would necessitate concentration of the vapor, with its attendant dangers. During the whole narcosis strict attention should be given to variations in the respiration, pulse, skin, pupil, eyelids, lips, etc. When chloroform is used in a closed room, where there is a light, the vapor is decomposed, chlorin is set free, and some compounds formed which are very irritating to the respiratory tract. A towel saturated with ammonia and hung up, or a little ammonia scattered about, will lessen this difficulty.

Syme administered chloroform in 5000 cases without a single death therefrom. He ascribed this excellent record to his adherence to the following rule: "Never mind the pulse, never mind the heart, leave the pupil to itself, but keep your eyes on the breathing, and if it becomes embarrassed to a grave extent, pull the tongue well out with an artery forceps." The Edinburgh rule is practically this: "Watch the respiration, the heart will take care of itself;" but Professor Stewart suggests that a second one should be inculcated: namely, "Watch both the breathing and the pulse; and if the heart threatens to fail for want of blood, fill it by raising the legs and compressing the abdomen."

Complete anesthesia is indicated by deep, rhythmic respiration, absence of corneal or conjunctival reflex, muscular relaxation, an insensibility of pain. It should be remembered that some patients will be completely anesthetized and the corneal reflex still

persist. It is rarely necessary to push the anesthetic to the production of stertor in order to abolish this reflex. Relaxation of the eyelids during narcosis will usually obviate touching the conjunctiva. If this becomes necessary, gently pulling open the upper eyelid and touching its inner margin with the tip of the finger will answer. In children the corneal reflex is quickly abolished. Here substitution of the palmar reflex suffices, or close attention to the respiration will always indicate complete anesthesia.

Administration of nitrous oxid gas requires a mouth-piece or face-piece which should fit accurately and tightly all the contour of its application. The aim should be to exchange all the air in the air-passages for the gas. Breathing should be slow and deep, about 15 times a minute, and never jerking. Expirations should be complete. The breathing should become stertorous or interrupted, the pulse very feeble, or convulsive twitchings should occur before the face-piece is removed. Lividity of the skin, insensibility of the eyelids, or the state of the pupil, will not show whether the influence of the anesthetic is complete or not. Air may be admitted every fourth or fifth respiration, since the continuance of the gas without air will bring on convulsive movements. Anesthesia by this agent, therefore, is not adapted to operations lasting as long as 5 minutes and requiring steadiness.

Signs of Importance during Anesthesia. Breathing.—While every sign that will give any indication of the patient's condition is important, the character of the breathing is most important of all. The ear, rather than the eye, should be depended on for the assurance that the patient is breathing properly, for the chest may continue to rise and fall regularly and no air enter the lungs. The ear will instantly detect this condition, as the sound of air entering the trachea and the bronchial tubes is unmistakable. Snoring is an assuring sound, but the stertor produced by a partial closure of the glottis is ominous, and the moment it is heard the jaw must be brought more forcibly forward; if it does not cease then, the anesthetic must be discontinued until the condition is corrected. It sometimes happens that the patient will take a long inspiration, like a sigh, due to some manipulation of the surgeon; when this occurs, the inhaler must be removed until the breathing is again natural. It is not necessary nor is it advisable that the anesthetist should concentrate his attention on the breathing or, in fact, on any point; his ear should be so well trained that it will instantly detect the slightest change in the character of the respiration, even while his attention may be directed elsewhere. It not infrequently happens, when the patient is just sinking into unconsciousness, that he will hold his breath; if the pulse is good, this is not alarming, and the inhaler need not be removed; however, if there is any doubt as to the condition, the anesthetic had better be stopped until breathing is normal.

The Pulse.—The anesthetist should keep one finger constantly on the facial or temporal artery; without directing much attention to the pulse, he will thus be warned if any marked change takes place. At the beginning of anesthesia the pulse will often be very rapid, due to the excitement of the patient, but as soon as unconsciousness is complete, it usually becomes much slower.

The Pupils.—The appearance of the pupils furnishes valuable indications of the condition of the patient. On beginning the anesthetic they dilate, then contract until normal or a little smaller, and usually remain contracted during the maintenance of safe anesthesia. If they are dilated and respond to light, it indicates that the anesthesia is not profound; if dilated and do not respond to light, it indicates that the anesthetic has been pushed to a dangerous extent and it must be instantly stopped; the variations of the pupils in different individuals is so great that too much must not be risked on their appearance. Occasionally, the pupils will be as small as pinheads. It is well in such cases to inquire whether the patient may not have been given a dose of morphin a short time before. Again, the pupils will be very much dilated throughout the anesthesia, and this, too, is a disquieting condition. In fact, any variation from the conditions usually witnessed is to be looked on with suspicion and the vigilance of the anesthetist redoubled.

Color of the Face and Lips.—The color of the lips and face should be noticed before beginning the anesthesia, for any marked change in their appearance indicates impending trouble. If the face becomes blue, it shows that the patient is not getting enough air and the inhaler must be removed at once. The color of the face is a valuable indicator in women, but is less useful in men. A patient with bright-red lips or rosy cheeks is not in any immediate danger from the anesthetic.

Treatment of Complications.—As spasm of the muscular system and collection of mucus in the throat of the patient are likely to occur in the early stages of anesthesia, accompanied by irregular, jerky, and abortive respiratory efforts and marked cyanosis, much unnecessary anxiety may be avoided if the surgeon always assures himself that there is nothing loose in the mouth of the patient before administering the anesthetic.

If particles of undigested food should be the cause of obstruction, the forceps or finger will usually dislodge them. If it does not, complete inversion of the patient and slapping the back vigorously will usually suffice. Efforts at vomiting indicate incomplete anesthesia. Gently pushing the anesthesia will abolish this reflex. If vomiting occurs, the patient should be turned completely on the side with head slightly lower than the body. Before continuing the anesthetic the patient's mouth should be thoroughly cleansed. Blood entering the larynx will interfere with respiration. If not prevented, it will cause death by asphyxia. If this occurs during the operation, the patient should be placed in the Trendelenburg position.

It should be a rule during anesthesia to watch both the respiration and the circulation. The color of the face is a valuable guide. Cyanosis, indicating feeble respiration or obstruction of the

respiratory tract, and pallor should lead at once to an investigation of the condition of the circulation. Efforts at vomiting are to be overcome by pushing the anesthesia. If vomiting occurs, the head is to be turned to either side, so that the ejecta may not be inspired. Stertorous breathing indicates profound anesthesia, and it is desirable to keep within this limit. Paralysis of the diaphragm also indicates that the anesthetic has been pushed too far. During normal inspiration the diaphragm descends, pushing down the intestines and distending the abdomen. When anesthesia has been carried too far, the action is reversed, the diaphragm is paralyzed and hangs helpless. With each inspiration it is drawn up into the thorax, and the abdomen retracts. When this occurs, the ether is to be withdrawn until the normal action is restored. This most valuable observation was first pointed out by Hare and Martin. Wide dilatation of the pupil demands immediate withdrawal of the ether.

Should the respiration show evidences of failing, the anesthetic is to be instantly removed, the tongue is to be brought well forward, and the throat is to be cleared of mucus or other obstruction; the head is then to be extended and the fingers hooked behind the angle of the lower jaw, which is to be brought well forward. This raises the epiglottis. This method is an improvement on that proposed by Howard, which consists in bringing the patient's head over the end of the operating table until it swings free, when it is carried backward and downward, until the utmost possible extension of the head and back is obtained. If voluntary respiration does not begin at once, some external stimulus is to be used. One always at hand is that pointed out by Hare, of baring the abdomen of the patient and dashing a quantity of ether upon it. Artificial respiration, preferably by Sylvester's method, about 18 respirations a minute, should be practised. Rhythmic traction of the tongue, Laborde's method, 18 times a minute, will stimulate respiration. Applications of cloths wrung out of very hot water over the region of the heart will stimulate it to increased action. The König-Mass method of rapid compression of the chest, the thumb of one hand being applied over the heart, will stimulate both respiration and the cardiac beat. Direct insufflation of air into the chest by bellows (Fell) or by means of a soft-rubber catheter introduced into the trachea, may sometimes be valuable. The anesthetist takes several deep inspirations, then exhales into the catheter to his entire extent. Introduction of a normal saline solution into a vein, the temperature being 105° F., or if into the rectum, the temperature being 115° F., is of supreme value. Hot coffee introduced into the colon is excellent. Atropin, 1/60 of a grain, and strychnin, 1/50 of a grain subcutaneously, being sure to have dosage large enough, are indicated. Amyl nitrite should never be used—it increases vasomotor depression. Alcoholic stimulants are contraindicated, as they tend to deepen narcosis.

Remote Sequels of Anesthesia.—These are nausea, vomiting, bronchitis, pneumonia, nephritis, and paralysis. Nausea, vomiting, and bronchitis are more frequently the results of improper preparation of the patient and of faulty methods of administration than of the anesthetic itself. If nausea and vomiting persist, 1/2 ounce of hot water or some cold substance, at varying intervals, with or without the addition of 10 drops of lemon-juice, will often abate it. The factors in the production of pneumonia following ether are a predisposition on the part of the patient; supersaturation and inhalation of cold ether by open inhalers; septic inhalers; sudden chilling of the patient. Pneumonia is an exceedingly infrequent sequel of anesthesia. Bronchitis is occasionally seen. Proper administration of the anesthetic and the reduction to the smallest quantity possible to produce perfect anesthesia will reduce the complication of nephritis to a minimum. Paralysis may be central or peripheral in its causation. The latter is most frequent, and is caused, usually, by pressure upon a supplying nerve or by pressure of a crutch or apparatus for maintaining the position of the patient. Central paralysis may be caused by rupture of a vessel in the brain. An improper method of administering the anesthetic is here the cause, as it is in so many other complications during or following narcosis.

Acid intoxication or acetonuria sometimes develops, particularly after chloroform narcosis. It is said to be due to acute fatty degeneration of the liver, as the result of which diacetic acid and acetone are formed. The symptoms consist of vomiting, restlessness, delirium and coma, jaundice, and the odor of acetone on the breath. Sodium bicarbonate should be given internally and normal salt solution should be administered by hypodermoclysis.

ANESTHETICS, LOCAL.—Local anesthesia is indicated in operations in which the field of operation is not extensive, and in which the best procedure cannot be determined upon beforehand. It is of doubtful service for children or for excitable and intractable individuals.

The following is a list of local anesthetics: Alcohol, acetanilid, carbolic acid, carbon bisulphid, carbonic acid snow, chloroform, cocain, compression, creosote, electricity, ether spray, ethyl chlorid, eucain, formanilid, freezing, guaiacol, ice, infiltration-anesthesias, magnesium sulphate, novocain, quinin and urea hydrochlorid, rhigolene spray, salt, Schleich's fluid, stovain, tropocain, essential oils, such as cassia, cinnamon, cloves, sassafras, etc.; but very few of them are of any practical interest to the surgeon.

Methods of Administration. 1. *Subcutaneous Injection.*—When a solution is used hypodermically, it is of the utmost importance that it be properly introduced and placed. The hypodermic syringe should be held almost parallel with the skin, and the point of the syringe introduced into, but not through, the skin. The injections should be into the malpighian layer of the derma, where a network of sensory organs comes into contact with it. Injections into the areolar subcutaneous layer tissue are likely to be followed by rapid absorption and toxic symptoms. Injections into

the malpighian layer will produce rapid, certain, and safe anesthesia. When the first injection is made, a small white wheal will result, somewhat like a mosquito-bite. Successive wheals are made, sufficient to cover the area to be anesthetized.

2. *Local application* of the anesthetic to the mucous membrane, cornea, membrana tympani.

3. *Freezing*, generally by means of ethyl chlorid spray.

4. *Infiltration*, (*q. v.*).

5. *Catalytic.*—A weak constant current medicated with cocain solution, or, better, cocain and adrenalin may be used to anesthetize a small area of skin. See ELECTRICITY, Anesthesia.

6. *Cataphoric Cocainization.* See CATAPHORESIS.

7. *Intraspinal.* See INTRASPINAL ANESTHESIA.

ANEURYSM.—A tumor consisting of a dilated artery or communicating with an artery. In the early stages there is an expansile pulsation of the tumor generally associated with a systolic murmur or bruit. In the later stages the laminated coagulum increases, so that pulsation may be absent, and pressure of the growing aneurysm upon the adjacent organs may give rise to secondary disturbances, as pain, dyspnea, dysphagia, paralysis, or spasm.

Causes.—The chief **predisposing causes** are: (1) *Atheroma*, whereby the coats of the artery are softened and unable to resist an increased expansile pressure of the blood; and (2) *embolism*, which may lead to inflammatory changes and consequent weakening of the arterial walls immediately above the embolus. Thus the conditions which induce atheroma and embolism may also be considered as predisposing causes of aneurysm. Of these, however, syphilis, the abuse of alcohol, continued vascular strain, and ulcerative endocarditis may be especially mentioned. Syphilis is by far the most common cause of aneurysm in women.

The **exciting causes** are such as produce the rupture or yielding of the diseased coats, either by direct mechanic violence, or by increased blood-pressure in the vessel owing to violent and sudden action of the heart and obstruction by muscular contraction of the capillary flow. Hence, blows or strains, mental emotion, and violent and sudden exertion of all kinds may be mentioned as exciting causes.

Process of Formation.—An aneurysm may be formed in several ways: (1) By the simple dilatation of a diseased portion of an artery, due to the yielding of the softened coats to the expansile force of the blood-current. (2) By the giving way of the internal and middle coats at the diseased spot, and the yielding of the external coat to the force of the blood. This is the most frequent way in which an aneurysm is formed—the elastic fibers of the internal coat as the result of the atheroma soften and break down, the middle coat gives way, and the external coat, unable to resist the blood-pressure, is bulged out, forming the sac of the aneurysm. (3) By the giving way of all the coats at the diseased spot and escape of the blood into the tissues, which become condensed around it to form a sac. (4) By the giving way of the external and middle coats, and the protrusion of the internal coat through them (very rare). (5) By the giving way of the internal and part of the middle coats, and extravasation of the blood between the layers of the middle coat.

Structure of an Aneurysm.—An aneurysm consists of a sac and its contents. The *sac* may consist: (1) Of all the coats of the artery (A and B); (2) of the external coat only (C); (3) of condensed tissues external to the artery (F); (4) of the internal coat only (very rare) (D); (5) of the separated layers of the middle coat, between which the blood has been forced, with the external and internal

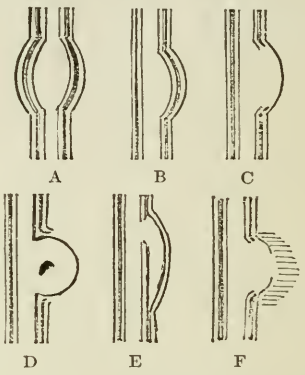


DIAGRAM ILLUSTRATING THE STRUCTURE OF AN ANEURYSM.

coats on either side—dissecting aneurysm—(E). The practical point, however, to be borne in mind is that it is only while the aneurysm is small, and then by dissection alone, that these distinctions can be made.

Classification.—Spontaneous aneurysms may be divided into the fusiform, the sacculated, and the dissecting.

1. **A fusiform aneurysm** is a dilatation of the whole circumference of a portion of an artery. The sac consists of all three coats, and is continuous with the lumen of the artery at each end.

2. **A sacculated aneurysm** is one in which dilatation occurs in part of the circumference of the artery only (B, C, and D). It may consist of all three coats, but more often the internal and middle coats give way, and it is formed of only the external coat, or, after it has existed some time, chiefly of the condensed cellular tissue around. According as all three coats were or were not present, the aneurysm was formerly spoken of as *true* or *false*. As these aneurysms increase in size the sac becomes composed almost entirely of the tissues around. While they are still enclosed by one of the coats of the artery, they are sometimes called *circumscribed*, and after all the coats have given way, *consecutive* or *diffused* (F).

3. **A dissecting aneurysm** is one in which the internal coat of the artery and part of the middle coat have given way and the blood has been forced between the two layers of the middle coat for a variable distance parallel to the course of the artery (E).

Spontaneous recovery may take place: (1) By the gradual deposit of fibrin from the blood in a laminated manner on the walls of the sac, so that

the aneurysm is completely consolidated, and subsequently by condensation and shrinking becomes converted into a small nodular mass of fibrous tissue. (2) By the filling of the sac with ordinary coagulum, the passive clot, as it is called, in contradistinction to the deposit of laminated fibrin (the active clot). (3) By the inflammation and sloughing of the sac and the plugging of the artery above and below with clot, and the subsequent changes described under the spontaneous arrest of hemorrhage.

A fatal termination may be brought about by: (1) Rupture of the sac; (2) inflammation and sloughing of the sac attended by hemorrhage; (3) pressure upon important parts; (4) gangrene due to the obstruction to the circulation in consequence of the large size of the aneurysm, or to the plugging of a large vessel by a portion of detached clot; (5) general constitutional disturbance. Rupture when it occurs into a serous cavity is generally by a rent or fissure; into a mucous canal, by a small, round, ulcerated opening; on to a cutaneous surface, by sloughing of the skin covering the sac. In the first case the rupture is generally rapidly fatal from excessive hemorrhage; in the last two, as a rule, only after repeated hemorrhages, the slough having at first a tendency to cause the coagulation of the blood and block the opening.

Pressure Effects.—The pressure of the sac of an aneurysm may cause: (1) Inflammation and condensation of the parts around, which thus become blended with the sac; (2) diminution or obliteration of the lumen of a large vein; and hence (3) edema and dilatation of the superficial veins; (4) irritation or interruption of the conducting power of nerves, giving rise to pain, spasm, or paralysis; (5) erosion of the bones and cartilages; (6) obstruction of the esophagus, trachea, or thoracic duct.

Effects on the Circulation.—Hypertrophy of the left ventricle of the heart; obstruction of vessels and enlargement of the anastomotic channels; syncope and gangrene.

Symptoms.—The attention is usually first drawn to the disease by pain, swelling, and a feeling of muscular weakness, or by stiffness in a joint. On examination, a tumor is discovered in the course of the main artery. It pulsates, and the pulsation is *expansile*—that is, on placing the hand upon the aneurysm it is felt at each systole of the heart to enlarge in every direction, or if the hands are placed on either side of the tumor, they are seen to be slightly separated at each pulsation. If the artery on the cardiac side of the tumor can be compressed, the pulsation of the tumor is felt to cease, and the tumor itself to become perceptibly smaller and less tense. On cessation of the pressure, however, it quickly fills again in two or three forcible pulsations, and resumes its former characters. On raising the limb, the pulsation is less forcible; on lowering the limb, more forcible, the tumor at the same time becoming more tense. The pulse below the tumor is smaller on the affected than on the sound side, and a sphygmographic tracing, if taken, shows the pulse to be delayed on the diseased side and diminished in force, the tracing being less abrupt in its rise and more rounded. On listening with the stethoscope, a bruit is heard in most cases. In consequence of pressure on the vein corresponding to the artery, there is often edema of the part below, and sometimes varicosity of the superficial veins.

In **internal aneurysms** no tumor may be felt; the signs are then often obscure, and the diagnosis will depend upon the effects the aneurysm produces by pressing upon important parts.

The signs of an aneurysm undergoing spontaneous cure are usually obvious. The tumor decreases in size, and the pulsation in it gradually decreases and finally ceases. At times a rapid cure may ensue; the pulsation then ceases suddenly and the tumor is felt to be hard, the patient often complaining of great pain at the moment of consolidation.

The signs of a leaking aneurysm—*i. e.*, an aneurysm in which blood is beginning to be slowly effused into the tissues—are as follows: The pulsation is less distinct, the outline of the tumor less circumscribed, the growth progressive, and the pressure signs more urgent.

The Signs of Sudden Rupture of an Aneurysm.—(1) If the rupture is into a serous cavity, the signs are those of internal hemorrhage, rapidly followed by death. (2) If into a mucous canal, there will be sudden hemoptysis in the case of the trachea or bronchus, hematemesis in the case of the esophagus or stomach, melena, if the patient lives long enough, in the case of the intestines. (3) If the blood is effused into the tissues, there will be pain, faintness, loss of pulsation and bruit, rapid increase in the size of the swelling, edema, coldness, and cessation of the pulse in the parts below, followed by increasing syncope from the loss of blood, or, if death does not soon occur, by gangrene. (4) Rupture externally is very rare; the signs are evident.

Diagnosis.—An aneurysm may have to be differentiated from simple dilatation of an artery, an abscess or a tumor over an artery, a pulsatile tumor of bone, and enlargement of the thyroid gland. In a simple dilatation there is an absence of bruit. In an abscess or tumor over an artery the pulsation is not expansile, there is no bruit, and the swelling is not emptied or made less tense on compressing the artery above. A tumor may often be lifted from the vessel. In the case of an abscess, there will probably be a history or signs of previous inflammation. In a tumor raising an artery over it the pulsation is only felt in the course of the artery, and there is no expansile pulsation in the swelling. In pulsatile tumor of bone the pulsation is not equally expansile; and although pulsation ceases on compressing the artery above, the swelling does not become smaller, like an aneurysm, or refill on removal of the pressure in two or three beats of the heart. Portions of expanded bone may also be felt in parts of the tumor, and there may be glandular enlargement and other signs of malignancy. A carotid aneurysm may be distinguished from an enlarged thyroid gland by the gland moving with the larynx in deglutition.

Treatment.—In no disease, perhaps, has an

accurate knowledge of its pathology done more to insure success in treatment than in aneurysm.

Medical Treatment.—Both internal and external aneurysms have been cured by medical treatment alone. Indeed, in some forms of internal aneurysm it is the only means at our command. In external aneurysms, however, local treatment in addition is nearly always expedient or necessary. Absolute rest, both bodily and mental, should be enjoined; the patient must lie in bed, and not move for any purpose whatever, not even to feed himself. The diet should be limited in quantity, unstimulating but nutritious in quality, and the fluid portion restricted as much as possible. The following diet scale is advised by Tufnell: Bread and butter, 4 ounces; meat, 3 ounces; potatoes, 3 ounces; fluid, 8 ounces in the 24 hours. Small repeated bleedings, when there is excessive action of the heart, or the patient is plethoric, may occasionally be useful. Medicines seem to have little efficacy, but iodid of potassium in large doses, acetate of lead, aconite, and digitalis have been recommended, either for promoting the coagulation of the blood or retarding the heart's action. When there is a history of syphilis, iodid of potassium should certainly be given.

Surgical Treatment.—In all suitable cases of external aneurysm, pressure, where it can be applied between the aneurysm and the heart, should first be tried, aided under certain circumstances by the method of flexion. These measures failing, or appearing unsuitable, the artery should be tied, if practicable, on the proximal side, and preferably at some distance from the sac, where the artery is more likely to be healthy. When pressure or ligature cannot be used on the proximal side, as, for instance, in aneurysms at the root of the neck, it becomes a question whether distal pressure or ligature, scratching the wall with needles (*Macewen's method*), manipulation, galvanopuncture, coagulating injections, or the introduction of wire or horsehair should be tried, or whether recourse should be had to medical means alone. In some varieties of traumatic aneurysm when the artery is presumably healthy, and in certain forms of aneurysm, as gluteal, when a ligature of the artery at a distance from the sac is attended with great risk, it may even be expedient to resort to the old method of opening the sac, turning out the clot, and securing both ends of the bleeding vessel by ligature. Each of these methods requires discussion. Before resorting to surgical methods, however, the circulation through the aneurysm should have been previously quieted as much as possible by rest, recumbency, restriction of the diet, and regulation of the secretions. Where the aneurysm is on an artery of the lower extremity, any embarrassment of the venous circulation and consequent edema that may be present should be lessened or removed by elevating and lightly bandaging the limb.

Compression.—It is applied upon some part of the affected artery between the aneurysm and the heart, and in such a way as to retard the circulation and so cause deposits of laminated fibrin. Carte's circular tourniquet is used for the purpose; also Gibbon's modification of Charrière's compressor, or Hoey's clamp. In some cases a five-pound bag of shot or an ordinary four-pound weight may be placed over the artery, with a pad intervening, or "*digital compression*" may be used; kept up by relays of assistants, the patient, if necessary, being kept under the influence of chloroform or morphin.

The advantages of compression are that it can be discontinued at once, if need be; secondary hemorrhage, the frequent accident of the ligature, is obviated; and even if it fails, the knife may still be resorted to. Compression is contraindicated when the integuments are inflamed or the limbs much swollen, from venous obstruction, and also in cases which are very rapidly increasing. The pressure should not be severe enough to cause great pain, and if there is room, it should be applied at two or three points in the course of the artery, and not carried to the point of completely closing the vessel. If very restless, the patient may be gently chloroformed, or kept quiet by morphin for 2 or 3 hours at a time.

Ligature.—When compression is inapplicable or unavailing, the artery must be secured between the aneurysm and the heart by:

1. *The Hunterian Method.*—The point of election must be neither too near the aneurysm, so as to tie a portion of the vessel that is diseased, nor too far from it, lest the circulation through it be kept up too freely by means of collateral branches. The direction and extent of the incision obviously depend on the situation of the artery to be operated on. A healthy portion of the artery is selected; great care is taken in exposing the vessel to disturb the sheath as little as possible; two ligatures are used; they are drawn sufficiently tight to gently approximate the inner tunic; the stay knot is tied and the end cut short.

2. *Anel's operation* consists of applying a ligature to the affected artery close above the aneurysm. The objections to this method are that the operation is performed on a part of the vessel that is already diseased, and that the proximity of the wound to the aneurysm is liable to excite inflammation in and around the sac.

3. *Brasdor's distal ligature* is applied to the diseased artery beyond the aneurysm, on the distal side. It is resorted to in aneurysm of the carotid, innominate, or subclavian artery, when the ligature cannot be employed between the aneurysm and the heart.

4. *Wardrop's operation* consists in tying one or more twigs branching off beyond the aneurysm. It is a modification of Brasdor's operation.

In separating the artery from its accompanying veins, the greatest care must be taken not to inflict injury upon the vessels.

The double ligature above and below the sac, either (1) by the old method of first laying the sac open and then securing the bleeding ends of the artery, or (2) by the method of Antyllus, of first securing the artery and then laying the sac open, is only employed in exceptional cases. Thus the *old method* is sometimes resorted to in traumatic aneurysm of the axillary artery in preference to

tying the subclavian, and also in gluteal aneurysm, where the Hunterian method of tying the common or internal iliac is attended with so much risk. The great danger is the possibility of the patient dying of hemorrhage under the operation. During the operation, therefore, in the case of the axillary artery, pressure should be made on the subclavian, an incision through the skin and fascia above the clavicle being made to insure its better control. In the case of the gluteal, Davy's lever or the abdominal tourniquet should be used. The true *method of Antyllus* may, in rare instances, be required, as in some forms of aneurysm at the bend of the elbow.

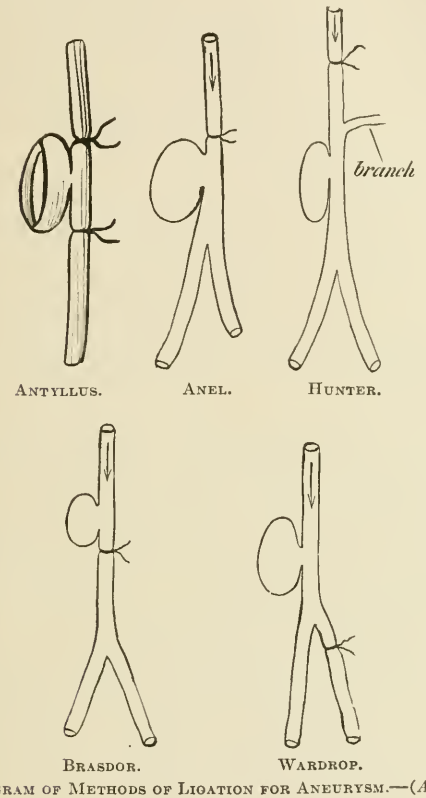


Diagram of Methods of Ligation for Aneurysm.—(*After Moullin.*)

Manipulation.—A spontaneous cure is sometimes brought about by the impaction of a portion of clot either in the mouth of the sac or in the artery below. Manipulation of the sac aims at breaking up and displacing any clot that may have formed, in the hope that a portion may become impacted in this way, and so lead to consolidation. Sir William Fergusson, who first introduced this method, used it with success, and others have done so likewise. It is far from being unattended with danger, however, since a portion of the clot may be carried away by the blood-stream and become lodged in a vessel leading to an important organ, as the brain. It should, therefore, only be tried when other means are impracticable or appear attended with even greater risk.

Irritation of the Interior of the Sac by Needles (*Macewen's Method*).—This method aims at so irritating the walls of the aneurysm as to induce slight inflammation and the formation of white thrombus. The skin having been made aseptic, long needles are passed into the sac and the walls systematically scratched all around the aneurysm. It is applicable to aneurysms where pressure or proximal ligature cannot be employed. Consolidation occurs very slowly.

Galvanopuncture, electrolysis, injections of perchlorid of iron, tannin, and the like, and the **introduction of foreign bodies, as horsehair or iron wire,** which have all for their object the coagulation of the blood in the sac, are highly dangerous procedures, and have not hitherto been attended with much success, although some favorable cases have been reported.

Extirpation.—Favorable as are the results from the Antyllus operation, they do not equal those obtained from the total extirpation of the sac, an operation to which attention has recently been directed by Scriba, Delbet, Trelat, and Kubler. Practised by Philagrius of Macedon in the fourth century, it was forgotten until the end of the seventeenth, when it was resorted to with success in a brachial aneurysm by Purmann. It is generally designated as the operation of Purmann. A method might certainly be called ideal which in 40 cases was followed by but one death, and after which gangrene and secondary hemorrhage were not at all observed. The one death resulted from acute anemia several hours after an operation made by Socin for aneurysm of the scalp. In 24 of the cases large arterial trunks like the axillary, brachial, femoral, and popliteal were involved. Ransohoff was able to find 4 more cases of popliteal aneurysm similarly treated, thus making 28 extirpations of major aneurysms of the extremities without a death.

Of the 46 cases, including those of Kubler, the 4 just referred to, and the cases previously reported, 31 were traumatic and 15 spontaneous. Twelve were arteriovenous, the remainder arterial. The presence of a sac in recent traumatic aneurysms has been questioned. Nevertheless, Trendelenburg found one in an injured femoral artery as early as the sixth day. While in such cases of recent traumatic aneurysm the mere incision and double ligation may answer, it certainly seems better surgery to insure that retraction of the arterial stumps into the sheath above and below that is so essential to safe occlusion of their lumens. This applies particularly to the distal end from which secondary hemorrhage, if it occurs at all, is more likely to ensue.

The disadvantages of total extirpation are the difficulty of its execution and the danger of wounding important parts to which the sac has formed adhesions. The first of these is not greater than that which attends the removal of tumors of the same size with adhesions. Under the artificial ischemia obtained by the rubber tourniquet, a careful dissection of the sac-wall is made through an ample incision. The smaller vessels are ligated as encountered, before they are divided. The

afferent and efferent vessels are sought, ligated, and divided above and below the sac. To accomplish this it may be necessary to divide the sac in its long axis. It is in the dissection of the deeper portion of the sac that the attending vein may be injured. The danger from this accident has certainly been overrated. From the table of Kubler it appears that the femoral vein was injured in 3 cases, the popliteal in 5, the axillary in 1, and the brachial in 3. In all but one of these the vein was ligated or resected, but gangrene did not ensue. The supposed disadvantage of ligating an unhealthy part of the vessel has already been seen to be largely assumption. Fifteen of the cases were spontaneous aneurysms.

Aneurysmorrhaphy.—This procedure, which was introduced by Matas in 1889, has gained constantly in favor since 1902, when he first described it in print. It consists in incising the sac and obliterating, by means of chromicized catgut sutures, all the arterial orifices opening into it. According to this method, "no attempt is made to reconstruct the parent artery." In treating sacculated aneurysms, however, in which there is only a single opening between the sac and the artery the opening is closed without encroaching upon the lumen of the artery, after which the incision into the sac is sutured and the sac folded upon itself by rows of sutures passed through its walls. This procedure is known as *endo-aneurysmorrhaphy with partial arteriorrhaphy.* Another procedure applicable to fusiform aneurysms having two arterial orifices situated close together on the floor of the sac is called *endo-aneurysmorrhaphy with complete arteriorrhaphy.* A new channel is made out of the walls of the sac by holding them over a rubber tube or catheter and sewing them together in such a manner as to restore the continuity of the artery lost in the sac, the tube being taken out just before the last sutures are tied. Matas states that preservation of the lumen of the parent artery is "only indicated positively in the sacciform aneurysms with a single opening where the parent artery exists as a formed vessel and in which the closure of the fistulous opening can be accomplished with the greatest ease." There is no doubt that this operation constitutes a decided advance in the surgery of aneurysm. Many surgeons are now employing it in cases in which they would have formerly practised extirpation, and are of the opinion that it is equally satisfactory and much safer.

In 1908 Matas collected 85 cases of aneurysm of various arteries operated upon by the methods above described. Out of this number there were 78 recoveries, 4 cases of gangrene, 2 cases of secondary hemorrhage, and 4 relapses. The relapses all occurred in cases in which reconstructive methods had been employed.

For **special aneurysms** see AORTA, etc.

ANGINA.—See LARYNGITIS, LUDWIG'S ANGINA, PHARYNGITIS, VINCENT'S ANGINA.

ANGINA PECTORIS (Stenocardia). Description.—The symptom-complex to which the term angina pectoris is given is seen in persons the subject of arteriocardiac disease, and those in whom no evidence of the presence of this disease can be found. The former is termed *true*, or *angina pectoris vera;* the latter, *false*, or *pseudoangina, angina pectoris notha* of Forbes.

Pain in the region of the heart, and an extreme sensation of anguish or of immediate dissolution are the subjective symptoms, and fixation of the body, pallor, with an expression of anguish or terror, cold extremities, a profuse sweat, slowness of the pulse, and enfeeblement, perhaps irregularity of the heart's action, are the congeries of objective symptoms that make up the complexus known as an attack. In some instances at the time of the attack the patients faint (*syncope anginosa*), or fainting attacks may occur in a patient with myocarditis and alternate irregularly with attacks of angina. In others, an attack of vertigo is followed by deep coma (apoplectoid) with or without convulsions, with slowness of the pulse, the **Adams-Stokes syndrome** (*q. v.*). Such attacks may precede or, as in the foregoing class, alternate with true angina.

Again, attacks may be characterized by the anguish and all the objective symptoms of angina, but without pain—*angina sine dolore.* The painless angina is more likely to occur if the heart is dilated. A patient may have had frequent attacks of painful angina. As the bodily strength fails, the heart dilates and mitral incompetency arises. Such leakage at the orifice relieves intracardiac pressure and seems to prevent the occurrence of pain.

It is to be remembered that in both forms of angina, true and false, the same symptoms obtain. In the latter form cardiovascular changes are not necessarily present. In true angina, myocarditis and arterial sclerosis are present and, perhaps, causal. Patients who have some advanced arterial disease may have attacks of pseudoangina. Both forms will be considered in the various subsections in order to emphasize their difference.

Etiology.—We have been speaking of attacks of angina, but a consideration of the attacks cannot be separated, in estimating the diagnosis, prognosis, and treatment, from the condition of the patient. Angina, true or false, is not a disease, but a symptom. It is an incident in the course of disease. True angina pectoris is an incident in the course of arteriocapillary fibrosis with myocarditis. Its etiology is bound up with that of arteriosclerosis. Not all subjects of vascular change are liable to attacks of angina, however. Added to the organic basis, two things appear to obtain—a fairly strong heart-muscle, a mobile vasomotor nervous system that responds to exciting causes by spasm of peripheral vessels, increased arterial tension, and, as a sequence, increased intraventricular pressure. For this reason he whose walk is on lower planes, whose sympathies are dulled, whose fires burn low, and in whom, with general nutritive failure, the cardiac muscle is weakened, is not subject to angina, although the victim of the most extreme vascular atheroma.

True angina pectoris occurs in subjects who have passed the meridian. They belong to the upper walks of life, and have been high livers and

perhaps drinkers, and have engaged in an occupation requiring mental strain and anxiety, perhaps emotional also. Professional men, bankers, and brokers are the most common subjects. Hence it is most common in *men.* Those who have had gout or syphilis are victims of arteriosclerosis, and in this wise can be traced a causal relation to angina.

All those infectious diseases that cause valvulitis and endarteritis are considered antecedent conditions in the subjects of angina pectoris. Finally, the liability to attacks of angina appears to occur in members of the same family or in successive generations.

False angina pectoris, on the other hand, is more likely to occur in *women,* early in life or about the menopause, and to be associated with poor nutrition in consequence of long and continued indigestion or the habit of taking small amounts of food. In a neuropathic type of constitution there is found, therefore, alternating with the attacks of pseudoangina or occurring in another decade of the patient's life, various neurotic phenomena. Such attacks are prone to take place in a neurasthenic subject. The reflex forms of pseudoangina have for their origin some disturbance of the functions of the various organs. The gastrointestinal form, for instance, is often seen after attacks of indigestion. The same form of angina is seen in toxic conditions, particularly in a toxemia associated with the excessive use of tea, coffee, or tobacco. With the anginal pain, palpitation, irregularity, and rapid heart-action are observed. The toxic forms of pseudoangina are usually associated with spasm of the peripheral vessels. When tobacco is the cause, the disturbance of the special senses, vertigo, the loss of reflexes, paresthesia, and cerebral confusion due to nicotin poisoning are present. In such subjects palpitation, irregularity, intermittency tachycardia or bradycardia, and attacks of syncope also occur. To arrive at a distinction between the two forms of angina it is necessary to bear in mind the wide divergence of etiologic factors in each instance.

Symptoms.—The antecedent symptoms and physical signs of cardiovascular disease need not be described. The patient with such disease, after 50, with any of the foregoing causes operative, may for some time have slight attacks of cardiac pain, each increasing in severity and gradually having added to it, one at a time, the symptoms of true angina pectoris. These pains will be observed to take place after exertion, after excitement, or after undue mental and physical effort combined, as detailed by a patient whenever he wrote an important business letter. He could dictate the letter without cardiac pain, but the combined act of composition and execution gave rise to anginal attacks. Sooner or later—perhaps after the end of a year, during which the patient may have had some forms of cardiac asthma or marked arrhythmia—attacks in their severest form take place. In other subjects the attacks of angina are preceded by the symptoms of failure in compensation, which, with careful rest and perhaps the use of digitalis, is gradually overcome. Dropsy may have been present to a considerable degree, and the phenomena of dilatation marked. With gradual restoration to health the heart-muscle regains its tone, the peripheral vessels continue mobile and contract, readily giving high arterial tension. After having run the gauntlet of dilatation, the severe attacks of angina begin. In a third group of cases the first attack may be the lethal attack, or the first may be very severe, followed by mild attacks until cardiac dilatation, with its subsequent train of symptoms, arises. Again, after a period of attacks at long intervals, they may without cause become more frequent and perhaps be the cause of death.

The pain is located in the region of the precordia. It is sometimes very severe in the epigastric region, and it is difficult to disabuse the patient's mind of the belief that the attack is one of indigestion. In other instances the pain is marked in the arms and not very pronounced in the thorax. In a large proportion of cases the pain radiates from the heart around to the axillary region, or extends upward to the shoulder and down the left arm. With the extreme pain there is paresthesia. The fingers and hands are particularly the seat of numbness and tingling. In one case the patient, a physician, in addition to precordial pain, complained of extreme pain in the jaws following the course of the vessels. He believed the pain was due to the fact that these vessels were overdistended and could not go beyond a certain limit because of confinement in the bony space. With the onset of severe pain and the great sensation of anguish, vomiting may occur. This symptom continues until the stomach is emptied of food, or it may disappear spontaneously. Immobility of the body is an important symptom. The position assumed depends upon the whereabouts of the patient at the time, or his habits. Some patients experience attacks whenever they exert themselves in walking, securing relief by resting on the nearest door-step or bench in the public square. Others support themselves at the nearest lamp-post or tree-box, or by the side of a house. The recumbent posture is assumed by some. Rarely does relief seem to occur while the patient is moving about, although the case of Mr. Charles Sumner was a notable exception. Coldness of the hands and feet, pallor, and a countenance of anguish are nearly always observed. Sometimes patients are very much perturbed, and at other times—notwithstanding their very great peril—they are cool and collected. Respiration is sometimes held in abeyance by the patient during the passing of the pain, or repeated full inspirations are taken, followed as the paroxysm reaches its height by a prolonged, often sighing expiration. In a larger number of instances the pulse-rate is slow. It is often irregular and intermittent. In angina sine dolore, with the hurried respirations, the pulse usually increases in frequency, and as the disease advances, becomes irregular and feeble. Usually the attack is not followed by any marked or critical discharge of urine, although sometimes a severe attack may be followed by involuntary discharge of urine and

feces. The temperature remains normal, or may be subnormal. The mind is usually clear; there is no delirium.

In pseudoangina pectoris the patient is usually the subject of neurasthenia, or the possessor of one or more of the hysteric stigmata. Certainly a neuropathic history may be elicited, or a history of some primary irritation elsewhere, or of some form of toxemia. The pain very closely resembles, and indeed cannot usually be distinguished from, the pain of the true form. The pulse, however, is more likely to be rapid. The respirations are increased, but are of a type of respiratory neurosis not associated with congestion or other signs of cardiac failure. Moreover, we find in such cases the various train of symptoms or phenomena that attend toxic conditions.

It is this form of angina pectoris in which vasomotor symptoms are most prominent, and to which the term angina vasomotoria was given by Nothnagel.

Prognosis.—True angina is a very grave affection. If the first attack is not lethal, no one can predict when another may take place. Recurrent attacks in a patient with high arterial tension and a hypertrophied heart are most serious. If the patient has also aortic regurgitation—the most common form of valvulitis in angina—the likelihood of sudden death is very great. Prognosis must depend entirely upon the extent of the cardiovascular disease; upon the character and severity of the attacks, and the frequency of their occurrence. The onset of dilatation and the occurrence, on account thereof, of mitral incompetency, as pointed out by Musser, is a favorable process, and lessens the liability to attacks.

Diagnosis.—True angina must be distinguished from pseudoangina and from cardiac pain due to pericarditis as well as that due apparently to neuralgia. Age, the occupation, the habits, and the hereditary predisposition count strongly for or against true angina. The presence of organic disease and the character of the attacks are most important diagnostic features of true angina. Patients with this form live but a short time, whereas pseudoangina never causes death, and death takes place from other causes much later in life.

Angina must be distinguished from pain in the breast caused by inframammary neuralgia, from pleurisy and neuritis, and also from that common cause of pain in the region of the precordia, gastric distention from flatulency, and flatulent distention of the colon. A consideration of the diagnosis of the various causes is not necessary in this connection.

Pseudoangina pectoris is distinguished from true angina pectoris chiefly on account of the etiologic differences. The phenomena of the attacks are much the same, save that fixation is not marked, and there is not the same anguish that we see in true angina.

Treatment of the Attack.—The physician is first called upon to treat an attack of angina pectoris. Often there is not enough time to weigh the data upon which a distinction between true and false angina is made. If cardiac pain occurs in a male subject past 50, it is fair to presume it is an attack of true angina, and proceed at once to administer complete relief.

Morphin.—The first step is to give at once a hypodermic injection of 1/4 of a grain of morphin sulphate, preferably with atropin. The possible presence of nephritis is not a contraindication. The dose may be repeated in half an hour. The heart's action should by this time have been ascertained. If it is attended by frequent incomplete systoles, alternating with full ones, it is well to give nitroglycerin hypodermically also, or to begin at once its administration by the mouth. Notwithstanding relief to pain may be secured, the patient should be kept under the influence of morphin for at least 24 hours by administering the drug every 4 or 6 hours. If the attack is one of angina sine dolore, there is much more reason why the morphin should be continued, for in the cardiac dilatation that attends this condition the drug exerts an undoubted tonic influence. Moreover, the dose of morphin to relieve pain must be large, for, as Yeo points out, anginal patients bear the drug very well. Sometimes we hesitate to give morphin because of its secondary effects or the idiosyncrasy of the patient. In the instance of angina, neither need be weighed.

Amyl Nitrite.—If the patient has had a previous attack, he is usually supplied with sealed glass bulbs containing this drug. Its immediate use is essential. Sometimes it fails to give relief. Four or 5 minims may be inhaled from a handkerchief every 10 minutes. To some, the cerebral effect is almost as distressing as the heart-pain. Patients at times decline to use it.

Erythrol tetranitrate is said to be especially useful in preventing anginal pain. Its action is slower and more lasting than that of amyl nitrite or nitroglycerin, beginning in 15 minutes and persisting for three or four hours. The dose is from 1/2 to 1 grain by the mouth in chocolate-coated tablets.

Chloroform.—The inhalation of 10 to 20 drops of chloroform generally gives sufficiently prompt relief. It is not attended by unpleasant symptoms, and is free from danger if used cautiously. The patient may be supplied with small bottles containing the proper dosage (1 to 2 teaspoonfuls), which he may inhale through a sponge. As soon as he is under the influence of the drug, the bottle will fall from the hand.

While these measures are used, other less positive means may be employed to prevent a recurrence or combat the effects of the present attack. As flatulence is possibly the most common exciting cause, it must be relieved. The remedies employed for its relief have the advantage of counteracting the shock, or, if the heart is weak, of stimulating that organ. Aromatic spirits of ammonia, Hoffmann's anodyne, small doses of whisky or brandy in hot water, or crême de menthe cordial may be given every 15 minutes or half hour. Counterirritation with mustard plasters relieves pain and flatulence, and should be applied over the precordia and epigastrium.

The treatment of an attack of pseudoangina

pectoris varies with the nature of the primary ailment. If the pain is extreme, morphin may be used in any form save that which is apparently of gouty origin. The hysteric form should be given Hoffmann's anodyne, valerian, the bromids, or asafetida. In the toxic forms sedative remedies, as morphin and bromid, and the cardiac stimulants, as Hoffmann's anodyne, aromatic spirit of ammonia, minute doses of digitalis and strychnin are indicated. In those forms which are reflex from gastrointestinal disorder, drugs that control fermentation and acidity are to be given at once. Preparations of sodium and ammonia, spirit of chloroform, carbolic acid, creosote, charcoal, and other remedies that allay flatulence are of service. In this class of cases small doses of calomel, as gastric sedative and antiseptic, are of the greatest service.

In all forms of pseudoangina. external applications may be used, as in true angina, and probably greater relief will result. Nitrite of amyl and nitroglycerin may be used, as in true angina, but unless the heart is weak or is the seat of mural change, the remedies are not by any means effectual.

The gouty form of pseudoangina should be treated by the immediate administration of a blue pill with euonymin or podophyllin, and frequently repeated doses of colchicum.

Treatment of the Subject of Angina.—The management of an attack of angina has just been considered. After relief has been secured from the attack, it is necessary to prevent future attacks or to modify them by treatment of the patient. Just as true angina is associated with more or less diversified constitutions and pseudoangina with marked individual conditions, so the management and the treatment differ entirely. It has been well said, with regard to the former, that every aspect of the patient's life must be inquired into and regulated. Treatment, therefore, is largely hygienic and dietetic, and includes a consideration of exercise, diet, occupation, and habits of the individual. In general it may be said that the patient should take a moderate amount of out-door exercise, the extent being controlled by the degree of mural change in the heart and the amount of dilatation that has taken place. In a few cases the resistance exercises in the Swedish movement cure are of very great benefit. In others, in addition, the Nauheim baths are valuable aids. In another class of cases carefully graduated exercise with hill-climbing, in accordance with the methods of some of our German confrères, equalizes the circulation and lessens the tendency to high arterial tension. Tonic baths are to be employed, excluding those that induce shock, particularly if the patient is the subject of aortic regurgitation. Cold sponge-baths or cold douches applied over the neck and spine while the feet are submerged in hot water are usually sufficient. The diet must be variously modified, depending upon the form of indigestion present. Foods that are liable to cause flatulency are to be interdicted. Generally, the patient is aware of the class of food that disagrees with him, although often it may be said it is not the class of food so much as the manner of its preparation that causes indigestion and flatulence. Fried and greasy articles of food, the so-called made dishes, rich sauces, and nuts and cheese should usually be forbidden. In many, liquids at meals cause flatulence, so that it is necessary to discontinue the use of fluids, or limit them to a small amount at meals. Patients should be instructed to take fluids between meals, and abundantly. If the patient is gouty or rheumatic, alkaline or alkaline-sulphur waters, not containing salts of sodium, should be taken freely. Under no circumstances, however, should the waters be aerated. For the same reason the amount of food should be limited so that the stomach is not overloaded, and if the patient is a large eater, the food should be taken more frequently: as, for instance, 4 times in the waking hours.

The patient should be instructed not to expose himself to cold and not to have the extremities chilled. He should not walk against winds, and unless cardiac nutrition is good, should be judicious in climbing stairs or hills. It is quite necessary that exertion should not be made after the taking of a full meal. Patients should sleep in a well-ventilated room, and yet be well provided with covers so that they are not chilled during the night.

The drugs that are of use in true angina vary with the state of arterial tension and the condition of the heart-walls. If there is high arterial tension, it is well to give nitroglycerin. One drop of a 1 percent solution, or a pill of 1/100 of a grain, should be taken every 4 hours. The dose should be increased until a physiologic effect is experienced. It may then be continued at this dose, but at the end of a week or ten days should again be increased. The effect of the drug wears off remarkably soon, so that it may be necessary after a time to give as much as 15 drops of a 1 percent solution 3 or 4 times daily. In aortic disease with high arterial tension iodid of potassium is often of very great advantage. It should be given in doses of 10 grains 3 or 4 times daily. The nitrites are also valuable remedies, as the nitrite of sodium in doses of from 2 to 5 grains 3 times a day. If the patient is gouty, it is quite necessary to manage the case on lines that are employed in this condition. The action of the bowels and the kidneys, and also the skin, must be carefully attended to, and from time to time colchicum and iodid of potassium given. In cases of weak heart in which there seems to be fatty change, arsenic in small doses is recommended by Balfour. In such cases strychnin may be employed. If there is marked anemia, preparations of iron may be used, and it must be borne in mind, as pointed out by Weir Mitchell, that large doses of the tincture of chlorid of iron reduce high arterial tension. Thirty to 40 minims may be given 3 or 4 times daily. Great care should be taken to see that the bowels are kept open, and that salines, particularly salts of magnesium, are administered from time to time, and if the patient is gouty, such remedies as apparently influence hepatic functions, as preparations of mercury or podophyllin, must be given every 2 or 3 weeks.

As flatulency so frequently precedes an attack, or at least gastric disorder with flatulence, all patients with angina pectoris should see to it that they are supplied with remedies that allay this condition. It must be remembered that flatulence often occurs 3 or 4 hours after meals, or about the time the food is passing from the stomach into the duodenum. It is well to give a drug about this time to anticipate the excessive distention. A prescription containing carbolic acid, spirit of chloroform, aromatic spirit of ammonia, bicarbonate of soda-mint water, if given in proper proportions 3 or 4 hours after a meal, is generally very satisfactory. Three grains of sulphocarbolate of sodium may produce a happy effect. A pill of creosote and charcoal is also of great advantage. Frequently flatulence occurs before meals or immediately after meals, when its degree can be controlled by the use of powder or cachet containing bismuth, bicarbonate of sodium, aromatic powder with or without rhubarb, depending upon the degree of constipation. Of course, small amounts of whisky in a hot grog are of advantage in elderly persons who are wakeful on account of flatulence. Hoffmann's anodyne, spirit of camphor, soda-mint, and small doses of bichlorid of mercury are remedies that may be employed.

The Treatment of False Angina Pectoris.—Here, again, the management selected for the individual case must be that which materially controls the causal condition. To outline that treatment would be to discourse upon the treatment of neurasthenia or of hysteria, of the various intoxications, as of gout, rheumatism, tobacco, tea, and coffee. It would be necessary to direct how to manage all cases of indigestion or other reflex causes of anginal pain. These various methods of management need not be entered into. In general it may be said that in all forms hydrotherapeutic measures are probably of the greatest service. These measures must be modified according to the individual conditions. Change of air and scene is sometimes necessary.

The drugs to be prescribed are most frequently the sedatives, as preparations of valerian and of the bromids. The famous compound pill of sumbul and the pill of the three valerianates is often satisfactory, although any attempt at curing the condition by drugs alone is dangerous, as the actual causal condition is too often overlooked, or we are temporarily led into a sense of false security.

ANGIOKERATOMA.—Lymphangiectasis; telangiectatic warts; a very rare disease of the extremities, characterized by warty-looking growths that develop on dilated vessels in persons with chilblain, etc. Dark spots the size of pins' points or pins' heads, evidently vascular, develop as an attack of chilblain is subsiding. The disease is peculiar to childhood, and especially occurs in females.

ANGIOLEUCITIS (Lymphangitis). — See Lymphatics (Diseases).

ANGIOMA.—A tumor formed of blood-vessels; called also erectile or vascular tumor. See Tumors, Nevus.

ANGIONEUROSIS.—A vasomotor ataxia due to deranged vasomotor system. It may manifest itself as a (1) hyperemia-dilatation of the cutaneous vessels due to angio-paralysis, or (2) as anemia-contraction of the peripheral vessels due to angio-spasm, or (3) as a combination of both. Closely allied to these functional disorders are migraine, urticaria, and circumscribed edema, exophthalmic goiter, Raynaud's disease. Factors in their etiology are heredity (a family history of disordered metabolism, gouty or rheumatic diathesis or nervous disorders), toxemia, emotions, fatigue, and, as Cohen suggests they may result from disturbed thyroid secretion. Besides the cutaneous angioneuroses there are many visceral forms giving rise to symptoms characteristic of the region affected, as, for instance, edema of larynx or lungs, asthma, hay fever, gastro-intestinal symptoms even sometimes simulating hepatic colic or appendicitis, cardiac, cerebral, or genito-urinary symptoms.

These "pseudo-conditions" may be independent of or associated with organic change or if long continued may lead to lesions. Treatment consists in regulations of the general health and is otherwise symptomatic. The organic extracts may be of use.

ANGIONEUROTIC EDEMA (Giant Urticaria).—A vasomotor neurosis characterized by sudden, transient, localized, edematous swelling. Heredity, nervous temperament, digestive disturbances, exposure to cold are probably factors in its etiology. It may appear on any part but especially on the face, hands, feet, genitalia. The treatment is symptomatic, tonics being indicated to increase nervous and muscular tone. See Angioneurosis.

ANHIDROSIS.—Deficiency of perspiration. See Sweat-glands.

ANHIDROTICS.—Agents that check perspiration, the opposites of the diaphoretics, which promote this secretion. They usually act either—1. By depressing the action of the sweat-glands. 2. By depressing the excitability of the sweat-centers. 3. By reducing the circulation in the skin.

The most important are the following, the figures indicating their mode of action as above arranged.

Belladonna,[1] atropin,[1] hyoscyamus,[1] stramonium,[1] muscarin,[2] agaricus albus,[2] salvia (sage), acids, locally,[3] pilocarpus, pilocarpin, nux vomica, strychnin, ergot,[3] sulphuric acid, chloralformamid, quinin (?), picrotoxin, Dover's powder, opium[2] (small doses), zinc salts,[3] local cold.[3]

Strychnin, camphoric acid, atropin, Dover's powder, pilocarpin, picrotoxin and zinc salts, all respiratory stimulants, are very efficient against the sweating of phthisis, though most of them are classed as diaphoretics. This is explained by the theory that the accumulation of carbonic acid in the blood by depressed respiration caused by severe coughing, stimulates the sweat-centers, an action which is opposed by agents stimulating the respiratory center.

ANIMAL EXTRACTS.—See Organotherapy, Thyroid Treatment, etc.

ANISE (Anisum).—The fruit of *Pimpinella*

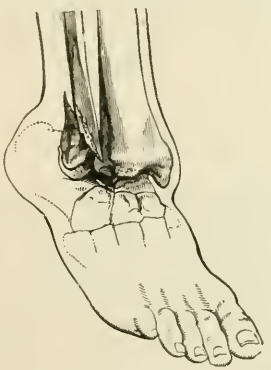
Anisum. Its properties are due to a volatile oil. It is slightly stimulant to the heart-action and to the digestive organs. It is useful chiefly to liquefy bronchial secretions, and is therefore a favorite ingredient in cough-mixtures. Dose, 5 to 10 grains. **A., Aqua,** oil of anise 1 part, water 500 parts. Dose, indefinite (average, 4 drams). **A., Oleum,** an ingredient in tinct. opii camph. Dose, 1 to 5 minims. **A. Spt.,** a 10 percent solution of the oil in alcohol. Dose, 1/2 to 2 drams.

ANKLE, DISEASE.—Tubercular disease of the ankle-joint is very common in children, beginning in the synovial membrane, the tibial epiphysis, or in the tarsus. Early diagnosis is difficult, the symptoms being obscure and ill defined.

The swelling is most characteristic when seen from behind, and it takes the form of a soft, puffy fulness lifting up the extensor tendons in front and occupying the hollows on each side of the tendo Achillis. Flexion and extension are more limited than in the opposite foot. Recovery may be expected if treatment is commenced at once and a fair range of movement obtained. Antitubercular remedies, guaiacol or iodoform ointment, and rest through means of splints or plaster are to be employed. Injections of iodoform emulsion may be useful, the needle entering below the outer malleolus. Opening, draining, injecting iodoform emulsion after washing out with normal salt solution and fixation of the joint in plaster are to be practised when caseation has ensued. When joint-disorganization occurs, excision may be performed. Osteoplastic resection is sometimes advised (Vladimiroff-Mikulicz operation). See JOINTS (Diseases).

ANKLE, DISLOCATIONS.—As a result of excessive dorsal or plantar flexion, the foot may be dislocated backward and forward respectively.

Lateral dislocation is not possible without malleolar fracture, which is spoken of under its appropriate head. See ANKLE (Fracture). The position of the foot is entirely characteristic: in one instance there is the lengthening of the heel, the astragalus projecting behind, and the shortening of the front foot, the tibia and fibula projecting in front; in the other, the front foot is lengthened and the heel shortened for contrary reasons. Reduction is effected by strong flexion in the direction that produced the displacement combined with direct pressure on the tibia backward or forward.



DISLOCATION OF FOOT BACKWARD.—(*From Moullin.*)

The astragalus may be dislocated from the tibia and fibula above and from the os calcis and scaphoid below and in front, and in an inward, outward, forward, or backward direction. The forward dislocation is the most common, and occurs from a wrench of the extended foot. The astragalus may be felt projecting under the skin and threatening to protrude through it at the instep. In the backward form it is a prominence beneath the tendo Achillis. The lateral varieties are generally compound.

The treatment should consist in pushing back the displaced bone into its socket by making pressure in the proper directions, the calf-muscles being relaxed by position, the foot then extended, and, if necessary, the tendo Achillis or other tendon or ligament felt tense divided. Anesthesia is generally required. If reduction is then found impossible, it must be left alone or excised. In compound dislocation it should, as a rule, be excised.

The subastragaloid dislocation is one in which the bones of the foot are displaced from the astragalus, which retains its natural connections with the tibia and fibula. The varieties are similar to those in the foregoing, the backward and inward variety being the most common. The foot is inverted, the sole turns inward, and the external malleolus is prominent in this variety.

The foot should be drawn forward, the leg forced backward, the tendo Achillis and tibialis anticus being divided; if necessary, anesthesia is used. The reduced foot should be placed on a splint and an ice-bag employed. If sloughing occurs, Pirogoff's or Syme's amputation may be necessary.

Dislocation of the other tarsal bones—the os calcis, the scaphoid, the cuboid, and the cuneiform bones—is extremely rare, and demands nothing more than mention.

Compound dislocation of the ankle-joint is a most serious injury, and may require immediate amputation if the patient is in poor health. The condition of the kidneys is of importance, as is age, the risk increasing with advancing years. The joint may be restored if the soft parts or the bones have not been bruised, although the joint has been exposed, but only through most perfect drainage. Acute suppurative arthritis is the condition to be guarded against.

ANKLE, EXCISION.—This operation is seldom practised. Syme's amputation involves less risk and may be relied upon. Excision may be performed either by two lateral incisions or an anterior transverse one, the latter being the more simple. See EXCISION.

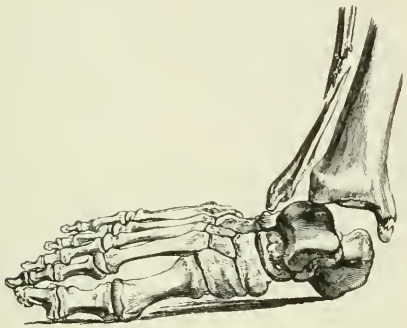
ANKLE, FRACTURE.—Typical malleolar fracture, or fracture of the ankle, or Pott's fracture, consists in fracture of the fibula slightly above the malleolus and displacement of the foot outward, with rupture of the internal lateral (deltoid) ligament, or fracture of the tip of the internal malleolus, which is commoner.

This injury results from hypereversion of the foot; the foot being caught and fixed, for instance, the body falls laterally to the side of the fixed foot.

This brings the strain on the deltoid ligament. This either gives way or the tip of the internal malleolus is torn away. The force continuing to act on the foot as a whole crowds the astragalus against the external malleolus, and produces fracture of the fibula by flexion.

If the foot is taken in the hand, the leg above the malleolar region being fixed, an abnormal lateral displacement may be produced, together with abduction of the foot to an unusual degree.

The fractured edge of the tibia stands out very prominently, the skin over it being tense; sometimes this breaks, producing a compound fracture, in which event an actual outward dislocation of the



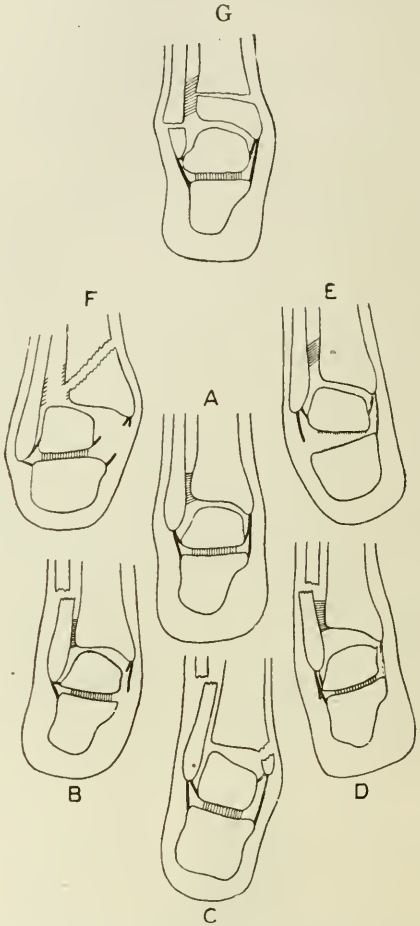
Pott's Fracture.—(*From Moullin.*)

foot occurs. The lower end of the tibia may project through the rent in the skin and resist efforts at reposition until the interposed skin is divided and retracted.

This injury is a very serious one, even if uncomplicated by being compounded. Besides being an articular fracture, this joint must bear the weight of the entire body. Without its inner support, the deltoid ligament, the foot falls into a valgus position and is incapable of performing its function even tolerably well.

Treatment.—An anesthetic should always be given to accomplish reduction, as it is of the utmost importance that perfect replacement be effected. The foot is sometimes displaced backward as well as outward, and this must be carefully considered in effecting reduction. A dressing should now be applied that will hold the foot in a slight varus position and at the same time permit ready and daily inspection. The old straight splint of Dupuytren serves this purpose well. The splint is applied to the inner aspect of the leg, projecting beyond the sole of the foot. A pad is placed beneath the splint over the lower end of the tibia, just above the malleolus; another pad is placed over the external malleolus below the point of fracture of the fibula. The application of a bandage now manifestly draws the foot toward the splint, and offers a certain means of combating the outward displacement and the valgus position. Attention must be paid to the dropping of the toes in plantar flexion, which favors a backward displacement of the foot. If such tendency exists after the internal splint is applied, it may be necessary to supplement it by a posterior splint with a right-angled foot-piece to control this dropping of the toes. The leg is now semiflexed upon the thigh and laid upon its outer surface on a pillow.

This dressing has the virtue of being easily removable, while plaster of Paris is not. During the first two weeks the dressing should be removed every 3 or 4 days, with a view of insuring the



Diagrams Illustrating Injuries about the Ankle-joint. (*After Treves*). A. Normal. B. Pott's fracture, with rupture of the internal lateral ligament. C. Pott's fracture, with fracture of the internal malleolus. D. Fracture of the fibula and displacement of the foot inward. E Subastragaloid dislocation. F. Dupuytren's fracture, *i. e.*, rupture of the interosseous membrane, oblique fracture of the tibia, rupture of the internal lateral ligament. G. Separation of the lower epiphysis of the tibia and of the fibula.—(*From Spencer and Gask.*)

continuance of good position, and for the purpose of massage and instituting gentle passive movements. After the second week, when good position is assured, a plaster-of-Paris dressing may be applied, extending from the knee to the tips of the toes. When this is applied, care must be taken to place the foot at a right angle to the leg, as after consolidation. After consolidation of this fracture, a persisting inability to flex the foot

dorsally to a right angle is the source of great inconvenience and disability.

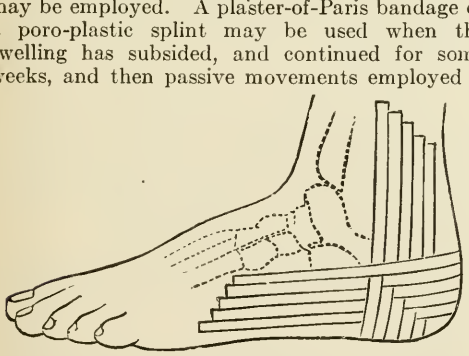
After 5 weeks, ordinarily, the splint may be removed. The foot should be protected, however, for several months by slightly raising the inner side of the shoe and perhaps providing an orthopedic appliance (club-foot shoe, support for flat foot) to prevent relapse into the valgus position.

In compound fracture this same straight splint may be applied to the outer side of the leg, the arrangement of the pads insuring the maintenance of the proper position. In this way the inner aspect of the ankle is left accessible for inspection and dressings; or a plaster-of-Paris splint may be applied, with suitable windows cut out.

Separation of the epiphyses at the lower end of both leg-bones is a rare injury, occurring only in children, and sometimes after forcible redressment of club-foot. Treatment is on general principles.

ANKLE, RESECTION.—The Mikulicz operation is osteoplastic resection of the ankle-joint, when the anterior part of the foot is perfectly sound. The heel, with the astragalus, os calcis, and soft parts over them, is removed, the articular surfaces of the tibia and fibula above and of the cuboid and scaphoid below are sawed off, and the front of the foot is brought vertically under the leg, so that the toes assume the position of extreme equinus. Langenbeck and König perform resection through bilateral longitudinal incisions, while an external transverse arched incision is employed in the Reverdin-Kocher method.

ANKLE, SPRAINS.—When there is much swelling, sprains of the ankle may be with difficulty differentiated from fractures, and if there is doubt, they should be treated as fractures. Absolute rest, cold and evaporating lotions, and a wet bandage may be employed. A plaster-of-Paris bandage or a poro-plastic splint may be used when the swelling has subsided, and continued for some weeks, and then passive movements employed if



(From *Spencer and Gask.*)

any stiffness is left. Recently, massage has been employed very successfully in conjunction with an elastic bandage or a rubber roller.

Immersion of the part in water as hot as can be borne for a half hour twice daily and then applying a firm bandage is most satisfactory in many cases.

A treatment that, according to Gibney, "involves no loss of time, requires no crutches, and is not attended with any impairment of functions," is as follows: A number of strips of rubber adhesive plaster, about 9 to 12 inches in length and of appropriate width, are prepared. Beginning at the outer border of the foot, near the little toe, the first strip partially encircles the joint and ends behind the foot. The second strip is begun on the inner side of the foot and is applied on the opposite side, nearly meeting the first strip behind. Other strips are applied in like manner, each one overlapping the last and crossing its fellow of the opposite side in front, so that the ankle is snugly and smoothly encased, care being taken not to completely encircle the joint with any one strip. After having bound the foot firmly, it is well to add one broad strip running around the foot from the internal side of the leg down the internal side of the foot, across the plantar surface, and up the outside of the leg, "as much as possible to take the place of the middle fasciculus of the external lateral ligament, which is so often the one most injured." It is a good plan to place a pad of absorbent cotton over the external malleolus and in the fossa below, to prevent undue pressure and chafing. Anyone of the injured ligaments may receive a similar reinforcement from an extra strip. Then apply a roller smoothly over the entire surface, allowing it to remain until the plaster takes firm hold. The hot-air treatment has proved valuable. See SPRAINS, JOINTS (Injuries).

ANKLE-JERK.—See REFLEXES.

ANKYLOBLEPHARON.—See EYELIDS.

ANKYLOSIS.—This signifies, literally, a crooking of the joint. In a general sense it is reserved for fixation of the joint, with which there is often associated an angular deformity. The diseased process may be in the joint proper, in the periarticular tissues, the overlying muscles and tendons, or even in the integument. Every joint-fixation has thus often been included in the term ankylosis. A division has likewise been made into the fibrous, or false, and the bony, or true, ankylosis. A better division is that by which the term *contracture* is used to designate joint-fixation by abnormalities of the soft parts, and *ankylosis* from fibrous or bony union of the articular surfaces proper.

Contracture.—Acute inflammation of the joints and tubercular processes are, as we have seen, very often early associated with muscular contraction, which, from the inception, immobilizes the joint absolutely, except to examination under anesthesia. After the subsidence of the primary disease, the contraction may continue and simulate the locking of the joint. The periarticular swelling and the thickening of the capsule attending rheumatism will often leave a joint in a similar apparently ankylotic state. The cicatricial contraction that follows severe burns may likewise produce an apparent ankylosis.

True ankylosis has been properly divided into the fibrous and the osseous, although in long-standing cases a combination of both forms will usually be found, and only in very chronic cases does it ever come to a complete bony union of the articular ends, with total obliteration of the joint-cavity. The diseases that are most productive of the true ankylosis are: acute suppurative arthritis,

tubercular disease, and chronic rheumatism. In the last-named, ankylosis of many joints is often seen. Gonorrheal arthritis, the nonsuppurative complications of puerperal septicemia, and the acute infectious diseases are less often followed by bony ankylosis.

The diagnosis of the conditions that fix a joint is ordinarily easily made; but that of fixation from extraarticular causes must always be differentiated from that of true ankylosis. The clinical history of the case and the condition of joint-movement under anesthesia would make the recognition simple. The differentiation between the fibrous and the bony ankylosis, is, as a rule, also easily established. A bony ankylosis will absolutely prevent joint-motion, whereas in the fibrous varieties the patient alone, or with a little assistance, can always elicit a certain degree of motion. The knee forms an exception to this rule; notwithstanding an osseous ankylosis, some degree of motion can be elicited.

Cases of osseous ankylosis of the patella to the anterior surface of the femoral condyle with slight joint-motion have been observed. The operation revealed the joint interior free except where the patella had formed attachments.

The use of the X-rays has elucidated the diagnosis of these joint conditions and a skiagraph should be had in every instance in which remedial measures are contemplated.

Treatment.—The treatment of joint-fixation necessarily varies with the conditions that produce it. If the result of cicatrices, fascial or muscular contractures, attention must be directed to them rather than to the joint itself. The first must be remedied by plastic operation. Contractures of muscle and fascia may often be overcome under an anesthetic. Constant traction or pressure by means of a properly applied brace will frequently succeed when failure has attended forcible correction under an anesthetic. If this fails, resort must be had to a division of the tendons and fascia, either by subcutaneous operation or, preferably, by open division.

In cases of ankylosis that are known to be fibrous, operative measures are called for only after a milder treatment by baths, massage, and active and passive joint-movements have been tried without effect. Mechanic appliances to stimulate motion may also be tried. Very frequently, indeed, by the combined use of massage and weight-extension, the deformity that so often accompanies ankylosis may be overcome. In the failure of these methods, recourse may be had to forcible breaking up of the fibrous adhesions that fix the joint, always under an anesthetic (*brisement forcé*).

The fewer the number of adhesions broken up at a sitting, the less is the reaction; therefore, anesthesia may be resorted to at intervals of a week or 10 days, and thus gradually the deformity be overcome and an opportunity given for the little that is gained each time to be maintained. By this method there is avoided the danger of lacerating a large vessel or nerve running in close proximity or adherent to the joint-capsule. In breaking up adhesions, force should first be applied to increase the deformity. The angle of flexion of the knee and elbow should, by the first movement, be even more reduced. Upon this flexion should follow the first attempt at extension. Unfortunately, with the most careful and frequently repeated attempts to overcome a fibrous ankylosis, failure to restore, even approximately, normal joint-function is the rule. The fibrous bands that have been broken up reunite and the ankylosis is speedily reestablished. If, therefore, the ankylosed part is placed in the most favorable position possible, it is all the patient may hope for.

The treatment of bony ankylosis must ordinarily be limited to the correction of the deformity. If the position of the limb is a correct one, osseous ankylosis is not to be interfered with. In the overcoming of deformity, the operation may be done through the joint or in close proximity to it. In ankylosis of the hip, in which there is often extensive new bone-formation, it is better to divide the bone below the trochanter (Gant's operation). When the neck of the bone has not been destroyed by disease, its subcutaneous division with a saw, after the method of Adams, may be resorted to. In ankylosis of the knee, recourse must usually be had to the excision of a wedge, with base anterior, before the deformity can be corrected. Bony ankylosis at the elbow is best treated by excision, which will leave a very serviceable, although an abnormally movable, joint. Murphy advocates the attempt to restore function to these joints by the implantation of a generous flap of fat and connective tissue between the bone surfaces, and reports good results. Baer uses chromicized pig's bladder carefully adjusted between the bone ends for the same purpose and has secured from 15 to 90 degrees of motion in various cases. See HIP-JOINT, KNEE-JOINT, etc.

ANKYLOSTOMA.—A genus of nematoid worms, one species of which, *A. duodenale*, is found in the human intestine. This is now referred to the genus *Dochmius*.

A peculiar anemia, called **ankylostomiasis**, is produced by the parasite sucking the blood from the walls of the duodenum. It is especially prevalent among brickmakers and other workmen in Europe. It is called also dochmiasis, brickmakers' anemia, tunnel anemia, miners' cachexia, Egyptian chlorosis, tropical chlorosis, etc.

The ankylostoma is a cylindric worm generally found in the small intestine, the female being from 10 to 18, the male from 8 to 12, millimeters in length.

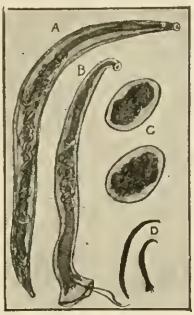
The embryo develops outside the body, but if taken into the alimentary canal through the medium of the food, lodges in the small intestine, where it undergoes development. The eggs are smooth, oval in shape, and usually contain several daughter-cells. Frequently, the eggs only are seen in the dejections, and therefore a microscopic examination is of first importance.

Symptoms and Clinical Course.—Grave forms of anemia are frequently met with when this parasite infests the alimentary canal, the lymphocytes being markedly increased.

When the parasite is suspected as the cause, the

stools should be allowed to stand for 24 or 48 hours, when the embryo will be fully developed, and may readily be identified by means of the microscope.

Treatment.—No solid food should be given for at least 24 hours before giving an anthelmintic. Of the remedies advocated, probably the oleoresin of male fern is best. It may be given in doses of from 1/2 to 1 dram, and repeated in 3 hours, after which a full dose (1 fluidounce) of castor oil should be administered. See HOOKWORM DISEASE.



UNCINARIA DUODENALIS, OR ANKYLOSTOMA DUODENALE.—(A) female, (B) male, (C) eggs, (D) male and female of natural size.—(*Greene.*)

ANODYNES AND ANALGESICS.—Anodynes are medicines that give relief from pain. They are nearly all hypnotic or narcotic.

The chief anodyne is opium or its alkaloid morphin. Others are canabis inndica, belladonna, hyoscyamus, stramonium, conium, veratrum, lupulus, gelsemium, potassium bromid, chloral hydrate, chloroform, ether, and camphor.

Hoffmann's anodyne is a preparation of ether known as the compound spirit of ether. See ETHER.

Chloral relieves pain only by inducing sleep, and only in dangerous doses does it produce anesthesia.

Butyl-chloral exerts a special anesthetic effect on the fifth nerve, and also induces sleep. Gelsemium also especially affects the fifth nerve; hence both these drugs are of particular value in the treatment of facial neuralgias. Belladonna chiefly affects the peripheral ends of the sensory nerves, and is applied with benefit in plasters, ointments, or liniments directly to the local spot or area of pain. Aconite, veratrin, cocain, and opium are also used as local applications for the relief of pain.

Anodynes may be administered by enema or suppository, by hypodermic injection, by endermic application, and by inhalation, as well as by the mouth. Certain measures are used locally as analgesics or anodynes, such as the application of cold, electricity, various forms of counterirritation, dry or moist heat, acupuncture, and the abstraction of blood.

An anodyne liniment:

℞.	Tincture of aconite,	ʒ ij
	Tincture of opium,	ʒ iv
	Tincture of arnica,	ʒ j
	Chloroform,	ʒ ij
	Soap liniment, enough to make,	ʒ iv

Apply as a liniment.

Analgesics are remedies that relieve pain either by direct depression of the centers of preception and sensation in the cerebrum, or by impairing the conductivity of the sensory nerve-fibers. Opium is the most efficient of all analgesics, because it arrests the afferent impressions at every step of their progress—at their formation, along the courses of their conduction, and at the points where they impinge on the sensorium.

Antipyrin, acetanilid, phenacetin, phenocoll, and exalgin are powerful analgesics, and relieve pain without disturbing the brain. They are especially useful in neuralgic pains, in headaches, and in pain due to affections of the spinal cord: *e.g.*, in the agonizing pains of locomotor ataxia.

An analgesic pill:

℞.	Phenacetin,	gr. xx
	Salol,	gr. xx
	Cinchonin salicylate,	gr. x.

Make 10 pills.

One every 2 hours, until relieved.

See DENTAL ANODYNES.

ANOREXIA.—Want of appetite, abhorrence of or aversion to food, is symptomatic of certain mental affections. It is met with in gastric disorders, and in chronic diseases. It is present in all fevers, in many chronic exhausting diseases and under the stress of violent emotion (grief, worry, anxiety), may be purely hysterical or neurasthenic and may take the form of mere loss of the hunger sense, actual revulsion, a sense of repletion, actual perversion, or nausea upon taking as light amount of food. Chlorosis, chronic alcoholism, hysteria, nervous and emotional overstrain, influenza and septic processes, including advanced tuberculosis. It often results from the dietetic fads and fancies of the physician or patient (or friends?), and from monotonous and narrow dietaries. Loss of appetite may be more apparent than real. Inquiry often shows that digestion is proceeding properly, but a habit of eating without allowing a proper interval between meals exists, or that the food is of too nutritious a nature, or an undue amount of alcoholic stimulants prevents hunger.

For loss of appetite:

℞.	Gentian, Quassia, Cinnamon, each,	ʒ ij.

Put into a pint of boiling water and, when cold, strain; take a wineglassful thrice daily as an appetizer.

℞.	Strychnin sulphate,	gr. j
	Arsenic trioxid,	gr. ij
	Quinin sulphate,	gr. xl
	Iron sulphate,	gr. xl
	Extract of taraxacum,	ʒ ss.

Mix and make 40 pills.

SIG.—One pill after each meal.

Anorexia nervosa, or hysterica, is a symptomatic or nervous manifestation of hysteria in which there is an entire absence of hunger and a distaste for food, eventually leading to starvation. Food

is often promptly vomited as soon as taken, though water may be retained. It occurs chiefly in neurotic girls between 12 and 16 years of age, and occasionally in children. It should be distinguished from cancer of the stomach, gastric ulcer, and diabetes. It rarely proves fatal. The treatment consists of isolation, hypnotic suggestion, hydrotherapy, electrization of abdomen, gavage, and lavage of the stomach. Forced alimentation and complete and continued isolation, with massage, are beneficial. Drugs have not been found of use.

ANOSMIA.—Partial or complete loss of the sense of smell—unilateral or bilateral—associated with impairment or loss of the sense of taste. Local nasal disease affecting the mucous membranes, injury or disease of the fifth nerves, disease involving the inner and lower parts of one or both anterior lobes of the brain, or the under surface of the temporosphenoid lobes may cause it. It may be associated with hemianesthesia of hysteric or organic origin. Taste is lost when anosmia is complete, except for sour, sweet, salt, and bitter substances.

ANTACIDS OR ALKALIES.—Remedies that neutralize acids, check alkaline secretions, and stimulate acid secretions, when in contact with the ducts of the organs producing them. Thus, a dilute alkali given before meals will stimulate the production of the acid gastric juice, and if applied to the mouth of the pancreatic duct, will check the secretion of the alkaline pancreatic juice. The principal articles that belong to this group are the following, which would always be administered in dilute solution:

The following are direct antacids, lessening the acidity in the stomach, many of them also acting as remote antacids, lessening the acidity of the urine:

Liquor potassii hydroxidi, liquor sodii hydroxidi; carbonates and bicarbonates of potassium, sodium, lithium, magnesium, and ammonium; magnesia; lime-water; chalk; aromatic spirit of ammonia.

Ammonium and its carbonates after absorption are eliminated as urea, and do not lessen the acidity of the urine.

The following are remote antacids, do not lessen acidity in the stomach, but lessen that of the urine, being oxidized in the blood and excreted as carbonates:

Potassium acetate; potassium citrate; potassium tartrate; sodium phosphate; sodium acetate; sodium citrate; lithium citrate.

Antacids are given to correct excessive acidity in the stomach that may be due to secretion of too abundant or too strongly acid a juice, as in acute dyspepsia, or to the decomposition of food from impaired digestion. Sodium salts are preferable to those of potassium, and lime salts should be used if diarrhea exists. Alkalies are best given after meals. See ACIDITY.

ANTAGONISM.—The fact that the physiologic action of certain substances may be affected, even neutralized, by the presence in the body at the same time of other substances having an opposite character. This balance is presumed to take place in the blood or in the tissues. An antidote so affects the chemic or physical character of a poison as to make it destitute of injurious action on living animal tissues. Poisons directly antagonize one another. The term antagonism is commonly used to express a physiologic action. Antagonism implies a balance of functional disturbance, and not an alteration of structure. There is no instance wherein the antagonism of two drugs is absolutely complete along the whole line of action. Morphin and atropin are nearly so. Digitalis and saponin and atropin and muscarin are very closely antagonistic.

Two mutually antagonistic principles may exist in the same plant, as the alkaloids pilocarpin and jaborin in pilocarpus.

The following table, modified from Brunton, gives the antagonistic poisons, as well as their mutual antagonistic and lethal doses in each case in which they have been determined. The doses are expressed in grains or fractions of a grain to a pound weight of the animal:

Antagonists.		Antagonistic Dose.		Lethal Dose.	
I.	II.	I.	II.	I.	II.
Aconitin and Atropin		1/750	1 3/5	1/900	7
Aconitin and Digitalin		1/600	2/5	1/900	1
Aconitin and Strychnin		1/750	1/125	1/900	1/288
Alcohol and Strychnin					1/288
Atropin and Aconitin				7	1/900
Atropin and Chloral				7	7
Atropin and Hydrocyanic Acid				7	.....
Atropin and Jaborandi				7	.....
Atropin and Muscarin				7	.....
Atropin and Morphin				7	3
Atropin and Pilocarpin				7	.....
Atropin and Phytolaccin				7	.....
Atropin and Physostigmin				7	1/25
Atropin and Quinin				7	1 1/4
Bromal Hydrate and Atropin				1/900	7
Chloral and Atropin				7	7
Chloral and Picrotoxin				7	.....
Chloral and Physostigmin				7	1/25
Chloral and Strychnin				7	.....
Chloroform and Amyl Nitrite		7	1/300	7	.....
Digitalin and Aconitin					1/288
Digitalin and Muscarin					1/900
Digitalin and Saponin					.....
Gelsemium and Opium		9/56	1/20	1/6	1/20
Gelsemium and Atropin		3	3/7	3	7
Morphin and Caffein		1/3	.....	1/3	1 3/4
Morphin and Chloroform					
Muscarin and Atropin					
Opium and Atropin					7
Opium and Gelsemium					7
Opium and Veratrum Viride					

ANTEFLEXION.—See UTERUS (Anteflexion).

ANTEMORTEM STATEMENT.—See DYING DECLARATIONS.

ANTERIOR POLIOMYELITIS, ACUTE.—See PARALYSIS, INFANTILE.

ANTHELMINTICS.—Agents that destroy (vermicides) or cause the expulsion (vermifuges) of intestinal worms. The chief vermifuges are castor oil, jalap, and scammony. They dislodge and expel the worms by the increased peristaltic action that they occasion.

The chief vermicides are as follows:

For Thread-worms: Alum, sulphate of iron,

lime-water, quassia, eucalyptol, sodium chlorid, tannin, vegetable astringents, and naphthalin. These substances are all used locally by enema.

For Round-worms: Santonica, santonin, spigelia, chenopodium, senna, calomel, and naphthalin.

For Tape-worms: Aspidium, kamala, kousso, granatum, pelletierin, pepo, turpentine, chloroform, and naphthalin.

Adjuncts, such agents as prevent the excessive secretion of intestinal mucus, thus affording a nidus for the worms, are bitter tonics, preparations of iron, ammonium, and sodium chlorid. Thymol is specific against the **Hook-worm** (*q. v.*).

Vermicides are generally given after fasting for 8 or 10 hours, in order that, the intestines being empty, the drugs may act more readily on the worms. Some 3 or 4 hours after a purgative is given to expel the dead or stupefied worms. Thread-worms chiefly infest the rectum, and are more effectually killed by enemas, such as strong infusions of quassia chips, salt and water, vinegar and water, solution of the sulphate or chlorid of iron, oil of turpentine, castor oil, a decoction of aloes, or an infusion of senna.

An anthelmintic against the round-worm for children above 4 years of age is:

℞. Powdered spigelia, gr. x
Calomel, gr. iv.

Mix into a powder. To be taken for two mornings in succession and on the afternoon of the second day followed by a purge.

Another anthelmintic against round-worms is:

℞. Spigelia root, ℥ ss
Senna leaves, gr. xl
Orange bark,
Bruised santonica seeds,
Bruised fennel seeds, } each, ℥ j
Boiling water, ℥ xij.

Macerate in a closed vessel for 2 hours and strain. Give a wineglassful every morning.

The fluidextract of spigelia, 1 dram to a child of 2 years, 2 drams to an adult, is serviceable, as are also divided doses of the fluidextract of spigelia and senna in from 2- to 3-dram doses. Santonin, 1/4 to 1/2 of a grain, in the form of troches, or santonin and calomel troches are serviceable.

Oil of chenopodium may be given on sugar in from 5 to 20 drops.

Against the tape-worm, pelletierin, in 1- to 2-grain doses in capsule, is the most efficient remedy. Tanret's pelletierin, dispensed in phials containing about 5 drams is a satisfactory preparation. Pumpkin seeds made into a paste with sugar are sometimes used. The oleoresin of aspidium, or filix mas, in 1/2- to 1-dram dose, may be used for an adult, to be followed by a calomel purge and a saline.

Ogilvie urges the administration of larger doses of the fluidextract of male fern for children than are usually given. He believes that the small doses of 15 minims are inadequate, and also more likely to produce toxic symptoms. For several days before the treatment he directs that the child be given less food than usual, and then a simple milk diet for one day, on the evening of which a purgative draft of jalap and magnesium sulphate is given, to be repeated the next morning at 7 o'clock. At 8 o'clock one-half of the following mixture should be taken, and the remainder at 9 o'clock:

℞. Fluidextract of male fern, ♋ ss
Mucilage of acacia, ♋ iij
Almond mixture, q. s. ♋ ij.

Two hours later a dose of castor oil and jalap should be given, even if the entire worm has been expelled, as it is necessary to remove the vermifuge from the intestines. See Worms.

ANTHEMIS.—See Chamomile.

ANTHRACOSIS.—A chronic interstitial pneumonia with pigmentation of the lung, in coal-miners. See Pneumonokoniosis.

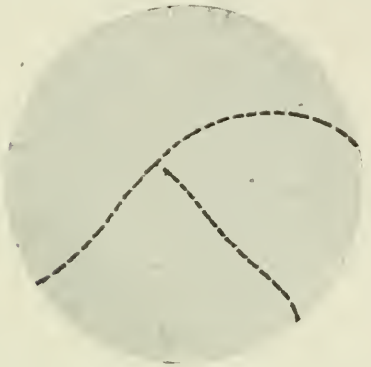
ANTHRASOL.—An antiseptic and parasiticide. Like ordinary tar, it allays irritation of the skin, but is claimed not to obstruct the follicles nor to favor the development of acne. It is used locally in the form of a 5 to 10 percent petrolatum ointment in eczema; 10 percent ointment with glycerite of starch and 10 percent of wool fat (adeps lanæ) in pruritus; 20 to 30 percent ointment or paste, in lichen; in combination with sulphur and soft soap, in parasitic skin affections.

ANTHRAX (Charbon, Malignant Pustule, Wool Sorter's Disease).—The other synonyms are splenic fever, splenic apoplexy, gangrene of the spleen, carbuncle fever. It is a specific affection communicated by animals suffering from splenic fever. Graminivorous animals are liable to splenic fever,

Bacillus Anthracis in Blood of Rabbit.—(*Coplin.*)

and those who tend these animals or handle their hides and flesh after death are generally affected. The infection enters man through the lungs or digestive tract or skin (probably only when there is an abrasion). It is a peculiarity of the disease that there is an entire absence of pus-formation until the slough is being thrown off. After a slight itching, a vesicle forms, then an indurated red area

appears around it, which may become of the diameter of an inch or more. This area is usually elevated about 1/8 of an inch above the healthy skin, while a central depression of about 1/20 of an inch is seen. The lymphatic glands enlarge. There is a remarkable absence of pain. Constitutional symptoms set in from 8 to 10 days after the



Anthrax Bacilli with Square or Slightly Concave Ends sometimes seen; Fuchsin Stain. (× 1000.)—(*Williams.*)

papule appears. The vesicles may dry up and form a black slough, which is separated and cast off as any other inflammatory process.

It is the presence of the **bacillus of anthrax** that gives this disease its essential character. The anthrax bacillus, the largest of the pathogenic bacilli, is rod-shaped, having a rectangular form caused by the rounding off of the corners. It is

Anthrax Bacilli, Showing Spores. (×1000.)—(*Williams.*)

not motile and does not have flagella, but contains spores. The bacillus and especially its spores are remarkably resistant. The bacilli grow upon artificial culture media, such as gelatin, and have a tendency to arrange themselves in the shape of threads. These bacilli stain with ordinary saturated alcoholic or aqueous solutions of anilin dyes and by Gram's method. See Bacteriology, Pathologic Technic.

Symptoms.—The disease may be external or internal, in the former assuming the type of "*malignant pustule*" or "*malignant anthrax edema.*" The latter form is usually pulmonary, more rarely intestinal.

Malignant pustule begins a few days to a week after exposure, with itching and smarting pain at the site of inoculation, on the arm, hand, or face. A papule appears which becomes a vesicle. This discharges its serum and a number of smaller vesicles are disclosed at the margin of the enlarged papule. Induration and edema are intense. Adjacent lymphatic necrosis may be extensive, lymph glands become involved. Symptoms of general infection appear—fever, rapid pulse, thirst, dyspnea, enlarged liver and spleen. Death usually supervenes in several days.

Malignant anthrax edema begins in the eyelids and travels to the head, arms, hands. The local symptoms are secondary to the constitutional disturbance. The skin is red and edematous. There may be vesicles but no papules. The edema may become extensively gangrenous. Recovery is exceedingly rare.

Wool-sorter's disease is acquired by inhaling the bacilli into the lungs. The onset is sudden with chill, fever, high temperature, pain, dyspnea, bronchitis, and cough, together with the physical signs of lung involvement. There is often no external lesion. It is rapidly fatal, the patient often dying in 24 hours in collapse. Other cases are more protracted, and there may be vomiting, diarrhea, delirium, and unconsciousness, while the brain may be the chief seat of involvement, the capillaries being filled with bacilli. *Rag-picker's* disease is another pulmonary variety involving the pleura accompanied by constitutional disturbance.

Intestinal anthrax or *mycosis intestinalis* is due to the ingestion of meat or milk of infected animals. At the onset there may be a chill followed by moderate fever, nausea, vomiting, diarrhea, general pains and prostration; dyspnea, petechiæ and pustules may be observed; the spleen is enlarged. Hemorrhage may occur from the mucous membrane in contradistinction to the external form. Marked cerebral symptoms may be observed. Convulsions may occur before death.

Diagnosis of the external form is generally easy. In most cases the characteristic eschar is recognized. A boil or carbuncle may be mistaken for it, especially when on the face. A poisoned wound, a soft chancre, erysipelas, or cellulitis may cause confusion, but the history is to be inquired into and a microscopic examination of the serum will prove the diagnosis. Cultures may be made and a mouse or guinea-pig inoculated.

Prophylaxis is of signal importance. It consists in cremation of all animals dead from the disease, disinfection of hides, wool, rags etc., by superheated steam, isolation of infected pastures, and the disinfection of infected buildings.

Treatment.—In the external form it is of the utmost importance that the whole of the indurated area be destroyed or removed. Deep crucial in-

cisions should be made, followed by potassium hydroxid or strong phenol and the wound dressed with phenol (1:20) or powdered with mercury bichlorid. Local or perhaps general anesthesia is indicated. Subcutaneous injections into the adjacent parts of solution of phenol (1/2 to 3 percent) or tincture of iodin (3 to 5 percent) or mercury bichlorid, or iodin and potassium iodid are valuable in controlling the infection.

Constitutional symptoms should be treated by rest in bed, a plentiful supply of animal food, beef-tea, milk and eggs, including quinin in large doses, strychnin, and alcoholic stimulants. Sodium sulphite in 10-grain doses has been recommended. Collargol intravenously is said to effect a cure. Morphin may be given for the insomnia and diarrhea.

Internal anthrax demands the same general treatment but is usually intractable. At the onset free purgation is advisable, and the bowels should be kept open. Senega and other expectorants are useful when the lungs are affected, and inhalations of air charged with carbolic acid or some other antiseptic agent may be used.

In Massachusetts an outbreak of *anthrax among tannery workers* occurred in 1916. Among the 25 cases so studied it was found that every one of the persons infected had been handling dried "China" hides. In this country the great majority of cases of anthrax infection are due to imported hides and as a result of contact in the early stages of the tanning process. Therefore, this *infection can be controlled* first, by the exclusion of infected material from this country; secondly, by the disinfection of the material after it arrives in this country, and, thirdly, by the safeguarding of the workers who handle the material (Potter).

Serum Therapy.—Sclavo's anti-anthrax serum has been used with success. It should be employed whenever it can be obtained. The dose is about one ounce injected subcutaneously. It has been suggested that injections of the bacillus pyocyaneus be given, because it is known that this organism when injected into animals with the bacillus of anthrax materially modifies the virulence of the latter.

ANTIBODIES.—See SERUM THERAPY AND VACCINE THERAPY.

ANTIDIPHTHERITIC SERUM. See DIPHTHERIA ANTITOXIN; SERUM THERAPY.

ANTIDIPLOCOCCUS SERUM.—See SERUM THERAPY.

ANTIDOTES.—Agents that so affect a poison, physically or chemically or both, as to remove it from the body or alter its character by forming with it an insoluble or inert compound before its absorption, with the object of *preventing* its toxic action upon the organism. **Antidotes.** See ANTAGONISM. Antidotes act against vegetable and mineral poisons in the alimentary canal or respiratory tract, but are not available against poisons administered hypodermically. There are (1) *chemic or true antidotes*, which unite chemically with the poison, converting a soluble and absorbable substance into a compound which is more or less insoluble and nonabsorbable, or harmless though soluble, and (2) *mechanic or antidotal measures*, which include such medicinal or mechanical processes as tend to remove a poison from the body, either before or after the use of an antidote; and include emesis, the use of the stomach-pump, purgation, etc. Among the latter are emetics, cathartics, washes, injections, ligatures, poultices, the use of the stomach-pump, of tourniquets, etc. The chemic antidotes include albumin, alkalies, potassium permanganate, milk, charcoal, soap, starch, oils, tannin, turpentine, acids, alkalies, carbonates, hydrates, sulphates, sodium chlorid, iodin, and iron preparations, etc. See POISONING.

ANTIEMETICS.—Agents which diminish nausea and vomiting; some of them act by means of a local sedative influence upon the end-organs of the gastric nerves, others by reducing the irritability of the vomiting center in the medulla. The most important are *Local Gastric Sedatives:* alcohol, alum, arsenic, belladonna, bismuth, carbonic acid, cerium oxalate, chloroform, phenol, potassium nitrate, creosote, ether, ice, opium, hydrocyanic acid, silver nitrate, small doses of calomel and ipecac, hot water, cocain, *General Sedatives:* opium, morphin, codein, hydrocyanic acid, bromids, chloral, nitroglycerin, alcohol, amyl nitrite, food.

Ice, swallowed in small pieces, is probably the most efficient of the local sedatives. *Phenol* and *Cocain* are also effective antiemetics, given in small doses by the mouth at short intervals. *Astringents* are very useful where there is congestion of the gastric mucous membrane, as in the vomiting of alcoholism and phthisis, when *Silver Nitrate* and *Alum* are especially to be recommended. *Opium* and its principal alkaloid, *Morphin*, will produce nausea and vomiting in many persons, even when given in very small doses. See EMETICS; VOMITING.

ANTIFEBRIN.—See ACETANILID.

ANTIFORMIN.—A strongly alkaline solution of sodium hypochlorite. A germicide said to be more than three times as active as phenol, recommended for the disinfection of urine, stools, sputa, hands and instruments. It is said to be of value in certain skin diseases. It dissolves bacteria and protozoa but does not affect acid-fast bacteria, as tubercle and lepra bacilli, therefore its use facilitates the demonstration of tubercle bacilli. It is used externally in 2 to 10 percent solutions; as a disinfectant in 5 percent solution; as a spray in 4 : 1000 solution; for demonstration of tubercle bacilli in 15 percent solutions.

ANTIGALACTAGOGS.—Agents and measures which diminish or arrest the secretion of milk. Belladonna or its alkaloid atropin is the most efficient, acting whether applied locally or administered internally. Antipyrin has similar power, so also has camphor applied locally and potassium iodid, colchicum with magnesium sulphate, tobacco, sage, quinin, tannin, etc. Compression of the breasts, by bandaging or strapping with adhesive plaster, has positive antigalactic action.

ANTIGENS.—See SERUM THERAPY AND VACCINE THERAPY.

ANTIGONOCOCCUS SERUM.—This serum is obtained from the blood of healthy rams that have been inoculated with gradually increasing quantities of the most virulent strain of gonococci obtainable. It is not offered as a substitute for well established germicides in the treatment of acute gonorrhea, but as being of probable service in the sequelæ and complications of gonococcic infection—as orchitis, epididymitis, teno-synovitis, and in particular gonorrheal arthritis. See Gonococcus Infection.

ANTILITHICS AND LITHONTRIPTICS.—Agents which are supposed to promote the solution of concretions in the excretory passages (lithontriptics) or to prevent their formation (antilithics.) These terms are generally restricted to remedies affecting the urinary calculi, but those directed against the biliary form are included here for the sake of consistent classification. The chief agents against *Biliary Calculi* are: ether and turpentine (Durande's solvent), sodium bicarbonate, sodium salicylate, sodium phosphate, castile soap, alkaline waters, especially vichy; against *Uric Acid Calculi* are: distilled water, potassium salts, lithium salts, magnesium citroborate, piperazin, lysidin, lycetol; against *Calcium Oxalate Calculi* are: dilute nitrohydrochloric acid, carbonated water, lactic acid (for digestion); against *Phosphatic Calculi* are: ammonium benzoate, benzoic acid, dilute nitric acid.

There is probably little or no solvent value to the agents recommended for biliary calculi. In the case of uric acid calculi the administration of *Potassium* or *Lithium Salts* is based on their power of combining with the acid in the calculus.

ANTIMENINGITIC SERUM. See Cerebrospinal Meningitis.

ANTIMENINGOCOCCIC SERUM. See Cerebrospinal Meningitis.

ANTIMONY.—Sb = 120; quantivalence, I, III, V. A nonmetal having a metallic luster.

Action.—Irritant, emetic, diaphoretic, expectorant, powerfully depressant to heart and nervous system. In large doses by the mouth, or if injected into the circulation, its effects are practically identical with those of arsenic, but vomiting is always a prominent symptom. This is due to its effect as a gastric irritant, and the intestine may possibly remain unaffected, as antimony is absorbed more slowly than arsenic and the larger portion of the poison may be gotten rid of by the violent emesis excited. The sweat, the saliva and the mucous secretion of the respiratory tract are increased. The prolonged use of the drug is liable to cause fatty degeneration of many organs. It is excreted into the stomach and intestine, in the urine, and also probably in the bile and milk.

Uses.—The use of tartar emetic is now almost entirely confined to diseases of the respiratory passages. When a free secretion of mucus has once been established, it should, as a rule, be discontinued. Also, on account of its depressant properties, it is not a suitable preparation for infants or very young children. When an emetic is required in acute inflammations of the respiratory tract, ipecacuanha is usually preferable. As a diaphoretic it has been largely supplanted by pilocarpin.

In **poisoning**, tannic acid, or any substance containing it, is the antidote. Opium, alcohol, ether, and other antispasmodics are physiologic antagonists. Demulcent drinks should be freely given. Alkalies and lead salts decompose tartar emetic.

Preparations.—Metallic antimony is not official, and is not used in medicine. It is represented, however, by the following official salt and preparations, viz.:

Antimonii et Potassii Tartras, *Antimony and Potassium Tartrate* (*Tartar Emetic*), $2KSbOC_4H_4O_6.H_2O$—small white crystals or a granular powder of sweet, disagreeable metallic taste, soluble in 17 of water at 59° F., and in 3 of boiling water, insoluble in alcohol. It is decomposed by alkalies, and by lead salts. Dose, 1/16 to 1/4 of a grain (average expectorant dose, 1/10 of a grain; emetic, 1/2 of a grain) but after tolerance is established as high as 2 grains may be given. It is an ingredient of the two following, viz.: **Vinum Antimonii,** *Wine of Antimony*—has of tartar emetic 4, boiling distilled water 65, alcohol 175, white wine to 1000. Contains about 2 grains of tartar emetic to the ounce, and is an ingredient of Mistura Glycyrrhizæ Composita. Dose, 5 to 20 minims. **Syrupus Scillæ Compositus,** *Compound Syrup of Squill, Cox's Hive Mixture, Hive Syrup* (see under Squill)—contains about 1 grain of tartar emetic to the ounce, with Squill, Senega, etc. Dose, 30 minims; should be administered cautiously to children.

Incompatible with *Tartar Emetic* are: Acacia, acids (mineral), albumin, alcohol, alkalies, ammonia, ammonium carbonate, antipyrin, bicarbonates, carbonates, calcium chlorid, gelatin, lead salts, lime-water, mercuric chlorid, metallic salts, sulphids, tannic acid, and astringent vegetable preparations.

In whooping cough:

℞. Antimony and potassium tartrate,	gr. ss
Tincture of opium,	♏ xx
Distilled water,	ʒ j.

A teaspoonful every, or every alternate, night.

An expectorant:

℞. Antimony and potassium tartrate,	gr. j
Powdered ipecac,	gr. x
Powdered opium,	gr. ij
Powdered licorice,	ʒ j.

Mix well and divide into 10 powders.

Or—

℞. Wine of antimony,	ʒ ij
Solution of ammonium acetate,	℥ j
Syrup of tolu,	ʒ vj
Water,	℥ iv.

Mix well and give a sixth part every 4 hours.

ANTINARCOTIC LEGISLATION.—For many years the use (and abuse) of narcotic drugs was untramelled by legal enactments. Within the last few years we have suffered from an overdose of legislation on the subject, so that now one hardly knows what his duty is in the matter. The different States have, of course, their own laws, and many cities have also their own enactments; and these laws and enactments are many and various. There should be one Federal law governing the whole subject. (See HARRISON LAW.) The multiplicity of laws (and the endless variety of interpretations of the same), and the restrictions and "red tape" which are imposed upon honest and reputable physicians and druggists, have proved burdensome in the extreme. It is hoped that *some good* has also been accomplished.

The very useful summary of the main features of the various State laws, on the following pages, was published in the *Medical World*, November, 1916.

ANTIPERIODICS.—Remedies that affect certain periodic febrile diseases, preventing paroxysms or lessening the severity thereof. They are so called because they tend to break up the periodicity of the attacks which are characteristic of the disease, and they probably arrest the development in the blood of successive crops of pathogenic organisms. The principal ones are the cinchona bark and its alkaloids (especially quinine), bebeeru bark and its alkaloid berberine, salicin, salicylic acid and the salicylates, arsenic, opium and its alkaloid narcotin, eucalyptol, iodin, and Warburg's tincture.

ANTIPHLOGISTICS.—Measures and medicines that are regarded as having some specific action in reducing, or in preventing the progress of, inflammatory processes. Opium and mercury are especially effective in inflammations of serous membranes, aconite and antimony in inflammations of the respiratory tract and organs, and veratrum viride in puerperal metritis.

The chief antiphlogistics are the following: Aconite, veratrum viride, tartar emetic, mercury, opium, gelsemium, digitalis, ergot, ipecac, potassium nitrate, rest (recumbent position), venesection, local depletion, purgation, counterirritation, cold. Antiphlogistics are nearly all contraindicated in the presence of tissues whose vitality is impaired through former diseased conditions. See INFLAMMATIONS.

ANTIPLAGUE SERUM.—See PLAGUE.

ANTIPNEUMOCOCCUS SERUM.—This serum has been used with success in some cases although in other cases disappointment is reported in spite of its alleviating many of the symptoms. The dose is 20 c.c. hypodermically every 4 to 6 hours while the temperature is above 103° F. See PNEUMONIA; PNEUMOCOCCUS INFECTIONS.

ANTIPYRETICS.—Agents or measures that reduce the body-temperature when abnormally high. This may be done by two principal methods as follows:

By lessening the production of heat, by	1. Diminishing tissue-change; 2. Reducing the circulation.
or	
By promoting the loss of heat, by . . .	3. Dilating the cutaneous vessels and producing increased radiation. 4. Producing perspiration and its evaporation. 5. Abstracting heat from the body.

The following list (Potter) contains nearly all the antipyretics, the number following each referring to its proper method of action, as previously enumerated:

Quinine.[1]	Trimethylamin.[2]	Alcohol.[1,3]
Quinidin.[1]	Salol.[1]	Digitalis.[2]
Cinchonin.[1]	Acetanilid.[1,4]	Aconite.[2]
Cinchonidin.[1]	Antipyrin.[1,4]	Camphor.[1]
Berberin.[1]	Acetpheneti-	Antimonials.[2,4]
Benzoic acid.[1]	din.[1,4]	Veratrin.[2]
Carbolic acid.[1,3]	Chinolin.[1]	Colchicum.[2]
Picric acid.[1]	Resorcinol.[1]	Leeching.[2]
Salicin.[1]	Kairin.[1,4]	Cupping.[2]
Salicylic acid.[1]	Kairolin.[1,4]	Blistering.[2]
Sodium salicy-	Hydroquinon.[1]	Poulticing.[2]
late.[1,4]	Thallin.[1,4]	Nitrous ether.[3,4]
Quinin salicy-	Pyrocatechin.[1]	Dover's powder.[4]
late.[1]	Phenoresorcin.[1]	Cold bath.[5]
Methyl salicy-	Eucalyptol.[1]	Cold drinks.[5]
late.[1]	Thymol.[1]	Ice to surface.[5]
(Oil of gaul-	Other essential	Cold sponging.[5]
theria).	oils.[1]	Wet-packing.[5]

Purgation and venesection produce antipyretic results, but their mode of action is doubtful (Brunton). The body-temperature is raised by belladonna (or atropin) and by cocain, but not to so great a degree as to constitute fever or enable them to be classed as pyretics. Tuberculin, various albumoses, and certain animal poisons, as that of shell-fish, will also produce a rise of temperature.

ANTIPYRIN.—$C_{11}H_{12}N_2O$. Phenyl-dimethyl-pyrazolon. Phenazonum. A crystalline substance obtained from phenyl hydrazin. It forms salts analogous to those of ammonium, and occurs as colorless and inodorous scaly crystals, with a bitter taste, freely soluble in water, alcohol, and chloroform, less so in ether. With ferric chlorid it gives a deep red color, a green one with nitrous acid, and a yellow color, deepening to crimson on warming with nitric acid. It is not irritant to the stomach or tissues and may be administered hypodermically. Antipyrin has little flavor, is not unpleasant, and is therefore readily given to children; in this respect it is far superior to quinin. Dose, about 4 grains; best given in aqueous solution with one-half its quantity of sodium bicarbonate.

Incompatibles.—Antipyrin may be decomposed when brought into contact with nitrous compounds, a new and poisonous substance being supposed to be formed, of uncertain composition, but resembling the anilin greens. The mixture of this drug with spirit of nitrous ether is, therefore, highly

DIGEST OF STATE ANTINARCOTIC LAWS

State.	Prescription Required.	Dispensing Permitted.	Exemptions to Law.	Record Required.	May Treat Addicts	Refilling Prescription Prohibited.	Possession by Laity Prohibited.	
Alabama	Yes		Yes					
Alaska	Opium only.							Sale to addicts prohibited. Cause of revocation of license of druggist.
Arizona	Yes		Yes	Yes	Yes		Yes	After three weeks administration of narcotics consultation required and report names, etc., to health officer of town.
Arkansas	Yes							
California	Yes		Yes	Yes	Yes		Yes	Report habitues treated within twenty-four hours to Board of Pharmacy. Addicts may be committed.
Colorado	Yes	Yes	Yes	Yes exc. "personally attend."			Yes	Sale to addicts prohibited. Revocation of license if convicted of illegal dispensing.
Connecticut	Yes	Yes	Yes	Yes exc. "personally attend."	Yes	Yes		Revocation of license of addicts.
Delaware	Yes		Yes					Narcotic sold must be labeled. Forbidden to sell except to sick.
Dist. of Columbia	Yes		Yes					
Florida	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Health officer may prescribe for addicts. All physicians send to City Board of Health within three days of each narcotic prescription. Report to Board of Health or county judge if patient will not persist in treatment. Incurables may have prescription narcotic after investigation by Board of Health or judge. Revocation of license.
Georgia	Yes		Yes					
Hawaii	Yes							Treatment of addicts provided for.
Idaho	Yes	Yes	Yes					Practitioners convicted of violating law made ineligible to continue practice.
Illinois	Yes	Yes	Yes	Yes exc. "personally attend."		Yes		
Indiana	Yes	"Administering" instead of dispensing in law.	Yes					
Iowa	Yes							Law refers to cocain, cotton root, ergot, tansy, savin.
Kansas	Yes							Morphin, cocain and chloral.
Kentucky	Yes		Yes					
Louisiana	Cocain only.							
Maine	Yes	Yes	Yes	Yes within 48 hours.	Must not prescribe to addicts.		Yes	
Maryland	Yes		Yes				Yes	
Massachusetts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Michigan	Yes	Yes	Yes					
Minnesota	Yes	Yes	Yes	Yes			Yes	
Mississippi	Cocain only.						Yes cocain	
Missouri	Yes		Yes		Only "for immediate preservation of life."			Opium smoking houses forbidden.

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Montana	Yes		Yes		Yes			
Nevada	Yes	Only by pharmacist.	Yes		Yes			Copies of all orders for narcotics must be mailed to Board of Pharmacy within twenty-four hours.
Nebraska	Yes				Yes Record kept and copy filed with county attorney within five days.	Yes		
New Hampshire	Cocain						Yes	
New Jersey	Yes	Yes						Sale prohibited.
New Mexico	Yes	Yes	Yes					
New York	Yes Copy given to purchaser; verification needed if amounts over four grains morphin, etc. Prescription for hypodermic syringe.	Yes	Yes				Yes	Restricts amount in drug stores. Druggist prohibited from filling prescriptions of dentists and veterinarians for own use. Copy of prescription to be given to patient by druggist. No copy of physician's prescription to be given except the amount be less than 1 gr. to f ℥ or 2 gr. to 1 ℥ ointment, in which case a certificate is given showing the amount. Revocation of license. Limit of quantity allowed on hand.
North Carolina	Yes							
North Dakota	Yes				No		Yes	
Ohio	Yes		Yes				Yes	
Oklahoma	Yes		Yes					Teach narcotic effects in public schools.
Oregon	Yes		Yes				Yes	Pharmacy law: Unlawful for any person to manufacture, sell or dispense any drugs . . . unless such person be a registered pharmacist.
Pennsylvania	Cocain only.						Yes	
Philippines							Yes	Prescription for patient who does not need narcotics; cause for revocation.
Rhode Island	Yes		Yes				Yes	
South Carolina	Cocain only.						Yes	
South Dakota	Yes	Yes	Yes	Physicians must keep duplicate of narcotic ℞.			Yes	Quantity of cocain, etc., limited. Cocain can only be dispensed in liquid form. 5 percent limit.
Tennessee	Yes	Yes	Yes	Duplicate prescription of narcotic dispensed.			Yes	Quantity of cocain, etc., restricted. Cocain can only be dispensed in liquid form. 5 percent strength.
Texas	Yes		Yes					
Utah	Yes	Yes	Yes	Yes	Yes Report in 24 hrs. to State Board of Pharmacy.		Yes	
Vermont	Yes	Yes	Yes	Yes				
Virginia	Yes Yes for hypo. syr.	"Admin." perm.	Yes		Yes, Sanit. May prescribe ad lib. but copy of ℞ must be sent to Board of Health in 24 hours.			Limit of amount prescribed: 16 gr. opium, 8 gr. morphin, 8 gr. heroin, 8 gr. cocain, 8 alpha eucain, 8 gr. beta eucain, 1 oz. laudanum in 48 hours.
Washington	Yes		Yes					
West Virginia	Yes		Yes				Yes	
Wisconsin	Yes							Quantity limited.
Wyoming	Yes	Yes			Yes			Any administration or prescription of narcotic in excess of quantity in law shall report within five days to State Board of Health.

ANTINARCOTIC LEGISLATION

dangerous if this supposed reaction is at all likely to occur.

Incompatibles are: Alum, ammonia-water, amyl nitrite, benzoates, beta-naphtol, bromin, butyl-chloral hydrate, calomel, chloral hydrate, copper sulphate, chromic acid, cinchona alkaloids, euphorin, ferric chlorid, ferric salts in solution, ferrous sulphate, hydrocyanic acid, iodin, iodids, lead subacetate, mercuric chlorid, nitrites, orthoform, phenol, potassium permanganate, pyrocatechin, pyrogallol, resorcin, sodium bicarbonate, sodium salicylate, spirit of nitrous ether, tartar emetic, tannic acid, thymol, urethane; also tinctures of catechu, cinchona, hamamelis, iodine, and rhubarb; and infusions of catechu, cinchona, rose-leaves, and uva ursi. Antipyrin and euphorin liquefy when rubbed together.

Physiologic Action.—Antipyrin is a powerful antipyretic, a local anesthetic, and a general analgesic, and also possesses diaphoretic, mydriatic antiseptic, disinfectant, hemostatic, and slight hypnotic powers. After the ingestion of a full medicinal dose (20 grains), there is a stimulant stage of short duration, in which the heart's action is increased, and a subjective sense of heat is experienced, with flushing of the face. This is soon followed by profuse sweating, coldness of the surface, slowed pulse, considerable depression, and, if fever is present, a lowered temperature.

Therapeutics.—Antipyrin performs three important functions: (1) It lowers temperature; (2) it allays pain; (3) it checks convulsions and manifestations of motor excitation. It is more used to allay pain than for any other purpose. It is valuable in nervous headache, migraine, neuralgia, dysmenorrhea, locomotor ataxia crises, seasickness, neuralgia, sciatica, and lumbago, hypodermically. It is next in importance to the bromids in idiopathic epilepsy, is particularly of value in whooping-cough, and is useful in chorea and bronchial asthma. Antipyrin is used locally as a sedative, moderate analgesic, and hemostatic. It is a valuable adjunct in the treatment of nasal catarrh. It has been used with calomel on corneal opacities. Large doses are followed by marked cyanosis, dyspnea, and collapse, and various skin lesions may follow its continued administration. These symptoms usually pass off upon the application of external heat and the free use of stimulants.

In epilepsy:

℞. Ammonium bromid, ʒ j
Antipyrin, ʒ j
Solution of potassium arsenite, ʒ j
Peppermint water, enough to make, ʒ vj.

Mix into a solution and give a teaspoonful in water night and morning.

ANTIPYRIN SALICYLATE.—See Salipyrin.

ANTISEPTIC AND ASEPTIC SURGERY.—A thorough exposition of this subject is contained in the article on Abdominal Section.

ANTISEPTICS AND DISINFECTANTS.—Antiseptics are agents which arrest the development of the microorganisms which produce decomposition. In stronger solutions than those required for their antiseptic action, most of the antiseptics are germicidal and are therefore disinfectants; but all disinfectants are antiseptics. The chief antiseptics are named in the following list, the figures giving the minimum strength of their effective solutions, though these figures cannot be applied to all bacteria and their spores indiscriminately:

Mercuric chlorid, 1:50,000
Mercuric iodid, 1:40,000
Formaldehyd, 1:25,000
Silver nitrate, 1:12,500
Aluminum acetate, 1:6000
Creolin, 1:5000
Chlorin, 1:4000
Creosote, 1:3000
Naphthol, 1:3000
Copper sulphate, 1:2000
Pyoktanin, 1:2000
Bromin, 1:1666
Thymol, 1:1500
Salicylic acid, 1:1500
Eucalyptol, 1:1000
Hydrogen dioxid, 1:1000
Calcium hypochlorite, 1:1000
Trikresol, 1:1000
Benzoic acid, 1:900
Sulphuric acid, 1:800
Quinine sulphate, 1:80
Zinc chlorid, 1:500
Phenol, 1:333
Alcohol (absolute), 1:333
Potassium permanganate, 1:300
Acetic acid, 1:250
Alum, 1:222
Ferrous sulphate, 1:200
Coffee (freshly roasted) 1:200
Arsenic trioxide, 1:166
Boric acid, 1:143
Hydrated chloral, 1:107
Resorcinol, 1:100
Antipyrin, 1:25
Calcium chlorid, 1:25
Zinc sulphate, 1:20
Sodium borate, 1:14
Potassium bromid, 1:10
Potassium iodid, 1:10
Ammonium chlorid, 1:9
Sodium chlorid, 1:6
Glycerin, 1:4

The best antiseptics for surgical use are those which act sufficiently on microorganisms without injuring or irritating the tissues. The *Mercuric Salts* are very poisonous. *Chlorin*, *Bromin*, and *Iodin* are too irritant. *Benzoyl-acetyl peroxide*, though actively germicidal, has no antiseptic power on account of its proneness to break up in the presence of organic substances (Novy). *Salol* is of little value but the products of its decomposition in the intestines are active germicides, and it is one of the best intestinal antiseptics (Wood). *Benzoic Acid* and *Naphthol* are good intestinal antiseptics, but complete asepsis in this situation is impossible.

Disinfectants are agents which destroy the specific germs of infectious diseases. Many antiseptics do not possess germicidal power, and therefore are not disinfectants; but all disinfectants are antiseptics. Disinfectants act in several ways, some as oxidizants, others by combining with albumin, others by chemical combination forming substitution-compounds, others by arresting molecular changes, and still others by altering the reaction of the media containing the germs. The principal disinfectants are named in the following list, the figures following each giving the strength of its aqueous or aerial solution necessary for rapid and certain action:

Fire, the most efficient.	Chloretone, 1:100
Heat, moist, at 212° F.	Calcium hypochlorite, 1:100
Heat, dry, at 302° F.	Eucalyptol, 1:100
Benzoyl-acetyl peroxid, 1:1000	Creolin, 1:100
Mercuric chlorid, 1:1000	Lysol, 1:100
Iodin, 1:500	Trikresol, 1:50
Bromin, 1:500	Phenol, 1:33
Benzoic acid, 1:250	Sulphurous acid, 1:25
Salicylic acid, 1:200	Liq. Sodæ chlorinatæ, 1:20
Formaldehyd, 1:100	Ferrous sulphate, 1:20
Hydrogen dioxid, 1:100	Acetic acid, 1:134
Potassium permanganate, 1:100	Lime, fresh, 1:4
Chlorin, 1:100	Zinc chlorid, 1:2

Many good disinfectants are not available by reason of cost or some side action, as hydrogen dioxid, bromin, iodin, potassium permanganate. *Formaldehyd* is the best surface disinfectant, but has slight penetrating power. It has the advantage of being nontoxic and not retarded in action by albuminoid matter. *Sulphurous Acid* is of very doubtful value, even when present to the extent of 10 percent in moist air (Koch). *Chlorin* is used rather as a deodorant than a disinfectant, its germicidal power being uncertain (Munson). *Burnett's Fluid* is a 50 percent solution of zinc chlorid, and equivalent to the official Liquor Zinci Chloridi. *Labarraque's Solution* is the same as the official Liquor Sodæ Chlorinatæ. Both these preparations depend for their efficacy upon the amount of free chlorin which they give out. *Condy's Fluid* is a 2 percent aqueous solution of potassium permanganate; and though a good antiseptic and deodorant, it is practically useless as a disinfectant, being constantly expended in oxidizing the organic matter of the infective substance, and would be required in enormous and impracticable quantities (Davies).

The popular idea of disinfecting *the air* of a room by burning sulphur, etc., is an absurdity, because foul air is easily removed by simple ventilation. In disinfecting a room in which there has been a case of contagious or infectious disease, the true aim is to kill the germs contained in the dust on ledges, in the crevices between the boards, or adhering to the walls, and a dry gas is powerless for this purpose, which is best accomplished by using a *Corrosive Sublimate Solution* of the strength of 1:1000; or by *Lime* washing, provided that the lime be freshly burnt, and caustic; or by spraying with *Formalin*, or by dropping the latter on hot plates or sheets of hot metal (Potter). See Disinfection.

ANTISIALAGOGS.—Remedies or medicines that are effective against salivation. Atropin is the principal agent of this class, acting by paralyzing the terminations of the nerves of secretion. Physostigma counteracts this paralysis, but acts as an antisialic by lessening the blood supply to the glands. Opium diminishes the reflex excitability of the reflex center and also diminishes the secretion. Others acting locally are: Borax, potassium chlorate, soda, lime, lithia, magnesia, insipid or nauseous articles of food or medicine.

ANTISPASMODICS.—Agents that prevent or allay spasm of voluntary or involuntary muscles in any portion of the organism. Some of the agents belonging to this class act by stimulation of the higher nervous centers, the coordinating power, and the circulation, as alcohol and ether in small doses, camphor, musk, valerian, etc.; others by depressant influence on the motor centers, as the bromids, and still others by paralysis of the end organs of the vasomotor nerves, as amyl nitrite. A few depress all the vital functions, as aconite, tobacco, lobelia, hellebore, and prussic acid; and many stimulate the bowels to expel gaseous accumulations; namely: asafetida, cajuput, valerian, musk, aromatic oils, etc.

The principal antispasmodics are: Alcohol, ether, paraldehyd, chloroform, amyl nitrite, nitrites, bromids, potassium iodid, potassium nitrate, arsenic, valerian, conium, aconite, lobelia, tobacco, hellebore, opium, belladonna, stramonium, hyoscyamus, hydrocyanic acid, physostigma, curare, ammoniac, castor, musk, galbanum, sumbul, ipecacuanha, senega, silver salts, zinc salts, copper salts, asafetida.

Potassium bromid is the most powerful antispasmodic in such convulsive diseases as epilepsy, laryngismus stridulus, and infantile convulsions; valerian, asafetida, and the bromids, in hysteria; arsenic, copper, conium, and zinc, in chorea; lobelia and stramonium, in spasmodic asthma, nitrite of amyl in spasm of the blood-vessels.

The indications for the administration of antispasmodics are chorea, whooping-cough, epilepsy, asthma, delirium tremens, hiccough, hysteria, nervous excitability, and neurasthenia.

ANTISTAPHYLOCOCCUS SERUM.—See Staphylococcus Infection.

ANTISTREPTOCOCCUS SERUM.—A serum originally obtained by Marmorek from injecting the streptococcus and products into the horse. It has been used to combat all conditions caused by the streptococcus, although the reports of success are variable. See Streptococcus Infections.

ANTISYPHILITIC.—A remedy directed against, or used for the relief of, syphilis. Usually an Alterative (*q. v.*). See also Syphilis.

ANTITETANIC SERUM.—See Tetanus.

ANTITHYROID PREPARATIONS.—The blood or milk of animals whose thyroid glands have been removed has proved effective in the treatment of exophthalmic goiter of the mild type, and of obscure nervous disorders which are apparently dependent upon thyroid hypersecretion. *Antithyroidin.* Dose, 8 to 15 minims by mouth three times a day, gradually increasing as necessary. *Thyreoidectin.* Dose, 5 to 10 grains in capsule form three times a day. See Thyroid Treatment.

ANTITOXIN.—See Diphtheria Antitoxin, Serum Therapy and Vaccine Therapy.

ANTITYPHOID SERUM.—See Typhoid Fever.

ANTIVENIN.—A term given to the blood-serum of animals rendered immune against snake-poison, on account of its antidotal properties. Calmette's is the recognized serum for serpent bites and has been used successfully in many cases. It is of

decided value in all forms, but especially against cobra venom. It has been employed in cases of leprosy with excellent results. The dose is 20 to 40 c.c. repeated frequently in conjunction with other measures, *e. g.*, ligature above the wound which should be laid open, well sucked and surrounded by injections of an aqueous solution of calcium chlorid. See Bites and Stings, Serpent Venom.

ANTIZYMOTICS.—Agents preventing the process of fermentation; antiferments. They are usually subdivided into Antiseptics and Disinfectants (*q. v.*). See Fermentation.

ANTRUM.—See Jaws, Nose.

ANURIA.—See Urine (Retention, Suppression.)

ANUS, FISSURE.—A small, painful crack or ulcer, usually situated just within the anus, and seldom involving more than the skin or mucous membrane.

Causes.—Almost always constipation; sometimes neglect of local cleanliness or other source of irritation. The passage of unusually hard feces is often the immediate exciting cause. When the ulcer is once thoroughly established, healing is prevented by the action of the sphincter and the irritation of its surface during defecation.

Symptoms.—The chief of these is pain, the result of spasm of the sphincter. It is often very severe, and occurs during and after defecation. It may last for a few minutes or longer, even for several hours, and then cease until the next stool. The pain may not only be felt in the anus, but may be reflected down the thighs or to other parts, as the uterus, vagina, or testicles. The stools are often slightly streaked with blood, sometimes with pus. On examination, the sphincters are found spasmodically contracted. On gently everting the margins of the anus, the end of the ulcer will be discovered usually at the posterior part, a small, external pile or edematous fold of skin that is generally present then serving as guide to it. The insertion of the finger is attended with great pain.

Treatment.—In mild cases the use of laxatives and the application of astringent lotions or sedative ointments before and after defecation may be sufficient.

Allingham recommends the following ointment:

℞.	Calomel,	gr. iv
	Powdered opium,	gr. ij
	Extract of belladonna,	gr. ij
	Ointment of elder flowers,	ʒ j.

Tuttle insufflates a small quantity of anesthesin upon the surface of the ulcer and after a few minutes applies a few drops of pure ichthyol on a pledget of cotton. These applications are made every second day. The results are said to be excellent except in cases in which the sphincter is hypertrophied, hard, and spasmodically contracted, or the ulcer deep and indurated, and especially when the fibers of the sphincter are exposed. For the relief of spasm as well as of the pain sometimes produced by the ichthyol, an ointment composed of equal parts of the official ointments of stramonium, belladonna, and hyoscyamus is very efficacious.

If these fail, the sphincter may be forcibly dilated, or the ulcer measures divided together with half or more of the external sphincter by drawing a straight bistoury longitudinally through the base of the ulcer. The bowels should then be kept confined for 4 or 5 days, and the stools afterward kept soft for a fortnight or longer; or the sphincter may be divided subcutaneously by passing a tenotomy knife beneath it through the mucous membrane and cutting outward toward the skin. Ball treats these cases by cutting off a small pile at the end of the fissure. This simple operation, and that of the subcutaneous division of the sphincter, may be done without pain by painting the mucous membrane with cocain or spraying it with chlorid of ethyl, and does not necessitate the patient's lying in bed for more than 2 or 3 days.

Irritable sphincter of the anus, when independent of fissure or ulcer, is a serious source of trouble in defecation, since the power of the bowel is insufficient to overcome the impediment caused by the contracted muscle. It is generally found in hysteric females. It is relieved by mild laxatives, the local application of cocain, or an opiate ointment, and the occasional passage of a bougie coated with a sedative ointment.

ANUS, FISTULA.—By fistula, in the general sense of the term, is meant a sinus in the vicinity of the anus, left by an abscess that has healed up to a certain point, and then either remained stationary or grown worse. It may be complete, with one opening in the bowel and the other on the skin; or incomplete, the internal or the external opening only being present. The former of these is known as a blind internal fistula, the latter as a blind external one. In point of importance, fistulas may be divided into anal and rectal. The former merely occur near the margin of the anus, and are either entirely subcutaneous or are merely covered in by some of the fibers of the external sphincter; the latter are larger and deeper, running from the ischiorectal fossa, between the sphincters, or even above the internal one, and are often complicated by sinuses under the skin or in the submucous tissue.

The causes of fistulas are essentially those of the abscesses that give rise to them: injury to the mucous membrane, from fish-bones or other foreign bodies; tuberculous deposits; stricture; extravasation in the loose fatty tissue of the ischiorectal fossa; inflamed hemorrhoids; cutaneous boils, etc. The cause of their persistence is to be found in the mobility of the part, the spasmodic contraction of the sphincter and the levator ani, and, if there is an internal opening, the constant entrance of irritating substances from the bowel. Blind internal fistulas are the most rare, complete ones by far the most common, although it is sometimes a little difficult to find the internal opening. Probably, most are incomplete at first, but the second opening is soon formed; the abscess, as it enlarges, works its way simultaneously toward the bowel and the skin, and unless it is opened early, the mucous membrane is separated from the subjacent tissue to such a degree that it gives way by ulceration even after the pressure of the pus is relieved.

A fistula may be either a straight passage from the skin to the bowel, or it may be complicated by sinuses running from it in every direction. The most common of these is in the submucous tissue; the internal orifice is nearly always on a level with the internal sphincter, seldom more than an inch or an inch and a half from the anus; but sinuses may run up from this under the mucous membrane for several inches. More rarely, instead of taking this direction it passes round the bowel, causing what is known as a *horseshoe fistula*, and opening sometimes on one side, at others on both. In other cases, especially when there is a stricture of the rectum, these offshoots extend under the skin of the buttock, and open several inches away.

The walls of a recent fistula are covered with granulations, and secrete a thin, purulent fluid; after repeated attacks of inflammation they become thick and dense, the lining smooth and glistening, like the surface of a chronic ulcer on the leg. The external orifice may be the size of a pinhole or lie in the center of a little button-like mass of granulations; or, in tuberculous patients and after the rupture of a chronic abscess, there may be a large, irregular opening with undermined edges, like a scrofulous ulcer on the neck. The internal orifice presents very much the same character; at times it feels like a distinct papilla resting on the base that is firmer than the surrounding parts; on the other hand, especially in the case of blind internal fistula, it may be a large, irregular ulcer.

Symptoms.—So long as there is free exit for the discharge, fistulas merely give rise to inconvenience and discomfort. The skin around the anus is constantly moist, the surface becomes tender and eczematous, and little cutaneous boils are likely to form. In the worst cases there may be an escape of feces and flatus through the orifice, but there is never the agonizing pain of fissure. Now and then the orifice becomes obstructed; the discharge collects; the skin becomes hot and red and tender; the action of the bowels is attended with pain, and a small abscess forms. When this breaks or is opened, the symptoms subside again, but at each recurrence there is either an increase in the density of the tissues around or the formation of an outlying sinus.

Diagnosis.—There is rarely any difficulty in this; the patient is usually aware of the cause of his suffering; and the presence of a small orifice by the side of the anus, from which a drop or two of thin semipurulent fluid can be squeezed, is conclusive. It is necessary to ascertain the kind of fistula; whether it has an internal opening, and where it is; whether there are many sinuses in connection with it, and where they run; and, particularly, whether there is any cause for its persistence other than the action of the sphincter and the mobility of the part. There may be, for example, a stricture of the rectum, high up, and a complete fistula with its internal orifice in the usual situation near the anus; or, what is even more perplexing, there may be a complete fistula and necrosis of the sacrum or coccyx at the same time; the diseased bone has caused the formation of an ischiorectal abscess, and this has led to the development of a fistula. Of course, in any of these cases an operation upon the fistula alone is worse than useless.

The patient should lie upon a couch, on the affected side, with the knees drawn up. In most cases the orifice of the sinus is visible at once, but sometimes it is very small, concealed behind folds, or may be closed for the time being. If it cannot be seen, the induration can nearly always be felt, even when the fistula is a blind internal one, and very often slight pressure causes a drop of pus to exude. Sometimes the whole track of the sinus can be made out with the finger.

When there is an opening, a probe may be gently passed into it before anything further is done, in the hope that it may succeed in reaching the internal orifice without exciting the action of the sphincter. Usually, the sinus runs almost under the skin toward the bowel. If this does not succeed, the finger must be introduced and the mucous surface carefully explored just inside. Generally there is no difficulty in feeling the opening; if, however, it cannot be found, a speculum may be used, or some milk or other colored fluid is injected into the orifice; nearly always some of it finds its way into the bowel. It is a common mistake to pass the finger in too far at first and overlook the opening.

Blind internal fistulas differ from the others. They usually communicate with the bowel by an aperture of some size; and from the fact that fecal matter is constantly entering and setting up inflammation, they are very often attended with a good deal of pain. There is no discharge externally, but the patient is usually aware of a swelling by the anus emptying itself every now and then into the bowel with temporary relief. Digital examination nearly always reveals a hard and painful mass in the ischiorectal fossa, and often an irregular ulcer of considerable size in the bowel. Occasionally, the sac can be emptied by pressure; but to make the diagnosis certain, a probe bent like a hook must be passed down into the sinus through the anus. Fistulas of this kind are usually caused by a foreign body perforating the mucous surface of the bowel, or by the softening of some tuberculous deposit in the wall.

Treatment.—As a rule, fistulas can only be cured by operation. In exceptional cases in which there is no internal opening and in which the patient will submit to prolonged treatment, the sphincter may be stretched, the sinus stimulated with strong carbolic acid or tincture of iodin, and the external orifice kept widely open in the hope that it will close; but it nearly always ends in failure, after a long waste of time. The only method that is reliable is division of all the structures between the fistula and the anus, so as to lay it open from one end to the other and give it complete rest.

An aperient is given the night before, and an enema the morning of the operation. The patient is placed under an anesthetic, and laid on the affected side, close to the edge of the table, with the knees well drawn up and held by an assistant, who also raises the upper gluteal fold. The sphincter is gently dilated, and a director passed from the external orifice along the sinus into the bowel. Care must be taken to bring it out at the internal

opening and not make a fresh one, except in the case of a blind external fistula. Then the point of the director is brought out through the anus, so that the structures to be divided are stretched over it like a bridge, and a clean incision made through them with a sharp-pointed bistoury.

If this cannot be done, the finger is introduced into the bowel, a blunt-pointed bistoury passed along the director until its end can be felt coming through the orifice, and then, after withdrawing the director, the finger and the bistoury are brought out together so as to divide with one sweep all the structures that lie between them.

After this, exploration must be made for outlying sinuses. A submucous one may be laid open with a pair of blunt-pointed scissors; or if, from its position, there is any risk of serious hemorrhage, an elastic ligature may be passed through it by means of a suitable probe and tied as tightly as possible. Those under the skin are treated in the same way; or if they are of great length, a drainage-tube may be passed along them and brought out through an incision at the other end. If one is overlooked, an abscess is almost sure to form before the wound is healed, and render a second operation necessary In case of old fistulas lined with a smooth layer of false mucous membrane, the walls must be scraped thoroughly with a sharp spoon, so as to insure removal of all the indurated mass. Polypoid outgrowths and hemorrhoids are dealt with at the same time, and loose and undermined flaps of skin are cut away, though discretion is necessary.

Any bleeding point is tied or twisted at once, the wound packed with iodoform gauze, and a firm pad placed over the anus and secured in position with a T-bandage. The following day all external dressings are removed, and the deeper layer allowed to separate in a bath. The wound is cleansed night and morning and after each defecation, pain being prevented by cocain, and a single fold of lint laid between the edges. The application should be varied from time to time, according to the state of the granulations. The bowel should not act for 4 or 5 days after the operation, and the stools should be kept soft until the wound is perfectly sound. The recumbent posture is essential until healing is completed, although it is not necessary for the patient to be kept in bed for more than a week or ten days.

Moullin has succeeded in obtaining union by first intention by thoroughly refreshing the base of the sinus after the sphincter had been divided, and bringing the surfaces together in accurate contact with deep wire sutures. It is necessary, however, to move them at the first sign of suppuration, or secondary sinuses may form. Buried catgut sutures would probably answer better; but this can only be tried when the fistula is recent and simple in character, and when the patient is young and healthy.

In cases in which there are deep sinuses, when there is much reason to fear hemorrhage, or when the patient is exceedingly nervous, an elastic ligature may be used to divide the tissues gradually. It should be a solid cord, passed through from the bowel into the sinus, drawn as tightly as possible, and secured by means of a leaden clamp. Generally, it cuts through in from six days to a fortnight, and without pain; but sometimes it is followed by serious inflammation, and if there are any secondary sinuses present—and it often happens that this cannot be determined until the fistula is laid open—it is almost sure to fail. The length of time the wound takes in healing is approximately the same as follows other methods of division.

Incontinence of feces is always present for two or three weeks after the operation, and inability to control flatus for some time longer; but if the sphincter is divided at right angles and in only one place, there is seldom any permanent loss of power. According to Allingham, it is fairly safe if ever so narrow a ring of the upper part of the band of the internal sphincter is left. An exception, however, must be made in the case of anterior fistulas in women; the sphincter vaginæ and the sphincter ani decussate in the perineum, and the free incision through the front part of the anus is not unlikely to be followed by incontinence. In these cases it is well to apply the actual cautery freely to the old cicatrices, and to the external and internal sphincters as well, in several places, so as to narrow the orifice of the anus by the subsequent contraction; it is said that the muscular fibers, which are always very much degenerated, soon regain a considerable degree of their former power. Phthisical patients are exceedingly liable to fistula, but except in cases of extreme exhaustion, operation is advisable.

ANUS, IMPERFORATE.—See RECTUM (Abnormalities).

ANUS, PRETERNATURAL.—A term used for cases in which the aperture of the bowel communicates directly with the surface of the body, the escape of feces being direct and not through a fistula. Three varieties exist: (1) Congenital; (2) accidental; and (3) acquired. The first variety is limited to cases in which Meckel's diverticulum opens at the umbilicus. It may persist for years after birth. The opening is small, and generally closes spontaneously with the umbilical cicatrix. The second variety results from a wound, perforating ulcer, or gangrene, usually following strangulated hernia, and is the usual form of artificial anus. The third variety is the result of surgical operations upon the intestines, purposive or accidental.

Treatment of an artificial anus requires protection of the skin surrounding the opening, by painting with collodion, or by constant oiling with simple ointment or vaselin. Wearing a receptacle and protecting or guiding the escaping feces into this by means of a thin india-rubber tissue may be tried. As a rule, the patient will construct some sort of pad to receive escaping feces. Scrupulous cleanliness is imperative. The general health is to be maintained, and opium administered to check inordinate movements of the intestines. Constipation is to be prevented when the opening is into the colon, and the stools kept soft. Pressure by means of a truss or disc fixed over the fistula may bring about a spontaneous cure in mild cases. The difficulty is from the spurs or buttresses of

the opening, which refuse to heal. An india-rubber tube inserted into the two ends of the bowel has allowed the elastic pressure to overcome this and maintains the passage of the intestine free. Caustic measures to overcome this éperon are usually of little avail. Of the radical measures for the cure of an artificial anus, Denonvilliers' operation, Dupuytren's operation, and resection of the intestines have been employed. The last is an improvement upon the uncertain and tedious and ever-dangerous operation of Dupuytren, and its risks are more capable of being estimated, and, hence, guarded against.

Gangolphe counsels the employment of peritoneal incision and enterorrhaphy in cases of preternatural anus. There are, he points out, two methods of dealing with this condition: In one the surgeon works from without inward in the immediate neighborhood of the opening and, after gradual dissection, exposes the two extremities of the divided intestine, and draws these outward; in the other, the peritoneal cavity is opened by an incision made through the abdominal wall at some distance from the false anus. The latter method possesses many advantages. It is rapid, and the surgeon, without dread of wounding any important organ, cuts directly into the abdominal cavity. It is certain, as the finger introduced into the abdomen can explore the structures in the immediate neighborhood of the false anus, and guides the scissors or other cutting instruments by which the perforated portion of the intestine is set free. It permits free exposure and complete isolation of the structures submitted to operation. The risks of infection are diminished, and the manipulations of the surgeon facilitated by the free exposure of the perforated or divided portion of intestine. It is applicable to every case of false anus, and is likely to prove successful when the former method has failed. Gangolphe gives a description of his operative method, which, with variations in detail to meet special circumstances, he has practised with complete success in three instances. The first stage consists in making an oval incision about the false anus extending through sound skin and other layers of the abdominal wall as far as the peritoneum. This membrane is now incised at the upper wall so as to permit the introduction of the finger into the peritoneal cavity for the purpose of exploration. The extent of the adhesions of the intestine to the abdominal wall having been determined, the oval portion of abdominal wall formed by the first incision is set quite free, and the divided portion of the intestinal canal is freely exposed. The subsequent stage of the operation will depend on the size of the false anus and the extent of the intestinal adhesions. If the opening is small and involves only a portion of the circumference of the gut, it may be closed by lateral suture after excision of surrounding callous tissue. If there is much loss of intestinal structure and a spur has formed at the seat of the false anus, the author would set free both ends of the intestine, and then bring them together either by circular suture, Murphy's button, or Laplace's forceps. The last two methods are indicated in any case in which the patient cannot tolerate a long operation, and when the surgeon is inexperienced in the application of intestinal sutures, or is operating under unfavorable conditions. In cases of extensive adhesions it would be necessary, after apposition by suture or button at the ends of the intestine, to separate the loops of intestine from one another and from the abdominal wall by very careful dissection, and after closure of the external wound to drain the seat of operation. See Intestines (Surgery).

ANUS, PROLAPSE.—See Rectum (Prolapse).

ANUS, PRURITUS.—Itching about the anus, though often dependent upon local conditions, may occur without apparent cause. Such cases have been attributed to gout or disordered digestion. Eczema, hemorrhoids, and condylomata are fruitful sources of pruritus. Drinking milk in large quantities daily has been a cause.

Symptoms.—The itching is often intolerable, and is made worse when the patient is warm, as when in bed. If local causative conditions are present, they will be readily detected.

Treatment is directed to the removal of the cause, such as thread-worms, fissures, ulcers, pediculi pubis, hemorrhoids, etc. If the condition is an expression of a well-marked neurosis, arsenic, quinin, phosphorus, tonics, salicylates, antipyrin, or acetanilid should be given. The general health must be improved and the bowels closely looked after, and local treatment to allay the irritability of the peripheral nerves given. Cocain gives short relief and morphin suppositories with or without belladonna, often aggravate, although they may temporarily relieve, the itching. A small plug of wool or a simple wad of cotton inserted into the rectum may prove effectual.

An ointment consists of:

℞.	Carbolic acid or creosote,	ʒ j
	Camphor,	ʒ j
	Lard or vaselin,	ʒ ij.

When ointments do not give relief, benefit may be obtained by dusting freely the parts in the neighborhood of the anus with carbonate of bismuth. Lotions are seldom successful. This lotion may be tried, viz.:

℞.	Boroglycerid,	ʒ j
	Peppermint water,	ʒ xx.
Mix well.		
℞.	Chloral hydrate,	ʒ ij
	Rose-water,	ʒ x.

Friction and scratching must be avoided. Given at bedtime, a small enema of from 3 to 5 ounces of cold water will often act well. The constant current may give marked relief.

Cotton-wool may be used after defecation in the place of paper.

Before retiring, the patient may apply very hot water to the parts, dry them, and apply frequently a mixture containing—

℞.	Chloral,	ʒ j
	Gum camphor,	ʒ ss
	Glycerin, Water, } each,	ʒ j.
Mix well.		

The "scarf skin" must be made to peel off by the use of iodin, pure carbolic acid, corrosive sublimate (gr. iv to ℥j of cosmolin), calomel (℥ij to ℥j of cosmolin), etc.

AORTA, ANEURYSM.

Varieties.—(1) Thoracic; (2) abdominal.

The arch of the aorta is divided by Gray into 3 parts: the ascending, the transverse, and the descending. The ascending portion is 2 inches in length, arising from the left ventricle, on a level with the lower border of the left third costal cartilage, behind the left edge of the sternum. It ascends obliquely upward to the right to the upper border of the right second costosternal articulation. The transverse portion commences at the upper border of the right second sternal articulation, and arching to the left and forward, passes in front of the trachea and esophagus to the left of the third dorsal vertebra. The descending portion extends downward to the left side of the fourth dorsal vertebra.

The thoracic aorta extends from the left lower border of the fourth dorsal vertebra, and ends in front of the body of the twelfth dorsal vertebra, at the aortic opening in the diaphragm.

The abdominal aorta begins at the aortic opening in the diaphragm, descends a little to the left side of the vertebral column, and terminates over the body of the fourth lumbar vertebra, where it divides into the two common iliac arteries.

Etiology.—This disease usually occurs in the male sex, after 40 years of age. Any disease that will cause degeneration of the arterial system is likely to bring it on. Gout, syphilis, alcoholism, and rheumatism often give rise to an aneurysm; occasionally, it results from sudden violent exertion.

Aneurysms may be (1) true, (2) false, and (3) arteriovenous.

The **true** aneurysm is one in which the sac is composed of only one coat of the blood-vessel.

The **false** aneurysm—or dissecting aneurysm—is one that dissects its way between the coats of the blood-vessels.

The **arteriovenous** aneurysm is one in which a localized dilatation of an artery (aneurysm) communicates with a vein.

According to **shape**, they may be divided into (1) fusiform, (2) vascular, and (3) cylindric forms.

The dilated blood-vessel is usually the result of arteriosclerosis, with a subsequent rapid degeneration causing a weakening of the wall of the blood-vessel, giving rise to the varieties previously mentioned.

Thoracic Aneurysm

Definition.—A localized dilatation of the thoracic aorta, the arch being the most frequent seat.

Etiology and Pathology.—Same as for aneurysms in general.

Symptoms and Course.—The mode of onset may be sudden, and generally without warning. Should the aneurysm be of sufficient size to press upon the adjacent bronchi, there will be a short, high-pitched, or "metallic" cough, often in itself diagnostic. Dysphagia and dyspnea may be common symptoms. Occasionally, there is a deep-seated pain over the affected area.

Physical Signs.—At times there is a bulging in the precordial region and visible pulsation on inspection, with a distinct thrill on palpation; localized dulness will be found on percussion, and a "bruit" on auscultation. Generally, there is a diminished volume and irregular rhythm of one radial pulse.

The **Pressure Symptoms** of aneurysm are thus given by Greene:

Esophagus: dysphagia. *Trachea:* brazen cough (gander cough), dyspnea, stridor, bronchorrhea and hemoptysis (if not from sac itself). *Root of the lung, and the pleura: symptoms suggesting phthisis*, pulmonary collapse, pleurisy, etc. *Pericardium:* pericarditis. *Chest wall:* localized, dull pain. *Nerve trunks:* neuralgic pains, paroxysmal and intermittent. *Pulmonary artery:* systolic pulmonary murmur, dilated right heart. *Sympathetic fibers:* dilated or contracted pupil, unilateral sweating or pallor. *Cardiac plexus:* anginal attacks. *Superior vena cava:* edema of upper extremity, cyanosis. *Thoracic duct:* marasmus. *Vagus:* dyspepsia, nausea, vomiting, dyspnea, hiccough. *Phrenic:* unilateral diaphragm paralysis. *Recurrent laryngeal:* hoarseness, aphonia, spasm or paralysis of left cord, *paroxysmal dyspnea. It must not be forgotten that any or all of these symptoms may be caused by mediastinal growths other than aneurysms.*

Diagnosis.—May be confounded with a **solid tumor**, but in this case there would be no expansile pulsation on inspection, no thrill on palpation, nor bruit on auscultation.

Empyema.—There would be no history of the symptoms of this disease. Physical signs are entirely different. See EMPYEMA.

Prognosis.—Always grave, and death may supervene at any time. The average duration is from 1 to 3 years.

Abdominal Aneurysm

Definition.—A localized dilatation of the abdominal aorta. Generally, the disease is in the neighborhood of the celiac axis.

Etiology.—The same as thoracic aneurysm.

Pathology.—The same as thoracic aneurysm.

Symptoms and Course.—There is often localized pain disseminated along the course of the nerves in this region. Vomiting is common; occasionally, the rhythm of the femoral pulse is disturbed and there is a delayed cardiac wave on one side.

The physical signs, as those of thoracic aneurysm, are generally well marked.

Diagnosis.—**Aortic pulsation** in hysteric women is at times mistaken for aneurysm, but the regular rhythm of the femoral pulse, the absence of the deep boring pain, and the absence of tumor will exclude aortic pulsation.

Lumbar or psoas abscess may cause a fluctuating tumor, but there is an absence of the thrill on palpation, and bruit on auscultation. In abscess there is usually more pain, higher fever, a history of sweats and chills, and a septic condition is marked. Lumbar abscess is situated lower down than the tumor of abdominal aneurysm.

Prognosis.—Very good.

Treatment of Aortic Aneurysm.—The method that has met most favor is that now known as Tufnell's treatment, though Valsalva originally suggested a restricted diet and practised frequent venesections. Bellingham advised starvation without bleeding. Tufnell's treatment consists in absolute mental and physical rest in the recumbent position, together with a moderate, dry diet. The object of this is to diminish the blood-pressure and volume of blood, to increase the proportion of fibrin in the latter, and to promote its coagulation. The method is as follows:

For breakfast, 2 ounces of bread and butter and 2 ounces of milk; for dinner, 2 or 3 ounces of meat and 3 or 4 ounces of milk or claret; for supper, 2 ounces of bread and 2 ounces of milk. Thus it is hoped to diminish the blood volume and reduce the pressure within the sac, to render the blood more fibrinous, and favor coagulation. The addition of iodid of potassium is Balfour's modification. The proper maximum dose is 15 to 20 grains (1 to 1.3 grams) 3 times a day. An additional effect of the iodid of potassium is the relief it affords to pain. It is supposed also to act by increasing secretions, thus thickening the blood. Dr. Balfour also claims that it lowers the blood-pressure.

Other methods of securing coagulation and contraction of the clot are acupuncture, suggested by Velpeau, and consisting in placing an iron wire or a needle into the aneurysm, with the hope that the blood will coagulate on it, filling the aneurysm with horsehair or fine wire for the same purpose. The wire is introduced through a hypodermic needle. Galvanopuncture, suggested by Loretta, furnishes perhaps the most satisfactory results. Two needles are introduced into the sac, and a mild current of electricity passed through them. In this way a combined electrolytic and mechanic effect is obtained. Stewart has successfully employed the combined electrolytic and mechanical method, using silver wire which is introduced into the sac through an insulated hollow needle. The anode is attached to the wire and the negative pole, by means of a flat electrode, is applied to the sacral region. The introduction of astringent substances, as solution of acetate of lead or persulphate of iron, into the aneurysm may be mentioned only to be discouraged, for the danger of producing embolism far exceeds the chance of benefit. Ligation of the carotid, subclavian, or both has also been done for aneurysm of the aorta, with satisfactory results. It is, however, a formidable operation.

No other internal treatment for aneurysm other than that suggested by iodid of potassium has ever been of any use. As a part of the medicinal treatment of thoracic aneurysm it should be added that, when there is violent action of the heart, cardiac sedatives are sometimes indicated to allay this, in addition, of course, to the enjoined rest. Among these sedatives we include aconite and veratrum viride in extreme cases, also cold to the seat of the swelling and to the cardiac region. If arterial tension is high, nitroglycerin or one of the other nitrites, such as sodium nitrite, erythrol tetranitrate and the like, is of advantage. If there is a syphilitic history, iodid of potassium is at once indicated, beginning with 10 grains 3 times a day after meals, and gradually increasing to 30 or 40 grains 3 times daily.

If pressure symptoms are great and the patient is plethoric, resort may be had to venesection. A half-pint of blood may be removed from the circulation once or twice a week. Often an ice-bag over the seat of the aneurysm relieves the pain. As a rule, stimulants are contraindicated. The bowels should be kept open with Rochelle or Epsom salts, 1/2 ounce before breakfast. The reduced iron, 3 to 4 grains in pill form, may be given after meals. See ANEURYSM.

AORTA, INJURIES.—Injuries of the aorta, as a rule, are very rapidly fatal. Punctures of the aorta inside the pericardium, through the second intercostal space, and wounds of the coronary artery, cause profuse hemorrhage as well as direct interference with cardiac movements. It is not uncommon to find foreign bodies, such as fish-bones, driven through the esophagus into the aorta.

APERIENTS.—See CATHARTICS.

APHAKIA.—Absence of the crystalline lens. This malformation is sometimes congenital, but exists, of course, in persons upon whom discission or extraction has been performed. It is diagnosed by the deep anterior chamber, the trembling iris, high degree of hyperopia, and the loss of accommodation. There is also absence of the small inverted image of a candle held close to the eye. The treatment consists in prescribing correcting bifocal glasses for reading and distance. See CATARACT.

APHASIA.—Partial or complete loss of the power of expression or of comprehension of the conventional signs of language, from no lesion of the peripheral organs or nerves, but from lesions of the cortical centers concerned. Aphasia may be either motor or sensory.

Motor or Ataxic Aphasia.—A loss of speech, owing to inability to execute the various movements of the mouth necessary to speech. The muscles are not paralyzed, but are not coordinated, owing to disease of the cortical center. It is usually associated with *agraphia*, "aphasia of the hand," inability to write, and right-sided hemiplegia. *Motor agraphia* must be distinguished from sensory. The latter is sometimes amnesic—that is, the patient cannot write the word because he cannot call it to mind; at others it is a part of word-blindness. Motor agraphia is quite independent of ability to read aloud—that is, of effort memories necessary to speech, the difficulty being connected with the movements of the hand. In the former case he may still be able to write on dictation, in the latter not. Agraphia also varies greatly in degree. The patient may write one or two letters, or he may be totally unable to write voluntarily or from dictation. The seat of the lesion of motor agraphia is still unsettled.

Some aphasics can write, but are unable to articulate words or sentences. This variety is variously named **aphemia, alalia,** or **anarthria,** according as the impairment of speech is more or less marked. Charcot supposes the center for articulate language divided into four subcenters:

a visual center for words, an auditory center for words, a motor center of articulate language, and a motor center of written language. Lesions of one or more of these centers produce the characteristic forms of aphasia, all of which have clinical exemplifications.

Sensory Aphasia (Amnesia).—Loss of memory for words, which may exist alone or in association with the motor aphasia. Amnesia appears clinically in three distinct forms: (1) Simple loss of memory of words. (2) *Word-deafness*, or inability to understand spoken words (there is usually some paraphasia connected with this form). (3) *Word-blindness*, or inability to understand written or printed words. Recently, Hinshelwood has laid great stress upon the existence of word-blindness without letter-blindness, and vice versa.

Paraphasia is a form of aphasia in which there is inability to connect ideas with the proper words to express the ideas. **Agrammatism** is a phenomenon of aphasia consisting in the inability to form words grammatically, or the suppression of certain words of a phrase. **Ataxaphasia** is inability to arrange words synthetically into sentences. **Bradyphasia** is abnormal slowness of speech, from pathologic cause. **Tumultus sermonis,** a stuttering manner of reading, from pathologic cause. **Conduction aphasia** is not due to any central lesion, but to defect in some commissural connection between centers. **Gibberish aphasia,** aphasia in which the patient can utter many words, but uses them in such a way as to express no meaning.

The following table (taken from Tyson) shows the situation of the lesions causing aphasia:

		Seat of Lesion.
Apraxia, inability to recognize the nature and purpose of an object.		
Mind-blindness (Loss of visual memories.)		Supra marginal and angular gyri, or the white matter beneath, in the left hemisphere in the right-handed and right hemisphere in the left-handed.
Mind-deafness, including amusia, or auditory amnesia.		Upper temporal gyrus of left hemisphere in the right-handed.
Mind atactilia		Gyrus fornicatus, hippocampal gyrus, precuneus and post-parietal (Mills).
Mind anosmia		Uncinate gyrus (Ferrier), and hippocampal gyrus.
Mind ageusia		Temporal gyrus (Ferrier).
Aphasia, inability to comprehend words correctly and to use them properly.		
Sensory aphasia, inability to recognize word-pictures, loss of memory of word-pictures.	*Word*-blindness, in which memory of the appearance of a word is lost.	Angular and inferior parietal gyri.
	Word-deafness, in which memory of the sound of a word is lost.	Posterior part of 1st and 2d temporal gyri (Seppilli and Starr).
	Amnesia inability to recall a word.	Disturbance of association tract.
Motor aphasia, inability to utter words, though knowing well what to say.	Including *alexia,* or inability to read aloud.	Posterior part of 3d left frontal (Broca's) convolution.
Paraphasia, a confounding of words in speaking in which the wrong word is used instead of the right one.		Island of Reil and any disturbance of the association tracts.
Amimia. Loss of power of expression by signs.		Third left frontal convolution, receiving or concept centers.
Paramimia. Misuse of signs to express thought.		Disturbance of association tracts.
Agraphia, inability to write.		
Sensory agraphia, inability to write because of want of idea as to what a word (*a*) is or (*b*) looks like.	(*a*) Amnesic agraphia.	Association tract.
	(*b*) A part of word-blindness.	Angular and inferior parietal gyri.
Motor agraphia, inability to write because of want of motor power of writing.	A part of motor paralysis.	Not settled, but possibly middle of the ascending frontal convolution or ascending parietal.

Derangements of Speech of Irritative Origin.—In addition to those due to direct lesion of the speech-centers, there are also derangements of speech due to irritation. Such are the different kinds of stuttering, the labiochoreic and gutturotetanic stuttering and choreic speech. The first two probably reside in the cortical speech-centers, but the choreic spasms do not necessarily, for the muscles concerned in their production are unnerved from other centers as well.

The study of derangements of speech is by no means easy, but it may be facilitated by pursuing a systematic method like the following, which is that of Starr slightly modified:

A. To determine whether apraxia is present.	1. Test the power of recognizing the nature, uses, and relations of objects.
B. To test integrity of the auditory speech-area and association tracts between other sensory areas and the temporal convolutions.	1. The power to recall the spoken name of objects seen, heard, or handled. 2. The power to understand speech and musical tunes. 3. The power to recall to mind objects named.
C. To test the condition of the visual word-memories in the angular gyrus and of the connections between this area and the surrounding sensory and motor areas.	1. The power to understand printed or written words. 2. The power to read aloud and understand what is read. 3. The power to recall objects whose names are seen. 4. The power to write spontaneously and to write the names of objects seen, heard, etc. 5. The power to copy and write at dictation. 6. The power to read understandingly what has been written.
D. To test the integrity of Broca's center and its association tracts.	1. The power to speak voluntarily; and if it is lost, the character of its defects. 2. The power of repeating words one after another.

When aphasia is associated, as is so often the case, with paralysis of the right arm, the writing-test may be made with the left hand, when the patient will often produce the so-called aphasic mirror-writing, which can only be read by the

use of a mirror; or, if he cannot write with the left hand, as also happens, he may be asked to form words by letters cut out of printed pages.

The prognosis varies much, according to the nature of the lesion, to age, to ability, and to means of reeducation.

The treatment is that of the hemiplegia that accompanies it, and, in addition, teaching new words and the sound of letters. Prolonged rest alone secures relief. When associated with right-sided paralysis, long courses of alteratives may benefit, and if syphilis is present, potassium or sodium iodid and mercury should be given. Any disorder, concomitant or causative, must be attended to. See Brain, Speech Defects.

APHONIA.—Complete loss of musical tone, which occurs when the vocal bands cannot meet, or meet more or less imperfectly. It may be due to paralysis or paresis of the adductor muscles, alterations in the bands themselves, deficiency in the strength of the expiratory current, and abrogation of or perversion of the will, occurring in the morbid mental conditions of hysteria or other nervous disease. The intimate relations of the voice to the functions of the brain would lead us to expect that it would be influenced by the emotions. Thus a person may be hoarse with rage, speechless with terror, etc., and the origin of these cases of nervous aphonia is frequently some sudden emotion, causing loss of control of the voice.

When the aphonia is due to affections such as ulcerations or coating with false membrane, local treatment of the various conditions will restore the voice. The general treatment will depend on the constitutional state. See Laryngitis, Larynx.

APHRODISIACS.—Drugs that increase the sexual desire and power. They act by reflex or by direct action upon either the cerebral or the spinal genital center. The chief agents are nux vomica and its alkaloid, strychnin, phosphorus, nitroglycerin and cannabis indica. Others are cantharis, gold, cimicifuga, serpentaria, sanguinaria, opium (at first), camphor (at first), ergot, iron, alcohol, bitter tonics, flagellation, and meat diet. Strychnin acts by increasing general nutrition and exalting the reflex excitability of the genital centers. Hemp probably only causes a mild delirium, which may or may not take a sexual direction. Cantharis directly irritates the mucous lining of the urethra, and is dangerous in aphrodisiac doses. Alcohol in small doses excites the genital center in the brain; so do opium and camphor at first, the latter being decidedly anaphrodisiac after a time. The power of damiana is doubtful. Urtication and flagellation of the nates produce priapism by irritation of the genital center in the cord through the sensory nerve of the part. Ergot is considered useful by contracting the dorsal vein of the penis, preventing its emptying too rapidly.

℞. Tincture of cantharides, } each ♏ xl
Tincture of nux vomica, }
Mix well, and give 10 to 20 drops 3 or 4 times daily.

℞. Extract of nux vomica, gr. xx
Extract of glycyrrhiza, ʒ ijss
Mix and divide into 80 pills. Take 2 to 4 three times a day.

APHTHÆ.—Small white ulcers, spots, or vesicles of the mouth, occurring chiefly in children under 3 years of age, and generally associated with some febrile affection. It must not be confounded with thrush, in which disease the spots are smaller and are due to the presence of the parasitic fungus characteristic of that disease. See Stomatitis (Aphthous).

APINOL.—Obtained by destructive distillation of pine wood. It is said to be an antiseptic, local anesthetic and expectorant; to be useful when applied externally to wounds, burns, ulcers, and denuded surfaces for the relief of pain and promotion of healing. It is also claimed to be of service when given internally in catarrhal inflammation of the digestive tract and, when used by inhalation, to assist in freeing the respiratory passages from accumulated mucus. Dose, internally from 5 to 15 minims with cane sugar as a menstruum.

APIOL.—An oily liquid, of green color, acid reaction and pungent taste, soluble in alcohol, ether, chloroform, and in glacial acetic acid; extracted from the parsley. Apiol is probably a mixture of several substances, and as found in commerce is often an impure oleoresin. Dose, 3 to 10 minims in capsule two or three times a day; as an emmenagogue, 15 minims in one daily dose.

In small doses (3 to 5 minims) apiol is carminative, diuretic, diaphoretic, expectorant, and stimulant to the circulation. In full doses (15 minims) it is decidedly emmenagogue and feebly antiperiodic, but produces headache, tinnitus aurium, intoxication, and giddiness, its action generally resembling that of quinin. Large doses (30 to 60 minims) are decidedly narcotic.

Apiol has had some reputation in intermittents and in malarial neuralgias, but is most frequently employed in amenorrhea and dysmenorrhea, being of especial advantage in the amenorrhea of anemia, also when the menstrual discharge is fetid. It is becoming fashionable as a supposed abortifacient, but is useless for this purpose, and if freely used may produce decided narcotism, especially if the preparation employed should happen to be an active one. Cases of poisoning by apiol are seldom seen, as the French preparation in capsules sold in this country are generally inert for either good or evil, though an important source of revenue to the druggists.

APNEA.—Formerly used as synonymous with asphyxia, meaning breathlessness; difficult respiration; partial or complete suspension of breathing. It is employed now only in the physiologic sense, to denote the condition in which the blood is too highly oxygenized. The presence of an overabundance of oxygen prevents stimulation of the medullary respiratory center, and respiration is arrested in consequence. See Asphyxia.

APOMORPHIN.—An artificial alkaloid prepared from morphin or codein, usually in the form

of the hydrochlorid. It occurs in minute crystals, is odorless, of bitter taste, and soluble in about 45 parts of water and same quantity of alcohol, almost insoluble in ether or chloroform, and decomposed by boiling water or boiling alcohol. Solutions should be fresh when used, as they alter rapidly by keeping, and should have a few drops of hydrochloric acid added to them to prevent decomposition. The emetic dose is 1/15 to 1/8 grain hypodermically. It is given by the mouth in doses of 1/10 to 1/6 grain. In children, 1/60 to 1/30 grain should not be exceeded.

It is a systemic emetic acting directly upon the vomiting center, and is the quickest, most certain, and least irritating of all emetics. It is useful whenever an emetic is needed; in subacute and chronic catarrh of the stomach and air-passages to get rid of mucus by emetics, and in acute bronchitis it may quiet irritation and stimulate the secretion. In narcotic poisoning from alcohol or opium it is an invaluable emetic, although if very old and damp, it may add to the narcotic effect.

APOPLEXY.—A term applied to a sudden and prolonged loss of consciousness and motor power not due to heart-failure. It is generally due to cerebral hemorrhage, embolism, or thrombosis. See Brain (Hemorrhage, Thrombosis and Embolism).

APOTHECARIES' WEIGHT.—A system of weights and measures used in compounding medicines. The Troy pound of 5760 grains is the standard. It is subdivided into 12 ounces. The ounce is subdivided into 8 drams, the dram into 3 scruples, and the scruple into 20 grains. For fluid measure the quart of 32 fluidounces is subdivided into pints, the pint into 16 fluidounces, the ounce into 8 fluidrams, and the fluidram into 60 minims. The following abbreviations and symbols are used:

♏, *minim.*	℥, *uncia*, an ounce (480 grains).
gt., *gutta*, a drop. (gtt. = drops.)	lb. *libra*, a pound.
℈, *scrupulus* a scruple, (20 grains).	O, *octarius*, a pint.
ʒ, *drachma* a dram (60 grains).	C, *congius*, a gallon.
	gr., *granum*, a grain.
	ss, *semissis*, one-half.

See Weights and Measures.

APPENDICITIS.—Appendicitis is an inflammatory disease of the vermiform appendix, which may vary in degree from a single congestion of this organ to a complete destruction in part or whole of any or all of its tissues.

Description.—The vermiform appendix is a small intestinal tube which may vary in the normal condition from 3 to 12 cm. in length and from 3 to 6 mm. in diameter. Usually, the nearer the size of the appendix conforms to the normal, which is approximately 6 cm. long and 4 mm. in diameter, the less likely it is to become inflamed. Still, there are many appendices which have apparently remained normal throughout the life of the patient, which have varied greatly from this size in both directions. The lumen in the normal structure is uniform in diameter, open at one end where its lining is continuous with the lining of the cecum. At this point there is usually a little fold of mucous membrane which closes this lumen more or less perfectly against entrance of fecal material from the cavity of the cecum; but frequently the lower end of the cecum is funnel-shaped and the beginning of the appendix is continuous with this, so that the conditions seem especially favorable for the forcing of fecal material into the appendix from the cecum.

Location.—This organ is attached to the lower end of the cecum, in the right lower quadrant of the abdominal cavity into which it projects in various directions, being held only by its cecal attachment and by its mesenteriolum. The other end of the appendix is closed. Its walls are composed of a lining of mucous membrane filled with lymphoid tissue, a second layer of circular muscle fiber, a third layer of longitudinal muscle fiber and a covering of peritoneum; and on one side it is attached by a delicate fold of the peritoneum, known as the mesenteriolum, which contains the blood-vessels and nerves supplying this organ. Between the mucous membrane and the layer of circular muscle there is a loose layer of connective tissue.

Nerve supply is from the superior mesenteric plexus of the sympathetic nerve.

Blood Supply.—The chief arterial supply comes from the posterior ileocecal artery. In the female, a small branch from the ovarian occasionally reaches the appendix through the ligament of Clado, which seems to be of some importance in connecting chronic appendiceal infection with dysmenorrhea.

The vermiform appendix is **located** in a part of the abdominal cavity whose spontaneous isolation from other portions of the peritoneal cavity is greatly facilitated by the existing anatomic conditions. This is of the utmost importance for the patient, from the standpoint of safety. These conditions which must constantly be borne in mind in planning the treatment of patients suffering from appendicitis, are clearly shown in the accompanying illustration.

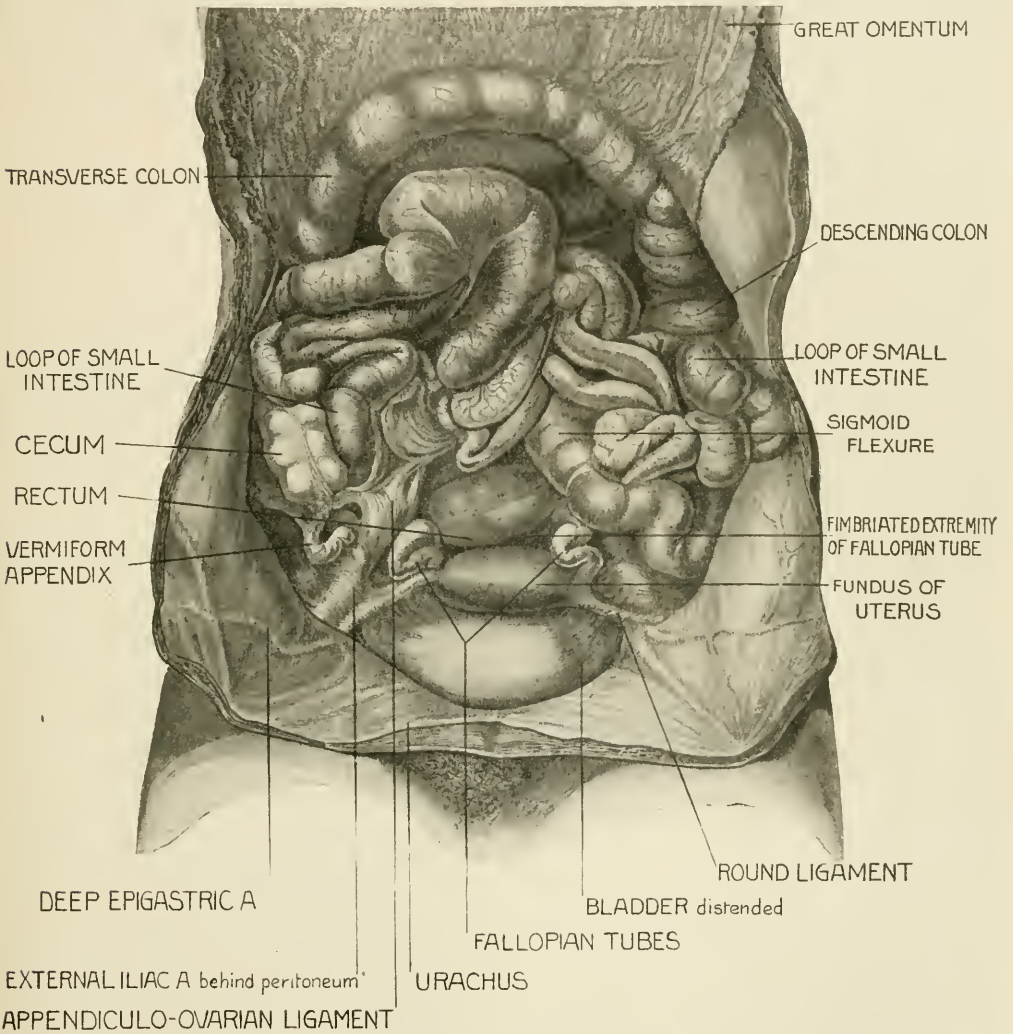
The appendix has for its boundary: *above*, the cecum; on the *outer side*, the lateral abdominal wall; *posteriorly*, the posterior wall composed of the iliacus muscle covered with peritoneum; *below*, is the pelvic cavity, which has been accustomed to dispose of septic material through ages; to the *inner side*, it may be protected by the sigmoid flexure of the colon, or the small intestines may be banked against it on this side. Aside from this, the omentum is long enough to completely surround the vermiform appendix in case of an inflammation, thus practically separating this organ from the remaining portion of the abdominal cavity. This is of the greatest importance, because infectious material from the infected appendix can in this way be prevented anatomically from reaching other portions of the peritoneal cavity, thus reducing the great danger of its destroying the life of the patient by producing a diffuse septic peritonitis.

Functions of the Appendix.—Undoubtedly the vermiform appendix served to store food in many of the lower animals and it seems reasonable to

accept the theory that in man and some other mammals the structure is a rudimentary remnant of an organ which served the same purpose during some portion of the evolution of these species. None of the theories which have been advanced giving the vermiform appendix in its present development definite physiologic functions seem at all satisfactory, and it seems plain that the structure is always useless, and generally more or less harmful, although Macewen has made a very attractive argument to the contrary, which should give rise to further investigation.

Etiology of Appendicitis.—As predisposing causes are some anatomic peculiarities: (1) Abnormally long appendices; (2) appendices with a narrowing at the cecal end; (3) those with a very narrow mesenteriolum or those in which this structure is entirely absent. It has often been observed that several members of the same family contain abnormally long appendices and that consequently five or six members of the same family come for operations for the relief of appendicitis. This has been attributed to the fact that all of these persons were exposed to the same errors in diet and hygiene and were subject to the same infections. The same fact as to diet and hygiene would apply to a somewhat slighter extent to persons belonging to the same nationality.

Age.—Patients between 12 and 30 years of age are most commonly affected; but the disease may occur in patients less than one year and over 80 years of age, and a very large number of patients between 1 and 12 years of age have been observed, in whom a diagnosis of acute gastritis or gastro-enteritis had been made, while they were actually suffering from appendicitis. It consequently seems likely that during this age many cases are overlooked, and that when all of the patients suffering from intraabdominal inflammatory disease are subjected to a careful physical examination the



proportion of young patients diagnosed as suffering from appendicitis will be greatly increased.

Diet.—Carelessness in diet undoubtedly causes much irritation of all portions of the alimentary canal and the resulting congestion and infection must be an important factor in the causation of appendicitis. In a large series of severe cases of acute appendicitis which were carried over the acute attack, Ochsner has never observed a recurrence when the patient subsisted entirely upon liquid diet, care being taken to prevent constipation (which in itself seems to be an important predisposing cause).

Sex.—This has but little importance as a predisposing cause. In hospitals in which all cases of surgery (including gynecologic cases) are operated on by the general surgeon there are as many females as males treated for appendicitis.

In some communities more cases of appendicitis occur during certain months or seasons of the year. It is possible that the occurrence of infectious diseases like influenza, tonsillitis and dysentery may increase the relative number of cases of appendicitis when these conditions are prevalent. It is also possible that during the months when more indigestible foods are consumed there may be an actual increase in appendicitis, but it will require much careful observation to establish these facts. Typhoid fever seems to predispose to appendicitis. That the two conditions may occur at the same time has been frequently observed in all communities where the water supply is infected with sewage. All of the infectious diseases are supposed to predispose to appendicitis.

Exciting Causes.—(1) *Eating* too much or too rapidly, or articles of food that cannot be readily digested (especially when the patient is physically exhausted) is the most frequent exciting cause. This seems to be especially true in cases of recurrent appendicitis, many cases being entirely free from recurrence so long as a strictly liquid diet is adhered to, and but mild recurrences being observed so long as they confine their diet to liquids, when tired.

(2) *Traumatism* can be applied directly to the appendix but very seldom. On the other hand, traumatism can cause a recurrence even in cases in which it is not applied directly over the region of the appendix.

(3) *Foreign Bodies.*—In cases in which the lumen of the appendix is normal in size, fecal matter in small quantities may undoubtedly be forced into it. Larger objects like gallstones, seeds of fruits, intestinal worms, shot derived from game, pins, portions of bone and many other objects and even teeth have become lodged in the appendix. The bacteria which find entrance into the appendix most commonly are the colon bacilli, the various saprophytic bacteria, bacilli of typhoid fever, dysentery, tuberculosis; the ray fungus has been found in the appendix, and in one instance at least, the ameba of dysentery, and all of the microorganisms of suppuration. (See Colon Bacillus Infection.)

Pathology.—Appendicitis is due to an infection of the tissues of the appendix, most commonly by the colon bacillus, the streptococcus, the staphylococcus or the pneumococcus. The colon bacillus is probably always present in this infection, its virulence being greatly increased, according to Turck, by the presence of obstruction. The infection is increased by interference with the blood supply of the appendix, by means of adhesions, angulations, distention of this organ and its mesenteriolum. The infection may be acute or chronic and may vary in degree from a mere congestion to a complete destruction of the tissues; it may involve only the mucous lining or this together with the muscular layers and peritoneum.

Varieties.—Acute appendicitis occurs in the following forms, according to Deaver:

(1) Catarrhal.
(2) Interstitial.
(3) Ulcerative.
    (a) Nonperforative.
    (b) Perforative.
(4) Gangrenous.

Chronic Appendicitis:
(1) Catarrhal.
(2) Interstitial.
(3) Obliterating.

This classification seems so reasonable and comprehensive that it can be generally accepted.

In acute appendicitis, Stanton has shown from the study of a great number of specimens that there is a very definite progress of the disease for each successive day of the attack, so far as the microscopic picture is concerned, although the gross lesions may differ greatly.

By making a gross as well as a microscopic examination of this series of 485 cases of acute appendicitis and determining the length of time which had elapsed from the time at which the attack commenced to the time at which the appendix was removed it was possible to determine the degree of invasion of the tissues which are fully described in the report of this research and which led to the following conclusions. "The character of the histologic changes is essentially similar in all of the appendices in this series which were removed during the first few days of the disease and consists of a severe, diffuse inflammation, accompanied by focal areas of hemorrhage and necrosis. These focal areas of necrosis may increase in extent during the first few days and give rise to microscopic areas of gangrene or they may remain of microscopic size and be quickly repaired. The various anatomic varieties, such as the gangrenous, perforative and ulcerative forms, are determined by the extent and distribution of these necroses. Evidences of repair are seen as early as the third day, and in the nongangrenous cases the histologic picture of an acute process has changed to that of a distinctly reparative process by the fifth day. In those cases in which the necrosis is so extensive as to give macroscopic evidences of gangrene, the histologic picture of an acute process persists for a longer period, but even in these cases (unless there is a later acute process engrafted on the earlier lesion) the evidences of repair are by the sixth or seventh day the predominating feature of the lesion. Evidences of a

recurrent acute process are by no means uncommon, and were present in from 10 to 15 percent of the cases after the first week.

"During the second week of the attack the repair proceeds rapidly, fibroblasts, new-formed blood-vessels and lymphocytes making up the chief features of the histologic picture. The rapidity with which the repair of the appendix itself is accompanied depends chiefly on the extent of the primary destruction and on the presence or absence of a periappendiceal exudate. By the end of the second week, in the majority of cases, the repair is so far advanced that the new-formed connective tissue may constitute the only evidence of a previous inflammation, although in cases with extensive periappendiceal exudates evidences of active organization of the exudate itself are still to be seen.

"Except for the completion of the repair in those cases accompanied by more extensive periappendiceal lesions, the histologic changes occurring after the second week are seen chiefly in the more fibrous nature of the new-formed connective tissue which persists so as to be readily recognizable in the majority of cases. Of the patients operated on one month or more following an acute attack, 78 percent were cases of chronic interstitial or chronic obliterative appendicitis very often accompanied by adhesions. Six percent of the appendices were apparently normal, while in 16 percent the demonstrable pathologic changes were confined to the mucosa.

"A notable feature seen in the histologic examination of these cases is the fact that in no instance was the pathologic change confined to the mucosa in the appendices examined during the first 10 days of the attack.

"In this series of cases, purulent fluid outside of the appendix was present in 51 percent of the patients operated on from the third to the tenth day of the attack. After the tenth day the relative number of cases accompanied by abscesses decreases steadily, with a corresponding rise in the number of cases presenting adhesions without the presence of pus, which would seem to indicate that resolution by absorption had played an important rôle in the repair of the lesion. This is doubtful, however, and is probably in large measure due to the fact that the involvement of the peritoneal cavity was less extensive in those cases in which operation was delayed. In a number of cases, however, the adhesions were so massive as to leave little doubt of the previous presence of an extensive periappendiceal exudate.

"After the third day the exudates on the peritoneal surface contain highly vascular granulation tissue, and it is probable that the high operative death rate between the third and tenth days in part may be accounted for by absorption from the denuded granulating surfaces as well as by the extent of the peritonitis and the bad general condition of the patients."

Although there is a marked uniformity in the microscopic findings in acute appendicitis on the successive days there is a marked difference in the effect upon the patient because this depends less upon the condition of the appendix itself than it does upon the extent to which the surrounding peritoneum has been affected. An absolutely gangrenous appendix may in one case give rise to but slight symptoms throughout the course of the disease, while in another case it may cause the death of the patient at any time after the first day after the beginning of the acute attack. On the other hand, a very slight perforation or a circumscribed gangrene may destroy the life of the patient in one case, while in another it may give rise to but slight symptoms. As a general rule it may be laid down that for the first 7 days from the beginning of the attack the danger increases with the time passed.

For many years these facts kept the physician in doubt as regards the prognosis and served as a basis for illogical treatment, because it seemed that so long as there was no certainty as towhat would happen, no matter how late it came under treatment, it must be imperative to remove the cause at the earliest possible moment.

Following the introduction of this plan Mynter pointed out the fact that practically all patients recovered who were operated on within the first 24 hours after the beginning of the attack of acute appendicitis without regard to the extent or character of the pathologic condition found in the appendix. Of those operated on within the first 48 hours after the beginning of the attack the death rate was very low. On the third day the death rate increased enormously and this increase continued until the seventh day when it gradually decreased. Many other surgeons made similar observations. Richardson classified the cases between the second and tenth day as too late for an early and too early for a late operation.

As a result of these various observations, it became clear that an early diagnosis must be made, in order to reduce the mortality by removing the appendix if possible on the first, but surely before the end of the second day of a severe acute attack. In order to make this possible it was necessary first, to educate the public to call the physician early; second, to educate the physician invariably to obtain an accurate history and always to make a careful physical examination; and third, never to give opium or morphin in any form in any case of acute intraabdominal pain during the first two days of the attack, and never at any time, except after making a diagnosis in a definite class of cases to be described in detail later.

After making a diagnosis of acute appendicitis in cases which come for examination before the infection has extended beyond the tissues of the appendix, all authorities in this country agree that if a competent surgeon is available the appendix should be removed at once, because this will result in the immediate and permanent recovery of the patient. It prevents the occurrence of complications like peritonitis and subsequent adhesions, which impair the health of the patient by obstructing the normal passage of intestinal contents and which may give rise to acute intestinal obstruction later on. It also prevents metastatic infection of other parts of the body and of

recurrent attacks which are likely to result in invalidism.

For many years there has been an enormous mortality in cases operated on when the diagnosis was made after the infection had already invaded the surrounding tissues. In the meantime many observations have shown that so long as the infection remains circumscribed in the vicinity of the appendix the patient still makes a safe recovery from the acute attack. It was also found that in many cases of beginning diffuse peritonitis in which the infection had apparently progressed to a marked extent beyond the vicinity of the appendix it still could become circumscribed and the patient could still make a safe recovery.

Putting all of these facts (as well as the microscopic findings) together, it is plain that the physician must try to obtain one or the other of two conditions in every case of acute appendicitis, namely, the removal of all the infectious material in cases in which the infection has not reached beyond the tissues of the appendix, or the infection must be induced to become circumscribed in the region of the appendix, thus eliminating it from the other parts of the peritoneal cavity.

In order to make the first condition possible it is, of course, necessary to make an early diagnosis and this can only be accomplished when a careful physical examination is made in every case of intraabdominal pain or of acute digestive disturbance; this examination must invariably be made when the physician is first called, and always before opium, in any form, is given.

Many times these symptoms seem so slight that it does not appear worth while to trouble the patient to remove his clothing; a careful physical examination should, however, be looked upon as the absolute duty of the family physician. Then, if a competent surgeon is at hand, the appendix should invariably be removed at once, and under no condition should a patient suffering from appendicitis be permitted to take food or cathartics of any form by mouth. Not even milk or broth, and in more severe cases not even water, should be given.

Fortunately, the public is now sufficiently educated, so that a physician is called in early; whereas formerly, the error of giving food and cathartics by mouth was often committed by friends before a physician was called.

Diagnosis.—It must be insisted that in making a diagnosis of acute appendicitis it is important to obtain a correct history of the case, and in every instance to make a careful physical examination of every patient who complains of digestive disturbances or of abdominal pain, whatever the character of the disturbance or the pain may be. Errors in early diagnosis of acute appendicitis are more commonly made because of a lack of care in determining the previous history of the case and from a lack of making a physical examination than from any other cause. As the prognosis and course of acute appendicitis both depend so largely upon a very early diagnosis, it is most important that these points be not overlooked.

In most instances the patient gives a history of previous gastric disturbances, such as nausea or vomiting, a dislike of certain articles of food, discomfort after eating a full meal when tired, gaseous disturbance after eating, in fact all of the symptoms which are usually supposed to characterize gastritis or gastric catarrh. These symptoms are usually described as being more severe after eating a large meal or after eating especially indigestible food and more especially when these indiscretions have been indulged in at a time when the patient was exhausted either physically or mentally. In children a capricious appetite is often an additional symptom. In these cases there is often a history of a number of acute attacks which are supposed to have been entirely confined to the stomach and have been looked upon as instances of acute gastritis. Until recently, acute attacks of appendicitis in children have almost invariably been first diagnosed as acute gastritis and attributed to some special indiscretion in diet; and because of this diagnosis, the patient has usually not been subjected to a careful physical examination of the abdomen, but has been given a cathartic by the physician or parent to remove the irritating food from the stomach and the intestines, often with most harmful or even fatal results. Fortunately for the child, it usually refuses food under these conditions, the favorable effect of which refusal will be considered later. In children in many instances there are marked evidences of malnutrition, which together with the symptoms which have just been described should cause the diagnostician to be suspicious of appendicitis. Frequently these children are retarded in their growth as compared with other children of their own age, or with other children in the same family.

It is important to guard against forcing the infectious material from the appendix into the surrounding tissues by making severe pressure upon the abdomen during the examination. Violent examinations are often followed by rapid increase in unfavorable symptoms.

At this point it may be well to direct the attention to the importance of experience in recognizing the symptom-complex of appendicitis. A young physician who has had an opportunity of seeing many of these cases during his service as resident in a hospital will often make a correct diagnosis when an older physician with much greater wisdom, learning and general experience, will fail.

Symptoms and Physical Signs.—Bearing in mind the importance to be placed upon the history of gastric disturbances, such as nausea or vomiting, or discomfort after eating, or erratic appetite, still a negative diagnosis must never be reached without a physical examination having been made.

The cardinal symptoms are:

1. *Pain* usually beginning in the vicinity of the umbilicus which later becomes located near a point halfway between the umbilicus and the right anterior superior spine of the ilium—McBurney's point.

2. *Rigidity* of the right rectus abdominis muscle, especially marked over McBurney's point, except

when morphine has been given before the physical examination is undertaken.

3. *Pain* upon pressure over McBurney's point.
4. *Nausea* or *vomiting.*
5. *Obstruction* to the passage of gas and feces.
6. Apparent or real *swelling* in the vicinity of McBurney's point.

Aside from this the patient may have had a chill. He may have a temperature above or below normal; and the pulse may be normal or rapid. In acute cases an examination of the blood shows an increase in the relative number of leukocytes, which may be very slight or it may exceed ten times the normal number. Aside from confirming the diagnosis of the presence of an infection, the blood examination has no significance.

Increase of relative number of leukocytes indicates an increase in severity of infection or increase in invasion with resistance. A low leukocytosis may mean slight infection or it may mean severe infection with slight resistance. In either case, the general condition of the patient will indicate to the experienced diagnostician what the local conditions are as regards the severity of the attack.

It is, however, a safe rule, that when a competent surgeon is present, one should never advise against an operation in acute appendicitis because the attack is mild in character. On the other hand, in the absence of a competent surgeon the presence of a mild attack is a most excellent reason for advising against an immediate operation, because if neither food nor cathartics are given by mouth until the attack has subsided one can prognosticate with absolute certainty that a mild case can be carried on to a condition in which the patient can be safely transported to a hospital where a competent surgeon can be found. After the patient has recovered from the acute attack, a recurrence can be prevented for an indefinite period if the patient be given only liquid or semiliquid food, such as soups, broth, gruel, milk, buttermilk, mush, prunes, cooked fruits and vegetables forced through a colander, soft-boiled eggs, meat juices, and fruit juices. It is also important to prevent constipation.

Regarding the second condition to be obtained, viz.: the limitation of the infection to a circumscribed area, it seems important to bear in mind the elements which serve to cause a diffusion of the infection.

The anatomic conditions have been shown to be favorable to keeping the infection in the region of the cecum unless it is carried to other parts of the peritoneal cavity by the motion of the small intestines. In order to prevent this motion an attempt must be made to inhibit peristalsis. This was accomplished many years ago by the so-called opium treatment, but it can be accomplished in a much more satisfactory manner by removing the stomach contents by gastric lavage and then prohibiting food and cathartics of all kinds by mouth. It must be remembered, however, that even the smallest quantities of liquid food or the mildest form of cathartics may cause dangerous peristalsis. Even water should not be given by mouth for fear of causing intestinal motion. Water can be supplied according to a method introduced by Murphy by means of proctoclysis through a soft-rubber catheter inserted into the rectum for a distance not to exceed 3 inches, care being taken to arrange the apparatus so that the normal salt solution will be instilled into the rectum drop by drop, in order not to cause any irritation.

It is well to continue this for a period of two hours during which time from 500 to 2000 c.c. of the solution may be absorbed. Whenever any irritation or incontinence occurs the proctoclysis should be interrupted. In case the patient suffers pain, from 10 to 30 drops of deodorized tincture of opium should be dissolved in 100 c.c. of normal salt solution and this should be given by rectum in the same manner. This may be repeated every 2 to 6 hours if the pain recurs, but the quantity should be reduced as the severity of the pain decreases. In order to support the patient's strength, it is well to add 1 ounce of one of the concentrated, predigested liquid foods in the market to the normal salt solution once every 3 to 4 hours.

This method of supplying food and water by rectum should be continued until the patient has been normal for 4 days, when it is safe to begin giving beef-tea or broth by mouth at regular intervals of 3 hours. After a few days a little gruel may be given. Milk should not be given until the patient has been apparently well for at least 10 days.

In order to prevent the occurrence of parotitis as well as to increase the patient's comfort, it is well to encourage the use of chewing gum, which will favor the flow of saliva and will not only prevent the formation of parotitis, but will cause this condition to subside if it has already begun.

From what has been said it is plain that if patients regularly consulted physicians at the very beginning of their attacks of appendicitis and if they then always received a careful physical examination an early diagnosis could almost invariably be made and in the presence of a competent surgeon the appendix could regularly be removed with safety to the patient.

Unfortunately these conditions do not always obtain; and frequently the condition of the patient has been made much worse by giving food or cathartics by mouth, or an incompetent physician has been called at first who has prescribed without having made a careful physical examination. In this manner many of these patients come under the care of the physician or surgeon at a time when the infectious material has already passed beyond the circumscribed space in the vicinity of the cecum. If these cases which come under treatment too late for an early operation and too early for a late operation are all operated on at once as soon as a diagnosis is made, the mortality is necessarily extremely high, because the operation cannot remove all of the infectious material, but the necessary manipulations will tend to distribute this to other portions of the cavity. It is in this class of cases that the treatment which has just been described is most useful, because it will serve to change a dangerous and acute condition into a relatively harmless chronic condition. In the

meantime circumscribed abscess may form which should be opened and drained, and later the appendix should be removed after all of the acute inflammatory conditions have subsided. It is well to wait long enough before undertaking this operation to insure the absorption of all of the infectious material, in order not to bring on a dangerous septic condition.

In the meantime it is well to place the patient entirely on liquid diet, because by doing this the operation may safely be postponed for an indefinite period, while if solid food is given a recurrence may occur at any time.

In chronic appendicitis there is more or less absorption of septic material from the appendix, as well as absorption of decomposing substances from the alimentary canal because of obstruction to the passage of intestinal contents due to the presence of adhesions. In all of these cases it is well to remove the appendix, to loosen the adhesions causing obstruction and to cover the raw surfaces with peritoneum. It is well to look for a short kink in the ileum within 5 or 10 cm. from its entrance into the cecum, because this location which has been pointed out by Lane is especially likely to give rise to angulation. We have observed this condition, known as Lane's kink, sufficiently often to make it worthy of especial attention.

Technic of Operation for the Removal of the Vermiform Appendix. Preliminary Treatment.—In operation for acute appendicitis no preliminary treatment is indicated because all time spent before the operation is begun is so much time wasted.

If the patient has suffered from nausea or vomiting, the pharynx should be sprayed with a 2 percent solution of cocain and gastric lavage should be performed through a large stomach tube. In these cases it is well to give a hypodermic injection of 1/4 grain of morphin and 1/100 grain of atropin at once as soon as the operation has been determined upon, then to spray the pharynx with a 2 percent solution of cocain and to make gastric lavage just before the anesthetic is begun. In this manner the lavage can be performed without discomfort to the patient and the amount of anesthetic necessary will be greatly reduced.

The patient should then be anesthetized with ether, the abdomen should be very carefully, but very gently washed with green soap with a gauze pad, then it should be shaved, then washed again with green soap and warm water, then with a solution of 1 part of bichlorid of mercury in 2,000 of hot sterile water, then with 95 percent alcohol, then it may be dried and the operation may be begun. The abdomen may be painted with compound tincture of iodin full strength before operation.

Incision.—If the disease is confined to the appendix, McBurney's incision is to be preferred. This consists in an incision parallel with Poupart's ligament and half way between this structure and the umbilicus, the middle of this incision being in the line drawn from the anterior superior spine of the ilium to the umbilicus. The incision may be made from 3 to 15 cm. in length, according to the space required for removing the appendix in the case under consideration. At one time much stress was laid upon the importance of a very short incision, but this is now generally looked upon as foolish pedantry. The incision is carried through the fascia of the external oblique muscle, splitting but not cutting its fibers, exposing the internal oblique muscle which extends at right angles to the former. The fibers of the internal oblique are then separated, exposing the aponeurosis of the transversalis muscle. This is then cut together with the peritoneum, and the anterior surface of the cecum is exposed. Following the longitudinal band of this intestine downward leads to the beginning of the appendix. If this is free from adhesions a clamp is applied to the base of the appendix and a second one to the mesenteriolum. The latter is cut and ligated. A purse-string suture of fine silk or linen is then applied around the base of the appendix, the suture passing down to the mucous membrane of the cecum, but not through it. It is well to pass a suture around the point where the mesenteriolum enters the cecum in order to compress any artery which enters at this point. The appendix is then cut away even with the outer surface of the forceps and the compressed stump is inverted into the lumen of the cecum while the purse-string suture is being tied. In rare instances when the appendix is very vascular, it is well to tie a fine catgut ligature about the compressed base of the appendix before inverting it and tying the purse-string suture. A few Lembert sutures are passed over this in order to reinforce the purse-string suture. If there are any raw surfaces they are carefully covered by suturing peritoneum over them. Then the cecum is dropped into the peritoneal cavity, the omentum is brought down over the cecum and the wound is closed by successively suturing the various layers with continuous catgut sutures. If the appendix is very adherent, it is better to grasp its cecal end by two strong hemostatic clamps placed closely together. The appendix is then cut off between these forceps and the adhesions are then caught successively by hemostatic forceps and cut between these and the appendix until the distal end of the latter is reached. Then the operation is completed as described above.

Occasionally an abscess is encountered outside of the appendix in a case in which it seemed possible to remove all of the infectious material with the appendix. In these cases it is wise to pack away the intestines with gauze pads moistened with normal salt solution in order to prevent the pus from touching any of the surrounding peritoneum. Then sponge away the pus carefully to prevent soiling the surrounding peritoneum, and institute some form of drainage for a few days after the operation until the infected area has been eliminated from the surrounding peritoneal cavity by adhesions.

The drainage may consist of a strip of gauze, or a glass tube covered with gauze, or a cigarette drain, or a rubber tube split longitudinally. Ochsner prefers a glass tube covered with gauze; but the form matters but little so long as provision is made for the escape of pus. It is of course

important not to injure the parietal or intestinal peritoneum by unnecessary manipulations during the operation.

In case the operator is not fairly certain that the infection is still confined to the appendix it is usually better to make the incision in a longitudinal direction over the middle of the lower half of the right rectus abdominis muscle. The incision passes through the skin, superficial fascia, and fat, and through the aponeurosis covering the anterior surface of the rectus muscle. The fibers of the latter are then separated longitudinally, then the posterior sheath of the transversalis fascia and the peritoneum are cut. The appendix is found and removed as described above.

In case drainage seems indicated in this operation it should be carried through a button-hole to the right of the incision, care being taken to separate and not to cut the muscle fibers. This can be done easily by making an oblique incision 2 cm. long, parallel with Poupart's ligament, passing through the fascia of the external oblique abdominal muscle, splitting, but not cutting its fibers, and then passing a pair of blunt-pointed forceps through the abdominal wall and separating the heads which will separate, but not injure the muscle. The drain can usually be removed after two or three days.

This is also the proper incision in cases in which gallstones are suspected, because by elongating the incision upward it is possible to remove the gallstones without making a second incision. In cases in which there is a complication with disease of the ovaries or the Fallopian tubes or the uterus, it is best to make a median incision between the umbilicus and the os pubis.

After-treatment must, in the main, be negative. The patient should be fed by nourishing enemata, and water should be supplied by continuous proctoclysis which may be repeated whenever thirst reappears. In case of severe shock subcutaneous injection of from 500 to 1000 c.c. of normal salt solution should be administered.

In suppurative cases the Fowler position is indicated.

In cases of nausea or vomiting or gaseous distention of the abdomen, the pharynx should be cocainized and gastric lavage should be practised. This should be repeated whenever these conditions recur.

In case of pain, from 10 to 30 drops of deodorized tincture of opium dissolved in 100 c.c. of normal salt solution should be given by rectum as often as necessary to keep the patient comfortable. So long as no nourishment is given by mouth, opium given in this manner is perfectly harmless. It is well for the patient to chew gum in order to prevent parotitis.

Conclusions.—Ochsner thus sums up the treatment of appendicitis:

Regarding the treatment of recurrent appendicitis, all authorities on the subject are agreed upon the plan of removing the appendix by a competent surgeon, during a time when it is not acutely inflamed. To this should be added the fact that many a surgeon is competent and safe to perform the operation at this time who could not safely do the work during an acute attack. It should also be borne in mind that so long as such a patient is confined absolutely to liquid diet and avoids constipation he will remain free from recurrence; even for an indefinite period of time. He can consequently postpone this operation to a convenient time and he can safely travel any distance to secure competent surgical skill.

For the treatment of acute appendicitis Ochsner formulates equally satisfactory rules:

(1) A careful physical examination should always be made in patients suffering from gastric disturbances, nausea, vomiting, gaseous distention or pain in any portion of the abdomen, so that an early diagnosis can be made. In acute cases violent manipulations are dangerous and not necessary during examination. They may cause a diffusion of septic material.

(2) The mortality in appendicitis results from the extension of infection from the appendix to the peritoneum, or from metastatic infection from the same source.

(3) This extension may be prevented by removing the appendix while the infectious material is still confined to that organ.

(4) The distribution or extension of the infection is accomplished by the peristaltic action of the small intestines.

(5) It is also accomplished by operation after the infectious material has extended beyond the appendix and before it has become circumscribed.

(6) Patients suffering from acute appendicitis should be operated on as soon as the diagnosis is made, provided they come under treatment while the infectious material is still confined to the appendix, and if a competent surgeon is available.

(7) Aside from insuring a low mortality this will prevent all serious complications.

(8) In all cases of acute appendicitis, and in all cases of peritonitis without regard to the treatment contemplated, the administration of food and cathartics by mouth should be absolutely prohibited and large enemata should never be given.

(9) In case of nausea or vomiting, or gaseous distention of the abdomen, gastric lavage should be employed.

(10) Opium in any form should never be given before a diagnosis has been made, and never in the presence of any form of peritonitis, unless gastric lavage has been done; and the introduction of every form of nourishment and cathartics by mouth is absolutely prohibited. This applies to even the simplest forms of liquids, like beef tea or broth, and also to the use of champagne and other stimulants.

(11) This applies equally to postoperative treatment.

(12) In cases coming under treatment after the infection has extended beyond the tissues of the appendix, especially in the presence of beginning diffuse peritonitis, conclusions (8) and (9) should always be employed until the patient's condition makes operative interference safe.

(13) In case no operation is performed, neither nourishment nor cathartics should be given by

mouth until the patient has been free from pain and otherwise normal for at least four days.

(14) During the beginning of this treatment not even water should be given by mouth, the thirst being quenched by rinsing the mouth with cold water and by the use of small enemata. Later small sips of very hot water frequently repeated may be allowed, and still later small sips of cold water. There is danger of giving water too freely, and there is great danger in the use of large enemata.

(15) All of these cases are greatly benefited by installation of normal salt solution by the drop method, by rectum, as introduced by Murphy, or by some other safe nonirritating method; this is one of the most valuable means of inhibiting peritonitis. It is well to give normal salt solution continuously for one to two hours, and then to interrupt this treatment for two hours.

(16) In rare cases where this method cannot be employed, normal salt solution should be given subcutaneously in quantities of 500 to 1000 c.c. sufficiently often to overcome thirst and keep the blood-vessels filled.

(17) Large enemata, except by the drop method, should never be given in the presence of peritonitis.

(18) All practitioners of medicine and surgery, as well as the general public, should be impressed with the importance of prohibiting the use of cathartics and food by mouth, as well as the use of large enemata, in cases suffering from acute appendicitis or peritonitis.

(19) It should be constantly borne in mind that even the slightest amount of liquid food of any kind by mouth may give rise to dangerous peristalsis and may change a harmless, circumscribed into a dangerous, diffuse peritonitis.

(20) The most convenient form of rectal feeding consists in the use of 1 ounce of any of the various concentrated liquid predigested foods in the market, dissolved in 3 ounces of warm normal salt solution, introduced slowly through a soft catheter, inserted into the rectum a distance of 2 to 3 inches.

(21) This form of treatment cannot supplant the operative treatment of acute appendicitis, but it can and should be used to reduce the mortality by changing the class of cases in which the mortality is greatest into another class in which the mortality is very small after operation.

(22) It is important to bear in mind the fact that this treatment is always indicated without regard to whether an immediate operation is or is not contemplated.

(23) It is further important not to be deceived by the very rapid improvement of apparently serious cases, into the belief that the case is not a gangrenous or perforative appendicitis, because such patients may easily be killed by food or cathartics.

(24) In acute appendicitis which has been carried through an attack without an operation, it is well to confine the patient absolutely to a liquid diet until his appendix has been removed.

(25) In case of severe pain in acute appendicitis after gastric lavage has been made, from 10 to 30 drops of deodorized tincture of opium should be added to each rectal feeding, until there is no longer any pain.

(26) Placing these patients in the Fowler position greatly increases their safety.

(27) The application to the abdomen of a large, hot, moist dressing of equal parts of the saturated solution of boric acid and alcohol greatly increases the comfort of these patients and prevents harm from manipulations.

(28) The repetitions in these conclusions are intentional, because it has seemed worth while to cover every possible point so completely that no one taking the time to read these conclusions carefully could be in doubt. They are all based upon the observation of a very large number of cases; they are not in any way theoretical, but all have an intensely practical foundation.

APPENDICOSTOMY.—The appendix is drawn out through a very small incision, fixed to the skin by suture, its tip cut off, and through its lumen the bowel is irrigated by means of a small rubber tube or catheter. By this procedure intractable cases of chronic colitis and dysentery have been cured.

APPETITE, LOSS AND EXCESS.—See Anorexia, and Bulimia.

APRAXIA.—See Aphasia.

APROSEXIA.—Inability to concentrate the attention. This condition is often due to the presence of adenoids.

AQUA.—See Water.

Nomenclature.—**A. Fluvialis,** river-water; **A. Pluvialis,** rain-water; **A. Fontana,** spring- or well-water; **A. Marina,** sea-water; **A. Carbonata,** carbonated water, soda-water; **A. Destillata,** distilled water; **A. Bulliens,** boiling water; **A. Fervens,** hot water; **A. Communis,** common water.

Aquæ, *waters*—are aqueous solutions of volatile substances, which may be solids, liquids or gases, dissolved by solution in cold or hot water, by filtration through an absorbent powder, by percolation through cotton saturated with the substance, or by distillation. The official waters are 18: **Aqua Ammoniæ.** Contains 10 percent ammonia gas by weight. Externally stimulant, irritant or caustic. Internally antacid and stimulant. Average dose, 15 minims. Should be largely diluted when taken internally. Useful in heartburn, sick headache, syncope. Slowly injected into a vein, a powerful stimulant to heart and respiration. **A. Ammoniæ Fortior** (stronger ammonia water). Contains 28 percent gas by weight. Used for making aqua ammoniæ, or properly diluted (4 or 5 to 8) as a rubefacient, vesicatory, or escharotic. Apply on cotton confined in top of a pill box. **A. Amygdalæ Amaræ** (0.1 percent). Useful vehicle. Average dose 1 dram. **A. Anisi** (0.2 percent oil). Useful vehicle. Average dose, 4 drams. **A. Aurantii Florum,** prepared by diluting the stronger water with equal volume of distilled water; it is used as a vehicle. Average dose, 4 drams. **A. Aurantii Florum Fortior** (triple orange flower water). Water saturated with the volatile oil of

fresh orange flowers, obtained as a by-product in the distillation of the oil of orange flowers. Vehicle. Average dose, 2 drams. **A. Camphoræ,** camphor 0.8 dissolved in alcohol and afterward triturated with purified talc. Vehicle. Average dose, 2 drams. **A. Chloroformi,** a saturated solution with excess of chloroform present. Antiseptic vehicle. Average dose, 4 drams. **A. Cinnamomi** (0.2 percent). Vehicle. Use cautiously in inflammatory affections. Average dose, 4 drams. **A. Creosoti,** 1 percent creosote. Antiseptic. Stimulant externally. Local nerve paralyzant. Average dose, 2 drams. **A. Destillata,** 800 parts from 1000 of water. Used for preparing the official diluted acids, for absorbing gaseous ammonia, for preparing nearly all the official aqueous solutions, and for compounding prescriptions. **A. Fœniculi** (0.2 percent). Vehicle. Average dose, 4 drams. **A. Hamamelidis** (so-called distilled extract of witch hazel, or Pond's extract). Average dose, 2 drams. **A. Hydrogenii Dioxidi** (solution of hydrogen peroxid). 3 percent by weight of pure hydrogen dioxid. Oxidizer, deodorant, disinfectant. Coagulates the albumin of tissues. Also used in the arts for bleaching purposes. Average dose, 1 dram. **A. Menthæ Piperitæ** and **Aqua Menthæ Viridis** (0.2 percent) are useful vehicles. Average dose, 4 drams. **A. Rosæ** (rose water). Prepared by mixing equal volumes of triple rose water and distilled water. Vehicle. Average dose, 4 drams. **A. Rosæ Fortior** (triple rose water). Water saturated with the volatile oil of rose petals, obtained as a by-product in the distillation of oil of rose. Average dose, 2 drams.

ARBUTIN.—See Uva Ursi.

ARCUS SENILIS.—A grayish-white opacity, extending around the edge of the cornea, about 1.5 millimeters from the sclerocorneal junction. Between it and the periphery the cornea is transparent. It is chiefly seen in old persons, and has been called both a fatty and a hyaline degeneration. It is often indicative of similar senile changes elsewhere. On account of its peripheral location it causes no visual disturbance. See Old Age.

ARGENTAMIN.—A solution of 10 parts of silver phosphate in a 10 percent aqueous solution of ethylene diamin. It has been recommended as a substitute for other silver compounds, on account of its great antiseptic power and astringency; but it is irritant. Aqueous solutions of various strengths, from 1 in 5000 to 1 in 1000, have been used as urethral injections in gonorrhea.

ARGENTUM.—See Silver.

ARGONIN.—A mixture of silver nitrate with sodium and casein. It is a valuable antiseptic, particularly against the gonococcus. A 2 percent solution is practically unirritating to the mucous membrane of the urethra. The drug is somewhat expensive to use for irrigation. Its solutions should be protected from the action of light.

ARGYLL ROBERTSON PUPIL.—A pupil responding to accommodation but not to light. It is of diagnostic value in locomotor ataxia. It is also seen in paretic dementia, in some cases of encephalomalacia, senile brain atrophy, syphilis, hydrocephalus, etc. See Pupil.

ARGYRIA.—A form of chloasma or discoloration of the skin and mucous membranes produced by the prolonged administration of nitrate of silver, the molecules of silver being deposited in much the same position as those of the natural pigment of the skin. It may be *general,* from internal administration, or *local,* from its local application. It is said that the administration of 450 grains of silver nitrate has caused it; and in the prolonged use of this drug much care must be taken to prevent argyria. Iodids in large doses have been suggested, but treatment for the removal of the pigment is usually unavailing.

ARGYROL.—Silver vitellin, a compound of a proteid and silver oxid containing 30 percent of silver, and is very soluble in water. It is painless and nonirritant, even in concentrated solutions on the conjunctiva. Solutions of 2 to 10 or 25 percent strength are used as local astringents, of 1 in 1000 for irrigating the vagina, bladder, and urethra. It is strongly bactericidal and has great penetrative power.

ARISTOCHIN. Diquinin Carbolic Acid Ester.—A white, tasteless powder insoluble in water, soluble in alcohol and in chloroform, and containing 96 percent of quinin. It is said to be free from the unpleasant effects of quinin, producing neither gastric irritation nor cinchonism, though twice as powerful against protozoa and twice as efficient in malarial fever. Dose, 8 to 15 grains, thrice daily; for children, 1 to 5 grains, according to age.

ARISTOL.—A combination of iodin and thymol. An amorphous, odorless, unstable, nontoxic powder, of fawn color, insoluble in water or glycerin, freely so in ether, chloroform, and fatty oils, and only sparingly soluble in alcohol. It is used as a substitute for iodoform. No heat should be used in mixing it or in its use; nor should alkalies, metallic oxids, or starch be mixed with it. It is of use in the local treatment of ulcers, wounds, and other breaches of tissue; in the treatment of indolent soft ulcers, lupus, psoriasis, syphilitic ulcerative processes, eczema, severe burns, affections of the ear, nose, and throat, in gynecologic and dermatologic practice, being nearly, if not quite, as effective as iodoform.

It is best applied in powder, in solutions in oil and ether (5 to 10 percent), or in ointment, with a base of lanolin or vaselin (5 to 10 percent).

A liniment is thus made:

℞. Alcohol, Ether,	each,	ʒ j
Aristol,		gr. v
Soft soap,		ʒ j.

Mix well and rub in part.

An ointment:

℞. Aristol,	gr. x
White vaselin,	ʒ ss.

Mix well and apply.

ARM, AMPUTATION.—The circular method usually gives excellent results; but skin flaps with circular division of the muscles, or one of these in front and a short transfixion flap behind, may be

adopted instead. In this amputation, as in all others through the shaft of a bone, the periosteum should be divided some little distance below the bone, so that it may invest and adhere to the face of the section. See AMPUTATION.

ARM, DISLOCATION.—See ELBOW, SHOULDER.

ARM, FRACTURES. Fractures at Upper End of Humerus.—Fracture of the anatomic neck is rare. It is sometimes entirely intracapsular, sometimes is just without, generally is partly within and partly without, the capsule. In the first instance the vitality of the fragment is doubtful, but in the last instance the attachment to portions of the capsule provides nourishment.

The cause is nearly always direct force. The head may be impacted between the tuberosities, or the upper diaphyseal end be driven into the cancellous structure of the head. The displacement, generally very slight, may be very great, the shaft being shifted inward, upward and forward.

The symptoms are usually little marked. In case of impaction the diagnosis is more probable than certain; deep palpation of the bony points under an anesthetic may demonstrate crepitation and abnormal mobility, making the diagnosis certain. A skiagraph should always be made if possible and another one taken after reduction of the fracture.

Treatment consists of rest in bed with extension of the arm downward and outward by means of weights, a pad or pillow being inserted in the axilla. Sometimes additional traction becomes necessary, acting laterally at the upper end of the humerus. If impaction exists, no effort should be made to separate the fragments. Passive movements should be begun early.

Fracture at the surgical neck, just below the tuberosity or penetrating it, is a frequent injury. The upper fragment may remain under the influence of the muscles attached to the tuberosity. Usually due to a fall upon the shoulder in elderly persons, it may result from a fall on the hand or elbow. The fragments may be fixed by impaction, or very marked displacement may be present, the upper end of the shaft of the humerus being frequently shifted forward, inward and upward.

The symptoms of abnormal mobility and crepitation, determined by palpation, together with the presence of the head of the bone in its proper position, and sometimes the occurrence of shortening, usually suffice for purposes of diagnosis. When the fragments are impacted, the diagnosis is not so easy, but exclusion of a dislocation should always be possible. The fracture may also be associated with and complicated by a dislocation of the head of the bone.

Treatment.—If displacement is present, reposition must be carefully effected. The upper fragment is so short that when there exists a marked tendency to displacement, the reposed fragments are held in place with difficulty. Ordinarily, splint dressings, with an axillary pad and a shoulder-cap, fixing the whole arm with the shoulder region as far back as the neck, suffice; when marked tendency to displacement exists, this serious injury is best treated by rest in bed, with permanent extension by weight and pulley in the longitudinal direction of the arm, together with an axillary cushion. It is better still to employ a second extension apparatus acting on the upper end of the shaft. This apparatus has the advantage of leaving the region of the shoulder bare and open to massage and the early careful use of passive movements, which are of value to prevent a tendency to ankylosis owing to the proximity of the joint. If reduction is difficult or impossible, operative interference to wire fragments is indicated.

Fracture of a tuberosity, especially the major one, may happen during the occurrence of a subcoracoid dislocation; also during the reduction of old luxations of the shoulder. The symptoms are not pronounced; the outer aspect of the shoulder may appear flattened, there are the signs of a contusion, and sometimes the mobility of the separated fragment can be made out.

Treatment is simple, having for its object the fixation of the arm, which is well accomplished by a simple spica bandage of the shoulder and a sling for the forearm.

Separation of the epiphysis at the upper end of the humerus occurs in young persons before the ossification of the epiphyseal cartilage, and is generally due to a fall upon the arm or shoulder. This injury is of great practical importance on account of the relative frequency of the injury and the possible interference with the growth and development of the limb as a result. The epiphyseal line is like a broad, reversed V, with the open end down, separating the head and tuberosities above from the diaphysis below. This gives the diaphyseal end a pointed extremity with lateral declivity.

EXTRACAPSULAR FRACTURE OF THE HUMERUS. (*After Gray.*)

The symptoms point to a separation of bone, as in fracture of the surgical neck. Abnormal mobility and crepitation can be determined under anesthesia if the displacement be slight; but the crepitation is soft—cartilage-crepitation rather than bone-crepitation. Frequently, the displacement is considerable, the lower fragment being displaced downward and inward; in this situation it causes an angular prominence, which is best seen and determined from a point above and behind the patient, and by comparison with the opposite side. Sometimes the displacement is so severe as to elude reposition under an anesthetic. In such cases it becomes necessary to cut down and separate directly the interfering soft parts. After reposition, treatment is essentially that of fracture of the surgical neck of the humerus.

This injury is a very serious one, because of the danger of interference with the further growth and development of the limb, which is almost sure to take place unless reposition is perfectly effected.

Fractures of the Diaphysis of the Humerus.—These occur as a result of direct or indirect vio-

lence, and present the common signs of fracture in a way readily determined—abnormal mobility, crepitus, various forms of displacement, etc. If the break occurs below the point of attachment of the deltoid muscle, the latter is likely to lift the upper fragment outward. On account of the close contact of the musculospiral nerve with the bone, it is liable to injury at the time of fracture, or to suffer later from inclusion in the callus formation, where it is often embedded as in a deep groove. Such an injury produces a typical paralysis (drop-wrist), and should be carefully borne in mind from the beginning, in order to avoid blundering in the prognosis.

Pseudarthrosis is relatively more common in this locality than elsewhere in the long bones of the body.

Treatment is best effected by means of an internal angular splint (of leather or heavy cardboard), and an external splint extending down to the elbow and capping the shoulder (of leather, felt, metal, or cardboard). These splints are to be well padded and held in place by cotton bandages, and over all starched bandages. The forearm must be carefully supported in a sling, whether the patient is lying in bed, or standing up, as its weight, if unsupported, is almost sure to produce some angulation at the point of fracture. Plaster of Paris is not suited to the treatment of this fracture ordinarily. If there exists much tendency to displacement, permanent traction may be an indispensable adjunct to the dressing.

Fractures at the Lower End of the Humerus.—These are supracondylar fracture, T-fracture, fracture in the epiphyseal line, oblique fracture through the articular extremity, and isolated fracture of the internal or external condyle. These fractures are frequent, and are of great importance, as they are, in fact or in effect, articular fractures.

Supracondylar fracture is due to a fall on the elbow or hand, and happens most frequently to children.

The T-fracture is a longitudinal splitting of the lower fragment. On fracture, the triceps pulls the lower fragment backward and upward in a distinctive way, which may be confused with luxation of the forearm. The injury is determined by grasping the condyles and demonstrating abnormal mobility. If, in case of T-fracture, the shaft of the humerus penetrates between the two portions of the lower fragment, the entire articular end is widened.

Treatment.—Under anesthesia, thorough reposition is followed by fixation in angular splints applied on the inner and outer sides, or by a single stiff angular splint applied on the flexor aspect of the arm. There is more or less danger, in such a fracture, of some stiffness or of complete ankylosis resulting. Therefore, the forearm had best be held, if possible, in a position of flexion, beyond a right angle, unless there are special local conditions that demand that it be kept more or less extended. Recent practice has demonstrated that in practically all fractures in and about the elbow the fragments are brought into the best position possible by a position of *acute flexion*. The tendency to stiffness and ankylosis is also reduced by this position.

Fractures of the condyles occur isolated or as complications of luxations.

Palpation shows displacement and mobility of the fragments.

Treatment consists of fixation by dressings and early passive movements.

Oblique Fracture of the Articular Extremity and Separation of the Epiphysis.—These articular fractures are frequently associated with marked displacement of the forearm at the elbow-joint. It is sometimes difficult to diagnose the exact condition; but careful palpation under an anesthetic, together with comparison with the uninjured side, will generally furnish an adequate idea of the nature of the injury. The prognosis of these fractures is less favorable than of supracondylar fracture, as some displacement of fragments is likely to persist and to diminish normal mobility by the formation of irregular bony prominences. Lateral deviation of the fragments may give rise to varus and valgus positions to the elbow.

What has been said about the **treatment** of supracondylar and T-fractures is applicable here; while the exigencies of the particular case may demand fixation in a more or less extended position, it will usually be best to fix the elbow in a position of acute flexion.

In the treatment of all these fractures at the lower end of the humerus it is necessary to change and replace the dressings every few days at first, and later on the dressings should be changed every other day. This plan permits very early and persistent passive motion and massage, which are the surest and only safeguards against a resulting ankylosis. The value of the anterior angular hinged splint with the Strohmeyer screw for the purpose of maintaining function must be remembered. This permits movement without removal of dressings. See AXILLA.

ARNICA.—The dried flower heads of "leopards'-bane." The flowers are used in medicine. Its properties are probably due to an alkaloid, *trimethylamin*, $(CH_3)_3N$. In small doses it is a cardiac stimulant; in large doses, a depressant. In toxic doses it frequently causes death. It is a popular remedy, when locally applied, for sprains, bruises, and surface wounds, and is valuable also in typhus and typhoid fevers as an antipyretic. **A., Infusum** (no longer official), 20 parts flowers, 100 parts water. Superior to the tincture for local use. **A., Tinct.**, 20 percent. Dose, from 5 to 30 minims. *Trimethylamin.* Unof. Dose, from 2 to 3 grains in syrup.

AROMATICS.—Substances characterized by fragrant, spicy taste or odor, as cinnamon, ginger, the essential oils, etc. They are generally stimulant to the mucous membrane of the gastrointestinal tract. **Aromatic powder** has of cinnamon 35, ginger 35, cardamom 15, and nutmeg 15, triturated into a fine powder. The dose is from 10 to 30 grains.

Aromatic fluidextract is a solution of aromatic powder in alcohol. Its dose is from 10 to 30 minims.

A grateful aromatic in flatulency:

℞. Powdered ginger root, ℥ jss
Boiling water, O ss.

Macerate for 2 hours in a closed vessel and strain

Add:

Tincture of ginger, } each, ʒ ss.
Syrup of ginger, }

The aromatic oils are local irrtiants. Internally, in large doses, they cause burning pain in the stomach, an increased circulation, and a species of intoxication. Their influence is more powerful and more transient than that of the simple bitters, and only temporarily increases digestive power. They are chiefly employed as carminatives to stimulate the intestines to contract upon and expel flatus, to disguise the taste of medicines, to make nauseating drugs acceptable to the stomach, and to prevent the griping of purgatives.

Some tonic drugs have, besides a volatile oil, a bitter principle that modifies their action. They are known as aromatic bitters.

The chief contraindication to the use of aromatics is inflammation of the stomach or bowels.

The principal aromatics are cinnamon, cloves, nutmeg, pimenta or allspice, cardamom, ginger, black pepper, red pepper, oil of cajuput, oil of sassafras, bitter orange peel, sweet orange peel, essence of spearmint, essence of peppermint, rosemary, sage, balm, lemon peel, orange-flower water, oil of anise, spirit of anise, oil of fennel, oil of caraway, oil of coriander, oil of lavender, oil of peppermint, oil of spearmint, oil of gaultheria, calamus, compound spirit of lavender, peppermint water, spearmint water.

ARRHENAL.—Disodic-methyl arsenate. Though similar in properties it is said to be more efficient than the cacodylates, especially in chronic malaria. Dose, 1/3 to 1 grain. See CACODYLIC ACID.

ARRHYTHMIA.—See HEART-DISEASE, Functional.

ARROW-ROOT.—A kind of starch derived from *Maranta arundinacea* of the West Indies, Southern States, etc. It is widely used as a food and is a popular remedy for diarrhea. The best variety comes from Bermuda. The secret of properly prepared preparation of arrow-root is in having the first mixture with milk absolutely smooth and free from lumps.

ARSACETIN.—Sodium-acetyl-paramidophenlyarsonate. Sodium acetyl arsanilate. A substitute for mercury in the treatment of syphilis, similar to atoxyl, but less tonic and more stable. It is used in 10 or 15 percent solution, 0.6 grains (6 c.c.) of a 10 percent solution, *i. e.*, 9 grains being injected in two consecutive days each week. Even with this drug, however, there is danger of serious toxic results, a case of optic atrophy having been reported. See ARYLARSONATES.

ARSENIC.—As = 75; quantivalence III, V. A nonmetal having a metallic luster and crystalline structure. In small doses it is a stomachic and general tonic, promoting appetite and cardiac action, and stimulating mental activity. It is of great value in irritative dyspepsia, and is sometimes used internally to blanch and clear the skin. In larger doses it creates skin-eruptions and behaves as a violent corrosive poison, acting with cumulative effect. Externally, it is a powerful escharotic, used in cancer. Only the salts and oxids are used in medicine.

Therapeutics.—Arsenic is especially useful in irritative dyspepsia, gastralgia, regurgitation of food without nausea, diarrhea coming on immediately after taking food, the vomiting of drunkards, and in chronic alcoholism.

Arsenic has proved of signal service in the commencement of phthisis, and in catarrhal pneumonia, probably by causing fatty degeneration of the exudation in the alveolar cavities, thus breaking it up and quickening its absorption. It is often very serviceable in chronic bronchitis with copious expectoration, in acute catarrh, hay-fever, whooping-cough, asthma, chorea, epilepsy angina pectoris, and other spasmodic nervous disorders. In many forms of neuralgia it often gives prompt and permanent relief, especially in cases due to malarial poisoning. As an antiperiodic it has high rank, being, however, of particular value in chronic malarial poisoning, and as an adjunct to quinin in the intervals between the paroxysms of intermittents. Anemia and chlorosis are remarkably benefited by it, and in rheumatic arthritis and chronic rheumatism it is sometimes of great service. In chronic scaly and papular skin-diseases its value is very great, but it is not serviceable in acute forms, and the more chronic the cutaneous affection, the more likely it is to be amenable to arsenic. Epithelioma may be retarded by small doses long continued, and it has certainly been useful in delaying the progress of other cancers, particularly scirrhus of the stomach and uterine carcinoma. Hypodermically, its solutions have been extremely efficient in histrionic spasm, local chorea of the head and neck, obstinate cases of general chorea, and in lymphadenoma. The so-called bromid of arsenic, in the form of Clemens' solution, has rendered good service as a remedy for diabetes mellitus of hepatic origin. Cupric arsenite is being highly recommended in typhoid fever.

Secret "cancer cures" have arsenic trioxid for their bases. In the form of a paste, arsenic has been used as a depilatory, and as an escharotic in cancer, but is exceedingly painful.

To avoid arsenic poisoning, full doses (10 minims of Fowler's solution) should be used at commencement, taken on a full stomach. The dose should then be steadily reduced. Tincture of opium will often give tolerance to the drug in susceptible persons, if given with each dose.

To remove morbid growths:

℞. Arsenic trioxid, ʒ j
Sulphur, ʒ j
Spermaceti cerate, ʒ j.

Mix into a paste and allow to remain in contact with the morbid growth for 24 hours.

In diabetes mellitus:

℞. Salicylate of sodium, ʒ iij
Solution of potassium arsenite, ʒ j
Glycerin, ʒ j
Cinnamon water, enough to make ʒ iij.

Mix and give a dessertspoonful 3 times daily.

In anemia and chlorosis:

℞. Arsenic trioxid, gr. j
Dried iron sulphate, ʒ ij
Powdered black pepper, ʒ j
Pill of aloes and myrrh, ʒ j.

Mix and divide into 40 pills. Give 1 pill twice daily, after meals.

Magnesia, lime, and solutions containing salts of iron or tannic acid are incompatible with arsenic.

Poisoning is either acute or chronic, and the anatomic characteristics are the same by whatever means or channel the poison has gained access to the system.

Acute poisoning usually ensues upon the nefarious administration of arsenic, generally the oxid. The prominent symptoms come on in from half an hour to an hour after taking; and the quantity taken has relation to the time of onset, and also to its state of solubility. The vomiting should be differentiated from bilious vomiting by the persistence in the latter of the symptoms after the removal of the apparent cause, and by the symptoms intermitting and again coming on after taking water or food. Choleraic diarrhea does not appear so suddenly, the stools are "rice-water" in character and the skin is livid, and the symptoms yield to treatment. In arsenic poisoning there is greater tenderness over the epigastrium, the diarrhea is less passive and is accompanied by more tenesmus, the stools are more bloody, and nervous symptoms more pronounced. The mucous membrane, moreover, is stripped off in threads, and so appears in the bowel discharges. About the third day after poisoning remission is likely to occur in the symptoms, only to be followed by a return then. Death generally occurs about the fourth or sixth day. A skin eruption is likely to appear on or about the third day, which may take any character. Fatty degeneration of all the tissues nearly always follows acute arsenic poisoning not speedily recovered from. Multiple neuritis may ensue.

Treatment of acute poisoning consists in applying external heat and stimulants, washing out the stomach, generally with a stomach-tube, and the administration of one of the antidotes. Only those antidotes having the freshly precipitated and hydrated sesquioxid of iron are of value. A fluid preparation of iron, such as the tincture of perchlorid of iron, must have added to it some alkali to precipitate the iron. If ammonia is used, the precipitate must be washed repeatedly to remove the ammonia. Magnesia is a better precipitant, because it not only throws down the iron, but is an antidote in itself. Monsel's solution, or the dialyzed tincture of iron, may be used instead of the tincture of the chlorid of iron. The former, however, is irritating, and so readily does dialyzed iron precipitate that it may be given pure.

The official antidote to arsenic of the U. S. P. is the ferri hydroxidum cum magnesii oxido. It should be kept on hand for immediate use, and is thus prepared:

℞. Solution of ferric sulphate, 40 c.c.
Water, 125 c.c.

Mix and keep in a well-stoppered bottle.

℞. Magnesium oxid, 10 grams.
Water, 750 c.c.

Mix the latter solution slowly with the iron preparation, and shake together until a homogeneous mass results.

Should be given in large doses (ʒ iv), and frequently repeated.

The following is a simple method of preparing hydrated oxid of iron, the antidote for arsenic, one of its chief advantages being that the ingredients are always easily obtained: Take tincture of iron chlorid, 4 ounces; mix in a vessel of 12 ounces capacity, and add aqua ammoniæ, 1 dram. Shake well, pour it on a large wet muslin drainer, wring out the water and alcohol, and wash with fresh water. The stomach having been evacuated by emetics while the antidote was being prepared, give 4 fluidounces at once, to be followed by an emetic. Then give 2 ounces every 10 minutes.

Opium is to be given in the after-treatment, to allay pain and irritation, and plenty of fresh water given, to dilute the poison and to flush the kidneys.

Chronic poisoning is generally accidental, from the inhalation of arsenic vapors in factories, or from green or other wall-papers, and in manufacturing artificial flowers. It shows itself by nervous symptoms due to inflammation of different nerve-structures, such as anesthetic areas, gradually extending loss of muscular power and paralyses, by suffusions of the eyes, a peculiar appearance of the conjunctiva, by irritation of the bronchial air-passages, diseases of the kidneys, and pigmentation of the skin. Asthma is often brought about by arsenic. The peripheral neuritis, paralyses and the anesthetic areas are generally confined to the lower extremities.

Treatment of chronic arsenic poisoning requires, first, the withdrawal of the source of the poisoning or absolute withdrawal therefrom. Tonics and attention to the digestive tract, removal to fresh country air, the administration of some form of iron, of quinin, etc., soothing lotions for the skin, and attention to ulcers are advisable measures. Potassium iodid will aid in eliminating the arsenic from the system. Warm baths and shampooing form the best treatment for the paralytic lesions.

Preparations.—**Arseni Trioxidum**, *Arsenic Trioxid* (*Arsenous Acid*), As_2O_3, is a heavy, white solid, occurring as an opaque powder, or in semi-transparent masses having usually a striated appearance, soluble in 30 to 80 of water at 59° F., the solubility varying with its physical condition, also soluble in 15 of boiling water, in alkalies and their carbonates, in hydrochloric acid and in glycerin. It is volatilized at 424.4° F., without melting, and when thrown on ignited charcoal it emits an alliaceous odor. It floats when sprinkled on

water, though its weight is about 3 1/2 times that of the corresponding bulk of the fluid on which it rests. Dose, 1/50 to 1/10 grain; average, 1/30 grain.

Liquor Acidi Arsenosi, *Solution of Arsenous Acid,* is a 1 percent solution in HCl and distilled water. Dose, 2 to 6 minims, thrice daily in water after meals. Average dose, 3 minims.

Liquor Potassii Arsenitis, *Solution of Potassium Arsenite* (*Fowler's Solution*), is a 1 percent solution, prepared by boiling together arsenous acid 1, potassium bicarbonate 2, compound tincture of lavender 3, and distilled water to 100. Dose, 2 to 6 minims (average, 3) in water thrice daily after meals.

Sodii Arsenas, *Sodium Arsenate.* Occurs in colorless prismatic crystals, of feebly alkaline taste and reaction, soluble in 4 of water at 59° F., very soluble in boiling water, hardly soluble in alcohol. Dose, 1/16 to 1/8 of a grain.

Sodii Arsenas Exsiccatus, *Exsiccated Sodium Arsenate,* an amorphous, odorless, white powder, very poisonous. Dose, 1/30 to 1/15 of a grain.

Liquor Sodii Arsenatis, *Solution of Sodium Arsenate* (*Pearson's Solution*), is a 1 percent solution of the dried arsenate in distilled water. Dose, 2 to 6 minims (average, 3) in water after meals.

Arseni Iodidum, *Arsenic Iodid,* AsI_3, occurs in glossy, orange-red crystalline masses or scales, gradually losing iodin by exposure to the air, soluble in 7 of water and in 30 of alcohol at 59° F.; is gradually decomposed by boiling water and by boiling alcohol, and is completely volatilized by heat. Dose, 1/20 to 1/8 grain; average, 1/10 grain.

Liquor Arseni et Hydrargyri Iodidi, *Solution of Arsenic and Mercuric Iodid* (*Donovan's Solution*), has arsenic iodid and mercuric iodid, of each 1 part in 100 of distilled water. Dose, 1 to 5 minims in water after meals.

Also, arsacetin, arsenobenzol, atoxyl, soamin, arrhenal, and cacodylic acid (*q. v.*).

The tests for arsenic are Fleitmann's, Marsh's, and Reinsch's. **Arrhenal** and **Cacodylic Acid** (*q. v.*).

A. Paste (*Pâte Arsenicale*), a French composition, used as application for destroying the pulps of decayed teeth:

℞. Arsenic trioxid, gr. v
Acetate of morphin, gr. x.

Mull in mortar; moisten cotton pellet in oil of cloves, eugenol, oily carbolic acid, or dental aconite, and dip into powder.

ARSENOBENZOL.—("606") Ehrlich's new specific for syphilis. See SYPHILIS.

ARTERIES, TABLE OF PRINCIPAL.

ARTERIES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Acromiothoracic (thoracic axis).	Second branch of first part of axillary.	Shoulder, arm, upper anterior part of chest, and mammary gland.	Acromial, humeral, pectoral, clavicular.
Alar thoracic.....	Second part of axillary.	Lymphatic glands in axilla.	
Anastomotic (of external plantar).	External plantar.....	Outer border of foot.....	Anastomoses with the tarsal and metatarsal branches of the dorsalis pedis.
Anastomotic (of internal plantar).	Internal plantar.....	Inner side of foot.....	Anastomoses with internal tarsal branch of the dorsalis pedis.
Anastomotic (of middle meningeal), also called *perforoting.*	Middle meningeal.....	Around greater wing of sphenoid..	Anastomoses with deep temporal.
Anastomotic (of sciatic).	Sciatic	External rotator muscles of thigh ..	Assists in the formation of the crucial anastomosis.
Anastomotica magna (of brachial).	Brachial.....	Elbow.....	Posterior and anterior.
Anastomotica magna (of superficial femoral).	Superficial femoral (in Hunter's canal).	Knee.....	Superficial and deep.
Angular.....	The termination of the facial.	Lacrimal sac and lower part of orbicularis palpebrarum.	Anastomoses with infraorbital.
Anterior (of corpora quadrigemina).	Posterior cerebral.....	Anterior portion of corpora quadrigemina.	
Anterior (of receptacle).	Internal carotid.....	Dura mater of cavernous sinus and adjacent parts.	
Aorta, abdominal.....	Thoracic aorta.....	Two common iliacs.....	Phrenic (right and left), celiac axis, suprarenal or capsular (right and left), superior mesenteric, lumbar (four pairs), renal (right and left), spermatic (right and left), inferior mesenteric, right and left common iliac, middle sacral.
Aorta, arch.....	Left ventricle of heart....	Thoracic aorta.....	Two coronary, innominate, left common carotid, left subclavian.

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Aorta, thoracic	Arch of aorta	Abdominal aorta	Two or three pericardiac, three bronchial, four or five esophageal, twenty intercostal, subcostal (or twelfth dorsal), diaphragmatic, aberrans.
Appendicular	Ileo-colic	Mesentery of vermiform appendix.	
Articular, middle (of knee).	Popliteal	Crucial ligaments and joint.	
Articular, superior external (of knee).	Popliteal	Crureus and knee.	
Articular, superior, internal.	Popliteal	Knee.	
Auricular, posterior	Fifth branch of external carotid.	Back of auricle, scalp, and part of neck.	Parotid, muscular, stylomastoid, anterior terminal or auricular, and posterior terminal or mastoid.
Axillary	Subclavian	Brachial and seven branches	Superior thoracic, acromiothoracic, long thoracic, alar thoracic, subscapular, anterior and posterior circumflex.
Basilar	By confluence of right and left vertebral.	Brain	Transverse (or pontile), internal auditory, anterior cerebellar, superior cerebellar, two posterior cerebral.
Brachial	Axillary	Arm and forearm	Superior and inferior profunda, anastomotica magna, nutrient, muscular, radial and ulnar.
Buccal	Facial	Muscles of cheek	Anastomoses with buccal branch of internal maxillary, the transverse facial and infraorbital.
Buccal	Internal maxillary	Buccinator muscle and mucous membrane of mouth.	Anastomoses with the buccal branch of the facial, the transverse facial and infraorbital.
Calcanean, external and internal.	Peroneal	Over the os calcis and surrounding soft parts.	
Calcanean, inferior (of external plantar).	External plantar	Over inner surface of os calcis.	Anastomoses with internal calcanean of peroneal.
Calcanean, middle	Posterior tibial	Os calcis.	
Cardiac	Gastric	Cardiac end of stomach.	
Carotid, common	*Right side*, innominate; *left side*, arch.	External and internal carotid	External and internal carotid.
Carotid, external	Common carotid	Anterior part of neck, face, side of head, integuments and dura mater.	Ascending pharyngeal, superior thyroid, lingual, facial, occipital, posterior auricular, temporal, internal maxillary.
Carotid, internal	Common carotid	Greater part of brain, the orbit, internal ear, forehead, and nose.	Tympanic, vidian, arteria receptaculi, pituitary, gasserian, meningeal, ophthalmic, posterior communicating, anterior choroid, anterior cerebral, middle cerebral.
Carpal	Radial	Branches to lower end of radius, wrist- and carpal-joints.	Enters into formation of anterior carpal rete.
Carpal	Ulnar	Carpus	Enters into formation of the posterior carpal rete.
Celiac axis	Abdominal aorta	Stomach, duodenum, spleen, pancreas, liver and gall-bladder.	Gastric, hepatic, splenic.
Cerebral, anterior	Internal carotid	Anterior portion of cerebrum	Anterior communicating, ganglionic (or central), commissural, hemispheral (or cortical).

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Cerebral, inferior	See *Cerebral, posterior.*		
Cerebral, middle	Internal carotid	Middle portion of cerebrum	Ganglionic (or central), hemispheral (or cortical).
Cerebral, posterior	Basilar	Temporosphenoidal and occipital lobes.	Ganglionic (or central), and hemispheral (or cortical).
Cervical	Uterine	Cervix uteri.	
Cervical, ascending	Inferior thyroid	Deep muscles of neck and spinal canal.	Muscular, spinal and phrenic.
Cervical, deep	Superior intercostal	Deep muscles of neck and spinal canal.	Muscular, anastomotic, vertebral (or spinal).
Cervical, descending	Deep cervical	Tissues of neck.	
Cervical, superficial	Transverse cervical	Trapezius, levator anguli scapulæ, splenius muscles and posterior chain of lymphatic glands.	
Cervical, transverse (transversalis colli).	Thyroid axis	Posterior cervical and scapular regions.	Posterior scapular and superficial cervical.
Circular, of uterus	Uterine	Cervix uteri.	
Circumflex, anterior (of axillary).	Axillary	Pectoralis major, biceps, and shoulder-joint.	Bicipital and pectoral.
Circumflex, external	Profunda femoris	Muscles of thigh	Ascending, transverse, and descending.
Circumflex iliac, deep	External iliac	Upper part of thigh and lower part of abdomen.	Muscular and cutaneous.
Circumflex iliac, superficial.	Common femoral	Iliacus and sartorius muscles, inguinal glands, and skin of thigh.	
Circumflex, internal	Profunda femoris	Muscles of thigh.	
Circumflex, posterior (of axillary).	Axillary	Deltoid, teres minor, triceps, and shoulder-joint.	Nutrient, articular, acromial, muscular.
Coccygeal	Sciatic	Integument over lower part of sacrum and coccyx.	
Colic, left	Inferior mesenteric	Colon, descending.	
Colic, middle	Superior mesenteric	Transverse colon.	
Colic, right	Superior mesenteric	Colon, ascending.	
Colic, transverse	Colic, middle	Transverse colon.	
Communicating	Dorsalis pedis	Enters into formation of plantar arch.	The fifth plantar digital, or princeps hallucis.
Communicating	Occipital	Muscles of posterior part of neck	Anastomoses with branches of the vertebral.
Communicating (or perforating).	Deep palmar arch	Join proximal ends of metacarpal and second and third dorsal interosseous arteries.	
Communicating	Peroneal	Anastomoses with communicating branch of posterior tibial.	
Communicating	Posterior tibial	Anastomoses with communicating of peroneal.	
Communicating, anterior.	Anterior cerebral	Assists in formation of anterior boundary of circle of Willis; sends branches to caudate nucleus.	
Communicating, posterior.	Posterior cerebral	Enters into formation of circle of Willis; uncinate convolution and optic thalamus.	Uncinate, middle thalamic.

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Coronary. See *Gastric*....			
Coronary, inferior.....	Facial.....	Lower lip.	
Coronary, left.....	Left anterior sinus of Valsalva.	Heart.....	Left auricular, anterior interventricular, left marginal, terminal.
Coronary, right.....	Right anterior sinus of Valsalva.	Heart.....	Right auricular, preventricular, right marginal, posterior, interventricular, transverse.
Coronary, right, of stomach. See *Pyloric.*			
Coronary, superior.....	Facial.....	Upper lip.....	Arteria septum narium.
Cremasteric.....	Deep epigastric.....	Cremaster muscle.	
Cremasteric.....	Spermatic.....	Cremaster muscle.....	Anastomoses with cremasteric from deep epigastric.
Diaphragmatic.....	Thoracic aorta.....	Diaphragm.	
Digital.....	External plantar.....	Outer side of the 2d and 3d, 4th and 5th toes.	
Digital, palmar.....	Superficial palmar arch..	Both sides of little, ring, and middle finger and ulnar side of index finger.	
Digital, plantar. See *Communicating, of dorsalis pedis.*			
Digital, superficial.....	Internal plantar.....	Toes.	
Dorsal.....	Intercostal.....	Spine and muscles of throat	Spinal and muscular.
Dorsal.....	Lumbar.....	Muscles of back.	
Dorsal, interosseous.....	Radial.....	Contiguous of 2d, 3d, 4th and 5th toes.	
Dorsal (of penis).....	Termination of pudic....	Penis.	
Dorsal (scapular).....	Subscapular.....	Muscles of scapula and shoulder-joint.	Infrascapular.
Dorsal of tongue.....	Lingual.....	Dorsum of tongue, tonsils, and epiglottis.	
Dorsalis hallucis.....	Continuation of dorsalis pedis.	Great and second toe.	
Dorsalis indicis.....	Radial.....	Index finger.	
Dorsalis linguæ.....	Lingual.....	Mucous membrane of tongue, pillars of fauces and tonsils.	
Dorsalis pedis.....	Continuation of anterior tibial.	Assists to form plantar arch.....	Tarsal, metatarsal, dorsalis hallucis, communicating.
Dorsalis pollicis.....	Radial.....	Thumb.	
Duodenal, superior, right. See *Pancreatico-duodenal, superior.*			
Duodenogastric.....	See *Gastroduodenal.*		
Dural.....	See *Meningeal.*		
Epigastric, deep (or inferior).	External iliac.....	Abdominal wall.....	Cremasteric, pubic, muscular, cutaneous, terminal.

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Epigastric, superficial	Common femoral	Inguinal glands, skin, superficial fascia, and abdominal wall.	
Epigastric, superior	Internal mammary	Abdominal wall and diaphragm, liver and peritoneum.	Phrenic, xiphoid, cutaneous, muscular, hepatic and peritoneal.
Epiploic	Right and left gastro-epiploic.	Omentum.	
Esophageal	Gastric	Esophagus.	
Esophageal	Inferior thyroid	Esophagus.	
Esophageal	Left phrenic	Esophagus.	
Esophageal (4 or 5)	Thoracic aorta	Esophagus.	
Esophageal, inferior	Coronary (of stomach)	Esophagus.	
Ethmoidal, anterior	Ophthalmic	Part of anterior portion of brain, nose, frontal sinuses and skin of face.	Ethmoidal, meningeal, nasal, frontal, cutaneous.
Ethmoidal, posterior	Ophthalmic	Posterior ethmoidal cells, dura mater, nose.	Ethmoidal, meningeal, nasal.
Facial	Third branch external carotid.	Pharynx and face	Ascending, or inferior palatine, tonsillar, glandular, muscular, submental, masseteric, buccal, inferior labial, inferior and superior coronary, lateralis nasi, angular.
Facial, transverse	Temporal	Parotid gland, masseter muscle, skin of face.	
Femoral, common	Continuation of external iliac.	Lower part of abdominal wall, upper part of thigh and genitalia.	Superficial epigastric, superficial circumflex iliac, superficial external pudic, deep external pudic, profunda.
Femoral, profunda	Common femoral	Muscles of thigh	External circumflex, internal circumflex and three perforating.
Femoral, superficial	Continuation of common femoral.	Muscles of thigh and knee-joint.	Muscular, saphenous, anastomotica magna.
Fibular, superior	Anterior or posterior tibial or popliteal.	Soleus and peroneus tertius muscles and integument.	
Of the frenum linguæ	Sublingual	Frenum of tongue.	
Gastric (or coronary)	Celiac axis	Stomach, liver, and esophagus	Esophageal, cardiac, gastric, and hepatic.
Gastroduodenal	Hepatic	Stomach and duodenum	Right gastroepiploic and superior pancreatico-duodenal.
Gastroepiploic, left	Splenic	Stomach and omentum.	
Gastroepiploic, right	Gastroduodenal	Stomach and omentum.	
Gastrohepatic	See *Coronary, of stomach.*		
Gluteal	Internal iliac, posterior division.	Pelvic and glutei muscles, etc.	Muscular, superficial and deep.
Gluteal, deep	Gluteal	Deep muscles of posterior gluteal region.	
Gluteal, inferior	Sciatic	Gluteus maximus.	
Gluteal, superficial	Gluteal	Gluteus maximus and integument over sacrum.	
Gluteal, superior	Deep gluteal	Muscles adjacent.	

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Hemorrhoidal, inferior (or external).	Pudic	Sphincter muscle, levator ani.	
Hemorrhoidal, middle (rectal, middle).	Internal iliac, anterior division.	Middle part of rectum.	
Hemorrhoidal, superior.	Inferior mesenteric	Upper part of rectum.	
Hepatic	Celiac axis	Liver, pancreas, part of duodenum, and stomach.	Pancreatic, subpyloric, gastroduodenal, right and left terminal.
Hepatic	Gastric	Left lobe of liver.	
Hepatic	Right phrenic	Liver.	
Hepatic	Superior epigastric	Liver.	
Hepatic, right	Hepatic	Liver substance	Cystic.
Humeral, thoracic	Acromio-thoracic	Pectoralis major, deltoid and adjacent integuments.	Anastomoses with anterior and posterior circumflex.
Humeral, transverse. See *Suprascapular.*			
Hypogastric	Continuation of anterior branch of internal iliac.	Vesical branches, impervious in the adult.	
Ileocolic	Superior mesenteric	Cecum and adjacent bowel.	
Iliac, circumflex deep. See *Circumflex iliac, deep.*			
Iliac, circumflex, superficial.	See *Circumflex iliac, superficial.*		
Iliac, common	Terminal branch of abdominal aorta.	Peritoneum, superitoneal fat, ureter, and terminates in external and internal iliac.	Peritoneal, subperitoneal, ureteric, external and internal iliac.
Iliac, external	Common iliac	Lower limb	Deep epigastric, deep circumflex iliac, muscular, and continues as femoral.
Iliac, external, small. See *Circumflex iliac, external.*			
Iliac, internal	Common iliac	Pelvic and generative organs, and inner side of thigh.	Anterior and posterior trunk.
Iliac, internal, anterior trunk.	Internal iliac	Pelvic and generative organs and thigh.	Hypogastric, superior middle and inferior vesical, middle hemorrhoidal, uterine, vaginal, obturator, sciatic, internal pudic.
Iliac, internal, posterior trunk.	Internal iliac	Muscles of hip and sacrum	Iliolumbar, lateral sacral and gluteal.
Ilio-lumbar	Internal iliac, posterior trunk.	Muscles of pelvis and pelvic bones.	Iliac and lumbar.
Infraorbital	Internal maxillary	Upper lip, lower eye-lid, lacrimal sac, side of nose.	Orbital, anterior dental, nasal.
Infrascapular	Dorsal scapular	Subscapularis, scapula, and shoulder-joint.	
Innominate	Arch of aorta	Right side of head and right arm.	Right common carotid, right subclavian, occasionally thyroidea ima.
Intercostal, anterior	Internal mammary	Intercostal muscles, ribs (upper 5 or 6), and pectoralis major.	
Intercostal, anterior	Musculophrenic	Lower 5 or 6 intercostal spaces.	

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Intercostal, aortic. 10 pairs.	Thoracic aorta	Lower intercostal spaces	Dorsal, intercostal collateral, pleural, muscular, lateral cutaneous, mammary glandular.
Intercostal, first	Superior intercostal	First intercostal space.	
Intercostal, superior	Subclavian	Neck and upper part of thorax	Deep cervical, first intercostal, arteria aberrans.
Interosseous, common	Ulnar	Interosseous membrane and deep muscles of the forearm.	Anterior and posterior interosseous.
Interosseous, dorsal (3)	Metatarsal	Contiguous sides of 2d and 3d, and 4th and 5th toes.	
Interosseous, dorsal	Posterior radial carpal.	Dorsal aspect of fingers.	
Interosseous, palmar (3).	Deep palmar arch	Interosseous muscles, bones, and 2d, 3d, and 4th lumbricales.	
Interosseous, plantar	Plantar arch	Toes.	
Interosseous, posterior (forearm).	Common interosseous	Muscles, back of forearm	Posterior interosseous recurrent.
Interosseous, recurrent	Interosseous, posterior	Elbow-joint.	
Labial, inferior	Facial	Muscles and integuments of lower lip.	
Labial, superior	See *Coronary, superior.*		
Lacrimal	Ophthalmic	Lacrimal gland, muscles of eye and cheek, and upper and lower eyelids.	Recurrent lacrimal muscular, palpebral, malar, ciliary.
Lingual	External carotid	Tongue	Hyoid, dorsalis linguæ, sublingual, ranine.
Lingual	Mandibular	Lingual nerve.	
Lumbar (4 pairs)	Abdominal aorta	Bodies and ligaments of vertebræ, lumbar muscles, and capsules of kidneys.	Vertebral, muscular, dorsal, renal.
Lumbar	Iliolumbar	Psoas muscle, quadratus lumborum, and spinal canal.	
Malleolar, external	Anterior tibial	External portion of ankle.	
Malleolar, internal	Anterior tibial	Internal portion of ankle	
Malleolar, internal	Posterior tibial	Internal malleolus.	
Mammary, external. See *Thoracic, long.*			
Mammary, internal	Subclavian	Structures of thorax	Superior phrenic, mediastinal (or thymic), pericardiac, sternal, anterior intercostals, perforating, lateral infracostal, superior epigastric, internal mammary.
Maxillary, internal (maxillary group).	External carotid	Structures indicated by names of branches.	Deep auricular, tympanic, middle meningeal, mandibular, small meningeal.
Maxillary, internal (pterygoid group).	External carotid	Structures indicated by names of branches.	Masseteric, posterior deep temporal, internal and external pterygoid, buccal, anterior deep temporal.
Maxillary, internal (sphenomaxillary group).	External carotid	Structures indicated by names of branches.	Posterior dental (or alveolar), infraorbital, posterior (or descending) palatine, vidian, pterygopalatine, nasal, or sphenopalatine.
Mediastinal, anterior (or thymic).	Internal mammary	Connective tissue, fat and lymphatics, in superior and anterior mediastina, thymus gland.	

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Mediastinal, posterior (several).	Thoracic aorta	Glands and loose areolar tissue in mediastinum.	
Mental	Facial	Muscles of chin and lower lip.	
Mesenteric, inferior	Abdominal aorta	Lower half of large intestine	Left colic, sigmoid, superior hemorrhoidal.
Mesenteric, middle	Common iliac (occasional branch).	Transverse and descending colon.	
Mesenteric, superior	Abdominal aorta	Whole of small intestine and upper half of large.	Inferior pancreatico-duodenal, middle right and ileocolic, vasa intestina tenuis.
Musculophrenic	Internal mammary	Diaphragm, fifth or sixth lower intercostal spaces, oblique muscles of abdomen.	Phrenic, anterior intercostals, muscular.
Nasal	Ophthalmic	Lacrimal sac and integuments of nose.	Lacrimal, and transverse nasal.
Nasal	Sphenopalatine	Turbinated bones, lateral walls of nose, ethmoidal and frontal sinuses and lining membrane of antrum.	
Nasal, lateral	Facial	Integuments, muscles and cartilage of nose.	
Obturator	Anterior division, internal iliac.	Pelvis and thigh	Iliac (or nutrient), vesical, pubic, external and internal pelvic.
Obturator, external	Obturator	Muscles about obturator foramen.	
Occipital	Fourth branch of external carotid.	Muscles of neck, and scalp	Sternomastoid, posterior meningeal, auricular, mastoid, princeps cervicis, communicating, muscular, terminal.
Ophthalmic	Internal carotid	The eye, adjacent structures, portion of face.	Lacrimal, supraorbital, central artery of retina, muscular, ciliary, posterior and anterior ethmoidal, palpebral, frontal, nasal.
Ovarian	Abdominal aorta	Ovary, ureter, Fallopian tube, uterus.	Ureteral, Fallopian, uterine, ligamentous.
Palatine, ascending (or inferior).	First branch of facial	Upper part of pharynx, palate and tonsils.	Palatine, tonsillar.
Palatine, descending (or superior).	Internal maxillary	To soft and hard palate	Anterior and posterior.
Palatine, posterior or descending.	Internal maxillary	Hard palate	Anterior and posterior.
Palmar arch, deep	Radial and communicating of ulna.	Palm and fingers	Princeps pollicis, radialis indicis, palmar interosseous (3), recurrent carpal, posterior perforating.
Palmar arch, superficial	Ulnar and superficialis volæ.	Palm and fingers	Digital (4), muscular, cutaneous.
Pancreaticoduodenal (inferior).	Superior mesenteric	Pancreas and duodenum.	
Pancreaticoduodenal (superior).	Gastroduodenal	Duodenum and pancreas.	
Perineal, superficial	Pudic	Muscles of perineum and integuments of scrotum.	Transverse perineal.
Perineal, transverse	Perineal, superficial	Muscles and integuments of perineum.	
Peroneal	Posterior tibial	Muscles and integument of leg and foot.	Anterior peroneal, muscular, medullary, communicating, cutaneous, external calcaneum, terminal (or posterior peroneal).

ARTERIES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Pharyngeal, ascending....	First branch external carotid.	Pharynx, soft palate, tympanum, posterior part of neck, and membranes of brain.	Prevertebral, pharyngeal, palatine tympanic, meningeal.
Plantar arch.....	External plantar artery...	Anterior part of foot and toes.....	Articular and plantar digital.
Plantar, deep.....	Metatarsal.....	Assists in formation of plantar arch.	
Plantar, digital (4).....	Plantar arch.....	Third, fourth and fifth toes, and outer side of second.	
Plantar, external.....	External, tibial.....	Sole and toes.....	Muscular, calcaneal, cutaneous, anastomotic, posterior perforating, plantar arch.
Plantar, internal.....	Posterior tibial.....	Inner side of foot.....	Muscular, cutaneous, articular, anastomotic, superficial digital.
Plantar, interosseous. See *Interosseous, plantar.*			
Plantar, metatarsal See *Interosseous, plantar.*			
Popliteal.....	Continuation of femoral.	Knee and leg.....	Cutaneous, muscular (superior and inferior) or sural, articular, superior and inferior external, superior and inferior internal and azygos, terminal (anterior and posterior tibial).
Princeps cervicis.....	Occipital.....	Muscles of neck.....	Superficial and deep.
Princeps hallucis.....	Communicating (of dorsalis pedis).	First and second toes.	
Princeps pollicis.....	Radial.....	Thumb.	
Profunda (or deep femoral).	Femoral.....	Thigh.....	External and internal circumflex, three perforating.
Profunda, inferior.....	Brachial.....	Triceps, elbow-joint.	
Profunda, superior.....	Brachial.....	Humerus, mucles and skin of arm.	Ascending, cutaneous, articular, nutrient, muscular.
Pudic, external, deep (or inferior).	Femoral, common.....	Skin of scrotum (or labia in female).	
Pudic, external, superficial (or superior).	Femoral, common	Integument above pubes and external genitalia.	
Pudic, internal.....	Internal iliac, anterior division of internal branch.	Generative organs.....	External (or inferior) hemorrhoidal, superficial perineal, muscular, arteries of bulb, crus, and dorsal of penis.
Pyloric, inferior.....	Gastroduodenal or right gastroepiploic.	Pyloric end of stomach.	
Pyloric, superior.....	Hepatic.....	Pyloric end of stomach.	
Radial.....	Brachial.....	Forearm, wrist, hand.....	Radial recurrent, muscular, anterior and posterior radial carpal, superficial volar, metacarpal, dorsalis pollicis, dorsalis indicis, deep palmar arch.
Radial carpal, anterior and posterior.	Radial.....	Wrist and carpal joints.	
Radial, profunda.....	Superior profunda of arm.	Back of elbow.	
Radial recurrent, anterior.	Radial.....	Elbow-joint and muscles of forearm.	

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Radial recurrent, posterior.	Posterior interosseous (forearm).	Elbow.	
Radialis indicis	Radial	Index finger.	
Ranine	Lingual	Tongue and mucous membrane of mouth.	
Renal	Abdominal aorta	Kidney	Inferior suprarenal, capsular (or perirenal), ureteral.
Sacral, lateral (1 or 2)	Internal iliac, posterior division.	Structures about sacrum	Spinal, rectal, muscular.
Sacral, middle	Continuation of aorta	Sacrum and coccyx.	
Scapular, dorsal	Subscapular	Muscles of infraspinous fossa	Infrascapular.
Scapular, posterior	Continuation of transverse cervical.	Muscles of scapular region	Supraspinous and infraspinous, subscapular, muscular.
Sciatic	Internal iliac, anterior division.	Pelvic muscles and viscera, and branches.	Coccygeal, inferior gluteal, muscular, anastomotic, articular, cutaneous, comes nervi ischiadici, vesical, rectal, prostatic, etc.
Sigmoid	Inferior mesenteric	Sigmoid flexure.	
Spermatic	Abdominal aorta	Scrotum and testis	Ureteral, cremasteric, epididymal, testicular.
Spermatic, external	Deep epigastric	Cremaster muscle, and spermatic cord.	
Splenic	Celiac axis	Spleen, pancreas, part of stomach, omentum.	Small and large pancreatic, left gastroepiploic, vasa brevia, terminal.
Sternal	Internal mammary	Sternum and triangularis sterni.	
Sternomastoid (or middle mastoid).	Superior thyroid	Sternomastoid, and other muscles of neck.	
Sternomastoid, inferior	Suprascapular	Sternomastoid muscle.	
Stylomastoid	Posterior auricular	Mastoid cells, tympanic cavity, etc.	Meatal, mastoid, stapedic, tympanic, vestibular, terminal.
Subclavian	Right, innominate. Left, arch of aorta.	Neck, thorax, arms, brain, meninges, etc.	Vertebral, thyroid axis, internal mammary, superior intercostal.
Sublingual	Lingual	Sublingual gland, side of tongue, and floor of mouth.	Artery of frenum.
Submental	Facial	Tissues under jaw	Muscular, perforating, cutaneous, mental.
Subscapular	Axillary	Subscapularis, teres major, latissimus dorsi, serratus magnus, axillary glands.	Dorsal and infrascapular.
Supraorbital	Ophthalmic	Orbit, frontal sinuses, diploë and upper eye-lid.	Periosteal, muscular, diploic, trochlear, palpebral.
Suprascapular (or transversalis humeri).	Thyroid axis	Muscles of shoulder	Inferior sternomastoid, subclavian, nutrient, suprasternal, acromial, articular, subscapular, supraspinous and infraspinous.
Tarsal, external and internal.	Dorsalis pedis	Skin and joints, etc., of foot.	
Temporal	External carotid	Forehead, parotid gland, masseter, ear.	Parotid, articular, masseteric, anterior auricular, transverse, facial, middle temporal, and anterior and posterior terminal.

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Temporal, posterior....	Superficial temporal.....	Side of head and vertex.	
Thoracic, acromial (thoracic axis).	Axillary.....	Muscles of shoulder, arm, and chest.	Acromial, humeral, pectoral, clavicular.
Thoracic, alar.....	Axillary.....	Axillary glands.	
Thoracic, long (external mammary).	Axillary.....	Pectoral muscles, serratus magnus, mammary and axillary glands.	
Thoracic, short (or superior).	Axillary.....	Intercostal muscles, serratus magnus.	
Thyroid axis.....	Subclavian.....	Shoulder, neck, thorax, spine, cord.	Inferior thyroid, suprascapular and transverse cervical.
Thyroid, deep.....	Arch of aorta, innominate (occasional branch).	Same as inferior thyroid.	
Thyroid, inferior (ascending).	Thyroid axis.	Larynx, esophagus and muscles of neck.	Muscular, ascending cervical, esophageal, tracheal and inferior laryngeal.
Thyroid, superior (descending).	External carotid.....	Omohyoid, sternohyoid, sternothyroid, thyroid gland.	Hyoid, sternomastoid, superior laryngeal, cricothyroid.
Tibial, anterior.....	Popliteal.....	Leg.....	Posterior and anterior tibial recurrent, muscular, internal, and external malleolar.
Tibial, anterior, recurrent.	Anterior tibial.....	Tibialis anticus muscle.	
Tibial, posterior	Popliteal.....	Leg, heel and foot.....	Peroneal, muscular, medullary cutaneous, communicating, malleolar, calcanean, internal and external plantar.
Tibial, recurrent, posterior.	Anterior tibial.....	Back of knee-joint.....	Anastomoses with the inferior articular arteries of knee.
Tonsillar.....	Ascending palatine.....	Tonsil and Eustachian tube.....	
Tonsillar.....	Facial.....	Tonsil and root of tongue.	
Tracheal.....	Inferior thyroid.....	Trachea.	
Transversalis colli.....	Thyroid axis.....	Neck and scapular region.....	Superficial cervical and posterior scapular.
Ulnar.....	Brachial.....	Forearm, wrist, and hand.....	Anterior and posterior ulnar recurrent, common interosseous, muscular, nutrient, anterior and posterior ulnar carpal, palmar arch.
Ulnar carpal, anterior and posterior.	Ulnar.....	Carpal region.	
Ulnar, recurrent, anterior and posterior.	Ulnar.....	Muscles of arm and elbow-joint.	
Ulnocarpal, anterior....	Ulnar.....	Muscles of hand.	
Uterine.....	Internal iliac, anterior branch.	Uterus.....	Cervical, vaginal, azygos.
Uterine.....	Ovarian.....	Uterus.	
Vaginal (2 or 3).....	Internal iliac, anterior division.	Vagina.	
Vaginal azygos.....	Uterine.....	Vagina.	
Vasa brevia.....	Splenic.....	Stomach.	
Vertebral.....	Subclavian.....	Neck of cerebrum.....	Lateral spinal, muscular, anastomotic, posterior meningeal, posterior and anterior spinal, posterior cerebellar.

ARTERIES, TABLE OF PRINCIPAL

Name.	Origin.	Distribution.	Branches.
Vesical, inferior	Internal iliac, anterior division.	Bladder, prostate, seminal vesicles, and vagina (in female).	
Vesical, middle	Superior vesical	Bladder.	
Vesical, superior	Internal iliac, anterior division.	Bladder	Differential, uracheric, ureteric, middle vesical (occasionally).
Volar, superficial	Radial	Ball of thumb	Enters into formation of superficial palmar arch.
Volar, superior. See *Volar, superficial.*			
Xiphoid	Superior epigastric	Ensiform cartilage.	

ARTERIES, INJURIES.—**Contusion or bruising** of an artery without laceration or other injury of its coats occasionally occurs, and is said to be followed by contraction and permanent diminution in the size of the vessel, and even by gangrene of the limb.

Rupture or subcutaneous laceration of an artery is perhaps most often due to the passage of a wheel over a limb, incautious attempts to reduce an old dislocation of the shoulder, and excessive violence in breaking down adhesions in stiff joints.

1. The rupture may be *partial*—*i. e.*, only the internal and middle coats may be torn. In such a case the external coat may subsequently yield to the pressure of the blood, thus laying the foundation of an aneurysm; or the internal and middle coats may be folded inward into the interior of the vessel, obliterating its caliber and causing gangrene of the limb.

2. The rupture may be *complete*—*i. e.*, all the coats may be torn across. Gangrene may ensue, especially if the vein is also ruptured and the injury occurs in the lower extremity. Sometimes the extravasated blood is encysted.

Symptoms.—When the main artery becomes occluded, there will be pain at the seat of rupture and cessation of the pulse below, while gangrene will probably ensue later; or, if the artery is patulous, blood in large quantities will escape into the tissues, giving rise to a rapidly increasing swelling, in which no pulsation can be detected. When the extravasation is very large, constitutional symptoms of hemorrhage will also be present. Gangrene, if the ruptured artery is in the lower limb, will probably soon supervene. On the other hand, should the blood become encysted, the swelling will slowly assume the characters of an ordinary aneurysm.

Treatment.—(*a*) *When the artery is occluded,* all that can be done is to endeavor to prevent gangrene occurring by maintaining the warmth of the limb until the collateral circulation has had time to become established. Should gangrene occur, amputation must be performed as soon as a line of demarcation has formed. (*b*) *When blood in large quantities is extravasated into the tissues,* the treatment will depend on the situation of the ruptured artery. Thus, in the case of the popliteal, amputation is usually called for, especially if the vein is also ruptured, as gangrene will almost invariably ensue if the main artery is tied either above or at the seat of rupture.

Treatment of Wounded Arteries.—The following are the rules of Walsham:

1. When an artery is seen spouting in an open wound, a ligature should at once be applied to the bleeding end.

2. When the end of a large artery is seen pulsating, but not bleeding, in consequence of having been *torn* across, it is wise to apply a ligature to it as a precaution.

3. When an artery is exposed for some distance in its continuity, two ligatures, as a rule, had better be applied and the artery divided between them, especially if it is notched or bruised.

4. When an artery has ceased to bleed, even though the hemorrhage may have been sharp, the wound should on no account be enlarged for the purpose of tying the bleeding vessel, unless it can be seen or felt; for not only may it not bleed again, but as the bleeding has ceased, it may also be difficult or impossible to find it. In such a case, however, especially if the patient is much collapsed, he should be watched for the first sign of any return of the hemorrhage, firm pressure in the meantime being applied over the wound, and, when practicable, over the course of the main artery, above and below.

The whole limb, moreover, should be carefully bandaged from below upward.

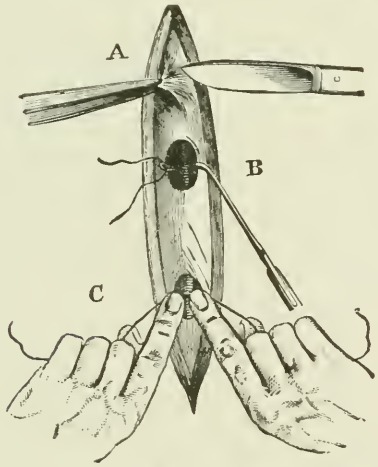
5. When the hemorrhage is moderate and clearly arterial, the external wound small, and the artery not visible, pressure should be applied in the way previously mentioned, and will probably suffice.

6. When the bleeding is severe and evidently arterial, and the external wound is still open, whether the wound is deep, recent, inflamed, or sloughing, the well-established rule—to which, however, there are, of course, exceptions—is to cut down upon the bleeding point and apply a ligature to each end of the artery if divided, or above and below the wound if the artery is punctured or only partially cut across. To do this it is generally sufficient to enlarge the wound in the soft tissues; but when the wound is on one side of the limb, and

the bleeding apparently comes from an artery on the other, a probe should be passed through the wound, its projecting point cut down upon, and the bleeding artery sought through this incision and tied. The object of this procedure is to prevent the necessity of making a very large wound.

While cutting down upon a bleeding artery, hemorrhage should be restrained by the use of an Esmarch bandage, or by the tourniquet, or the fingers applied to the main artery above the wound; in the case of a wound of the external iliac or gluteal, Davy's lever should be passed up the rectum and made to compress the common iliac. When it is impracticable to control the bleeding in any of these ways, the wound, if necessary, should be sufficiently enlarged to admit one or two fingers, and the bleeding vessel, having been recognized by the escape of warm blood, should then be compressed by the finger, the wound further enlarged, and the artery secured with the aid of an assistant before the finger is removed from the bleeding spot. Should gangrene ensue after ligation and spread rapidly, amputation must be performed at the seat of ligation; but if it involves only one or two fingers or toes, or spreads slowly, a line of demarcation should be awaited before amputating. See ARTERIES (Suture of).

ARTERIES, LIGATION. General Rules for Ligating.—(1) The incision is generally to be made parallel to the course of the artery, and the skin divided evenly to promote union by first intention



THIS DIAGRAM REPRESENTS THREE DISTINCT OPERATIONS: *A*. Opening the sheath. *B*. Drawing ligature round the artery. *C*. Tying artery.—(*Moullin.*)

(2) Each successive cut through the underlying tissues should be made the same length as that through the skin, and bruising of the parts avoided as much as possible. (3) The sheaths of muscles and tendons should not, if avoidable, be opened. (4) The sheath of the vessel having been exposed and the artery felt pulsating with the index-finger, the sheath should be pinched up with forceps, and opened by cutting with the blade of the knife on the flat. (5) The sheath being opened, it must be separated from the artery in the whole of its circumference, either by careful dissecting with the knife turned with its edge from the artery, or by the director insinuated by a gentle to-and-fro movement between the sheath and the artery. If this part of the operation is not done very delicately, too much of the sheath in the long axis of the artery will be separated, and there will be danger of secondary hemorrhage from cutting off of the blood supply which the vessel receives from its sheath. (6) Having separated the sheath, one side of it should be seized with the forceps and the needle passed, unthreaded, between it and the artery, and the point, by a gentle to-and-fro movement, carried around the vessel without injuring or including any of the contiguous structures. Save in exceptional cases, which will be mentioned, it should be passed from the side on which the vein lies. (7) When the point of the needle projects on the opposite side, it should be cleared of any loose cellular tissue of the sheath it may have carried before it, by scratching with the finger-nail or cutting on the needle with the edge of the scalpel directed from the artery. (8) The artery should be gently pressed between the curve of the needle and the finger, to ascertain that no other structure is included, and that pressure controls the pulsation in the aneurysm. (9) The needle should now be threaded with the ligature, which is carried around the artery as the needle is withdrawn; the ligature should then be tied in a reef knot and its ends cut off short. (10) Should much of the sheath have been unavoidably separated from the artery, two ligatures should be passed, and the artery divided between them. (11) Some form of aseptic ligature should be used, as silk, chromicized catgut, ox-aorta, or kangaroo-tail tendon, but the most suitable material can hardly be said to have been determined. (12) The wound should be accurately united, and if it is a deep one, it should be drained, and finally dressed antiseptically (Walsham).

Ligation of Special Arteries.—The common carotid artery may require tying for: (1) Wound of the artery; (2) a punctured wound near the angle of the jaw or tonsil; (3) aneurysm of the upper part of the artery or of one of its branches; (4) orbital, intracranial, or cirsoid aneurysm; and (5) aneurysm at the root of the neck (distal ligation). The artery may be tied either above or below the omohyoid. When practicable, it should be tied above, as it is here more superficial, and the risk of suppuration extending beneath the deep fascia into the chest is avoided.

The high operation, or ligation above the omohyoid: Make an incision 3 inches in length, with its center opposite the cricoid cartilage, along the anterior edge of the sternomastoid muscle—*i. e.*, in a line drawn from the sternoclavicular articulation to a point midway between the angle of the jaw and the mastoid process. Divide the skin, superficial fascia, platysma and deep fascia. Draw the anterior edge of the sternomastoid gently outward, and the artery will be felt pulsating in the angle formed by the omohyoid with the sternomastoid. Open the sheath on its inner side, and pass the aneurysm needle from without inward to avoid injuring the vein, which slightly overlaps

the artery on its outer side, and keep its point close to the vessel, lest the pneumogastric nerve be included in the ligation. The small descendens noni nerve runs superficial to the sheath, and, if seen, should be avoided. The superior thyroid, lingual, and facial veins cross the artery to open into the internal jugular vein. Should they impede the operation, divide them, having first applied two ligatures.

The low operation, or ligation below the omohyoid: Make an incision in the same line as for the high operation, but lower in the neck. Draw the sternomastoid outward and the sternohyoid and -thyroid inward, and the artery will be felt beating in the angle formed by the omohyoid with the sternothyroid. Pass the needle as before, from without inward, taking especial care not to injure the vein that on the left side slightly overlaps the artery. The head should be kept fixed, after ligation, by sand-bags or some form of splint.

The chief dangers after ligation are: (1) Cerebral disturbance from partial cutting off of the blood supply to the brain; (2) a low form of pneumonia from interference with the blood supply of the pneumogastric center; (3) suppuration descending into the mediastinum; and (4) suppuration of the sac when tied for aneurysm. The *collateral circulation* is carried on by the anastomosis of: (1) The vertebral with the opposite vertebral; (2) the inferior with the superior thyroid; (3) the internal carotid with the opposite internal carotid through the circle of Willis; (4) the deep cervical with the princeps cervicis of the occipital; (5) branches of the external carotid with the corresponding branches of the opposite side across the middle line of the neck.

The external and internal carotid arteries may be tied by an incision similar to that for the common carotid, but higher in the neck. A point to remember is that the internal carotid is in position at first external to the external carotid and that it is of larger size.

The lingual artery may require ligation for hemorrhage in cancer of the tongue, and as a preliminary to excision of the tongue. Make an incision along the greater cornu of the hyoid bone; divide the skin, superficial fascia, and platysma; hook up the submaxillary gland, and a few strokes of the director will expose the triangle, bounded below by the anterior and posterior belly of the digastric and above by the hypoglossal nerve. Scratch cautiously through the muscular fibers of the hyoglossus, which forms the floor of this triangle, taking care not to injure the lingual vein, which is superficial to the muscle; the lingual artery will be seen or felt lying upon the middle constrictor of the pharynx. The vessel, however, is often abnormal, and consequently may not be found in the usual situation.

The facial artery is readily tied at the anterior edge of the masseter, where it can be felt beating. It lies anterior to its vein. It is frequently tied in its course through the neck, in the removal of glands from that region.

The superior thyroid artery seldom requires tying, except for wounds of the neck, as "cut throat," and as a preliminary to removal of the thyroid body.

The temporal artery may require ligation for cirsoid aneurysm or a wound of the vessel. It may be readily secured at the spot where it is felt beating, as it crosses the zygoma just in front of the external auditory meatus.

The subclavian artery may be tied in the *third part of its course* for: (1) Axillary aneurysm; (2) aneurysm at the root of the neck (distal ligation);

Incision for the ligature of arteries in the neck. a. The temporal; b. the facial; c. the external carotid; d. the lingual; e. the common carotid; f. the third part of the subclavian.—(*Spencer and Gask.*)

(3) ruptured axillary artery; (4) secondary hemorrhage after amputation at the shoulder-joint; and (5) as a preliminary to the last-named operation. The head having been drawn well back, the face turned to the opposite side, and the shoulder depressed, draw down the skin over the clavicle, make an incision along the middle third of that bone through the integuments and platysma, so as to avoid injuring the external jugular vein, and let the tissues slip up again. Next divide the deep fascia on a director, and the posterior edge of the sternomastoid will be exposed. Hold aside, or divide if necessary, the external jugular or any other vein that may be in the way, but do not injure the suprascapular artery, as this is one of the chief vessels by which the collateral circulation will subsequently be carried on. Search with the finger and director for the scalene tubercle in the triangle bounded by the omohyoid above, the clavicle below, and the scalenus anticus on the inner side; the artery will be felt pulsating behind the tubercle. It has the vein in front of it, but on a lower plane, and the brachial plexus above it. Pass the needle from above downward. The artery, if necessary, may be tied in *the second part of its course* by extending the incision inward and partially dividing the scalenus anticus. Ligation of *the first part* has been so uniformly fatal hitherto that it will not be described. The *principal accidents* that may occur during ligation of the subclavian in the third part

of its course are: (1) Injury of the external jugular vein or other veins, and profuse venous hemorrhage; (2) wound of the sac of the aneurysm; (3) puncture of the pleura; (4) inclusion of a cord of the brachial plexus; (5) injury of the phrenic nerve. The *chief dangers after ligation* are pleurisy, secondary hemorrhage, and suppuration of the sac. The *collateral circulation* after ligation of the third portion is carried on by (1) the suprascapular and posterior scapular arteries anastomosing with the infrascapular, subscapular, and dorsalis scapulæ arteries; (2) the internal mammary, superior intercostal and aortic intercostal arteries anastomosing with the long and short thoracic arteries.

The axillary artery seldom requires ligation except for wound or rupture. In its continuity it may be tied in the first, second, and third parts of its course. In *the third part* it may readily be secured by making an incision, with the arm raised, through the skin and fascia along the inner border of the coracobrachialis and biceps (*b*). In *the first and second parts* of its course it lies below the pectoral muscles, and to expose it so deep a dissection is required that ligation of the subclavian is preferable. The *collateral circulation* after ligation of the first portion of the axillary is carried on by the same vessels as after ligation of the third part of the subclavian. After ligation of the third part of the axillary it is carried on chiefly by the anastomosis of small branches of the subscapular and circumflex above, with similar branches of the superior profunda below.

Lines of Incision for Ligation of Arteries of the Upper Extremity.

The brachial artery may require ligation for: (1) Wound of the artery; (2) aneurysm at the bend of the elbow; (3) wound of the palmar arch. It may be tied in any part of its course. Make an incision (*c*) along the inner edge of the biceps, in a line drawn from the anterior fold of the axilla to the middle of the bend of the elbow, through the integuments and deep fascia, avoiding the basilic vein, which lies over the course of the artery but superficial to the fascia. The median nerve crosses the artery along the middle of its course, from without inward. At the *bend of the elbow* make the incision obliquely from within outward (*d*), and divide the semilunar fascia of the biceps; the artery will be found between the tendon of the biceps on the outer side and the median nerve on the inner side. The *collateral circulation* when the artery is tied above the superior profunda is the same as that after ligation of the third part of the axillary. When tied below the superior profunda, it is carried on chiefly by the anastomosis of this vessel with the radial and interosseous recurrent and the anastomotica magna; when tied below the inferior profunda, by the additional anastomosis of this vessel with the posterior ulnar recurrent.

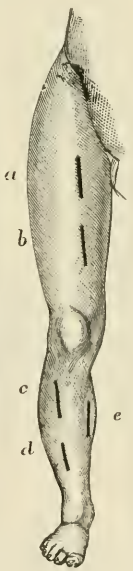
The radial and ulnar arteries may be tied for (1) aneurysm of either vessel or (2) wound of the palmar arch, but it is a question whether ligation of the brachial is not preferable in the latter case, as the anastomosis between the radial and ulnar and the carpal and interosseous arteries is so free. Both arteries, in the case of a wound of the palmar arch, must be tied. This is best done *at the wrist*, where they are superficial and can be felt pulsating. The radial lies between the supinator longus and the flexor carpi radialis; the ulnar between the innermost tendon of the flexor sublimis digitorum and the flexor carpi ulnaris, by which latter tendon it is slightly overlapped. An incision about an inch long through the integuments and deep fascia, parallel to the course of either vessel, is all that is necessary to expose them (*g*, *h*). In the case of the ulnar, however, the flexor carpi ulnaris may need to be held aside. The aneurysm needle should be passed from the ulnar to the radial side to avoid the nerve, which lies to the ulnar side. In the case of the radial, the needle may be passed either way, as the radial nerve at the wrist is not in contact with the artery. No harm will ensue if the venæ comites are tied with their respective vessels. *The radial artery in the upper third* lies deeply between the supinator longus and the pronator radii teres. Make an incision (*e*) in a line drawn from the middle of the bend of the elbow to half an inch internal to the styloid process of the radius. Separate the muscles, and the artery will be exposed. The radial nerve in this situation lies some distance to the outer side of the artery. *Ligation of the ulnar in the upper third* is more difficult, as it lies beneath the superficial flexor muscles. Make an incision (*f*) 4 inches long in a line drawn from the front of the internal condyle to the radial side of the pisiform bone. Seek the interval between the flexor carpi ulnaris and the flexor sublimis digitorum. Separate these muscles, and the ulnar nerve will be seen. Operate superficial to the nerve, and the artery will be found between the flexor sublimis and flexor profundus digitorum.

The external iliac artery may require ligation for: (1) Aneurysm in the groin; (2) secondary hemorrhage from the femoral; (3) a wound of the vessel itself. A line drawn from half an inch below and a little to the left of the umbilicus to the middle of Poupart's ligament indicates its course. Make a curved incision, beginning a little external to the center of Poupart's ligament, upward and outward for about 3 inches, toward the anterior superior spine of the ilium. Divide the skin, superficial and deep fascia, and the aponeurosis of the external oblique; cut more carefully through the internal oblique and transversalis muscles, and the fascia transversalis will be exposed. Divide this on a director, taking care not to injure the peritoneum. Separate the peritoneum gently from

the psoas muscle, and let an assistant press it carefully upward and inward. The artery will now be felt beating at the inner part of the wound, along the inner border of the psoas. Pass the aneurysm needle from within outward, to avoid injuring the vein, which lies to the inner side of the artery. The small crural branch of the genitocrural nerve lies on the artery, and the circumflex iliac vein and vas deferens cross it just before it passes under Poupart's ligament. The *chief accidents* that may occur during ligation are: (1) Injury of the peritoneum; (2) wound of the vein; (3) wound of the spermatic cord; (4) wound of the epigastric artery; and (5) puncture of the circumflex iliac vein. The *chief dangers* after ligation are: (1) Gangrene of the limb; (2) peritonitis; (3) secondary hemorrhage. Should secondary hemorrhage occur, carefully applied pressure must be tried. If this fails, no alternative remains but the desperate one of cutting down on the bleeding vessel and trying to secure it. Davy's lever should be used to control the hemorrhage during the operation. The peritoneum will probably be opened, and success will be problematic. The *collateral circulation* is carried on chiefly by the anastomosis between the internal mammary and deep epigastric; the iliolumbar and circumflex iliac; the gluteal and external circumflex; the obturator and internal circumflex; the sciatic and the superior perforating and internal circumflex.

The common iliac artery has been ligated for aneurysm of the external iliac and for gluteal aneurysm; the **internal iliac artery** also for gluteal aneurysm. Both arteries may be reached by prolonging the incision for ligation of the external iliac, and both have recently been tied through the peritoneum. Both operations were formerly attended with the most unfavorable results, but of late there have been several successful cases in which the abdomen has been opened in the middle line, the intestines drawn aside, and the vessels exposed by scratching through the peritoneum.

The superficial femoral artery may be ligated for: (1) Wound of the artery itself; (2) popliteal aneurysm; (3) hemorrhage from a wound of one of the tibials. The ligature may be applied either in Scarpa's triangle or in Hunter's canal. *In Scarpa's triangle* the artery is usually tied at the apex, where the sartorius touches the adductor longus. If necessary, the liné of the sartorius may be marked on the skin with lunar caustic by putting the muscle in action before the patient is anesthetized. Slightly flex the leg, and place the thigh on its outer side in a position of slight abduction and flexion. A line drawn from a point midway between the symphysis pubis and the anterior superior iliac spine to the adductor tubercle in this position indicates the course of the artery (*a*). Make an incision about 3 inches long in this line, beginning about 4 inches below Poupart's ligament; cut through the skin and superficial fascia, and divide the deep fascia on a director. Draw the sartorius gently *outward*, and the sheath of the vessel will be exposed. Open this in the usual way, avoiding the small branch of the internal cutaneous nerve, which crosses the artery at this spot. Pass the aneurysm needle from within outward, to avoid injuring the vein, which lies to the inner side of, and a little posterior to, the artery. *In Hunter's canal* the same line as the preceding indicates the course of the vessel (*b*). Place the limb as before, and make an incision 3 to 4 inches long in the line of the artery, in the middle third of the thigh. Divide the superficial and deep fascia, and the sartorious will be exposed. It may be recognized by its fibers running downward and inward. Draw the muscle to the *inner* side, and the aponeurotic covering of Hunter's canal (recognized by its strong transverse fibers) will be seen. Divide it on a director, and the artery will be found lying between the vastus internus on the outer side and the adductors longus and magnus on the inner side. The vein is behind and a little external to the artery. The long saphenous nerve crosses the artery from the outer to the inner side. Pass the aneurysm needle from without inward, keeping the point well applied to the vessel, as the vein in this situation is usually very adherent to the artery. The *chief dangers* after ligation are: (1) Gangrene; (2) secondary hemorrhage; (3) phlebitis and pyemia, from pricking the vein. The *collateral circulation* is carried on by the anastomosis of (1) the perforating branches of the profunda with the articular branches of the popliteal; (2) the descending branch of the external circumflex with the external articular branches of the popliteal and tibial recurrent; and (3) the artery of the great sciatic nerve with the internal articular branches of the popliteal.



Lines of Incision for Ligation of Arteries of Lower Extremity.

The popliteal artery may be ligated in its upper part for popliteal aneurysm. Place the limb on its outer side and make an incision about 4 inches long at the upper part of the popliteal space over the course of the artery. Divide the deep fascia and locate the pulsation of the vessel at the inner margin of the semimembranosus. Hook the nerve outward or inward, and open the sheath well to its inner side to avoid the vein.

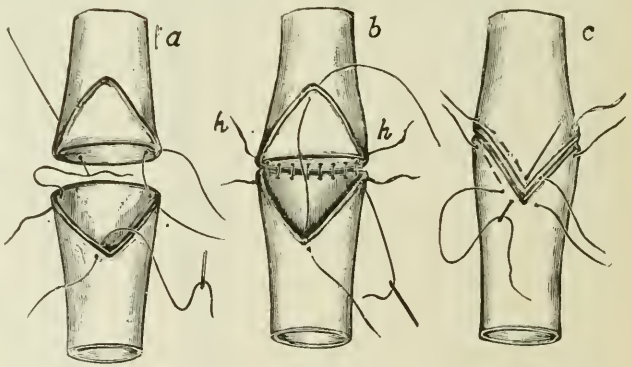
The Posterior Tibial Artery.—*In the upper third:* Place the limb on its outer side, and make an incision 4 inches long parallel with, and one-half of an inch posterior to, the inner border of the tibia (*c*). Divide only the skin and the superficial fascia in the first incision, to avoid injuring the long saphenous vein. Then divide the deep fascia and draw the gastrocnemius, if seen, backward; cut through the tibial origin of the soleus, and the intermuscular fascia will be exposed. Divide this on a director, and the artery will be found lying on the tibialis posticus, with the posterior tibial nerve to its outer side. Ligation of the posterior tibial in its upper third can hardly be required, except for a

wound, which should then be enlarged longitudinally until sufficient room is obtained. *At the ankle:* Make a curved incision over the artery a finger's breadth behind and below the internal malleolus. Divide the superficial and deep fascia and the internal annular ligament, and the artery will be found between the tendons of the flexor longus digitorum and flexor longus hallucis, with the nerve to its outer side.

The Anterior Tibial Artery.—A line drawn from the inner side of the head of the fibula to midway between the two malleoli indicates the course of the vessel. *In the upper third* make an incision about 5 inches long in the line of the artery (*c*), through the skin and superficial fascia, and look for the innermost white line, which indicates the cellular interval between the tibialis anticus and the extensor longus digitorum. Divide the deep fascia over this line on a director; hold the muscles apart by retractors, and the artery will be found on the interosseous membrane, with the nerve to its outer side. *In the middle third* the artery lies between the tibialis anticus and extensor proprius hallucis, and the nerve lies on the artery. *In the lower third* the artery lies between the extensor proprius hallucis and the extensor longus digitorum, with the nerve on its outer side. An incision in the line of the artery (*d*) and the separation of the muscles is all that is necessary to expose the vessel in any of these situations.

The dorsalis pedis artery may require ligation for a wound on the dorsum of the foot or for aneurysm of the vessel itself. Make an incision in a line drawn from midway between the two malleoli to the interval between the great and second toes; divide the skin and the superficial and deep fascia; the artery will be found between the extensor proprius hallucis and the innermost tendon of the extensor longus digitorum. As the artery sinks into the sole, it is crossed by the innermost tendon of the extensor brevis digitorum. The anterior tibial nerve is on the outer side.

ARTERIES, SUTURE.—This is carried out by means of a small round needle (No. 12) and fine silk (No. 000) by passing the sutures through all the coats. The glovers' in-and-out suture must be used so that the walls of the vessel shall pout out a little; this brings the endothelium accurately into contact and leaves no roughened surface within the lumen. For end-to-end union of a completely divided artery, the circular or oval cut section is drawn into the shape of a triangle by three equidistant fixation sutures. Then the three points of one triangle are approximated to the three points of the other by tying together the fixation sutures, while between the points in-and-out sutures are inserted as noted above. Implantation of the cut end of a vessel into the continuity of another may be done on the same lines, by first inserting fixation sutures to form two triangles.



ARTERY SUTURE.—*a*. Insertion of three fixation sutures so as to draw the divided ends into triangles. *b*. Approximation by the fixation sutures *h*, *h*, and suturing together of one side of each triangle. *c*. Suturing of a second side (*Spencer and Gask.*)

ARTERIOSCLEROSIS. **Synonyms.** — Atheroma. Chronic endarteritis. Anteriocapillary fibrosis. Arteriofibrosis. Angiosclerosis.

Definition.—A chronic inflammatory process, localized or diffuse, that takes place in the intima, producing a proliferation of round cells with wandering cells, and causing a distinct hardness and loss of tone in the arterial system.

Etiology.—Arteriosclerosis is a physiologic accompaniment of old age and it is often herditary. Rheumatism, syphilis, alcohol, heart-disease, and kidney-disease, gout, diabetes, excessive muscular or mental strain, lead-poisoning, toxins of acute infectious diseases, are the most common causes. "Time, tension, and toxins."

Pathology.—There is an inflammatory proliferation of the cells of the outer coat of the intima, which finally affects the adjacent coats. Often there is a tendency for the process to become localized, and this is termed **atheroma.** In atheroma the areas are at first whitish, but later undergo fatty degeneration and become yellowish or opaque. There is usually a tendency for certain portions of the area to undergo calcareous degeneration, with the formation of atheromatous plates. This process is very frequently seen in the arch of the aorta, thoracic aorta, coronary artery, and cerebral arteries. In the more diffuse form in advanced stages, the media and adventitia are invaded and the capillary walls are also thickened.

Results.—The process may affect the valves of the heart, setting up disease of these parts. Sudden distention may rupture the smaller vessels in the brain, giving rise to apoplexy; or, if in the larger vessels, an aneurysm may ensue.

Symptoms.—Slow rate and increased tension in the pulse, "pulsus tardus," causing a hardness, often feeling like "pipe stems." From the increased pressure in the arteries the heart must do more work, and often great hypertrophy of the cardiac muscle ensues. The coronary arteries may be involved, leading to fibroid degeneration, fatty degeneration, and the symptoms of angina pectoris, absence of compensation, dyspnea, scanty urine, and other symptoms.

Intermittent claudication (Charcot's symptom) may be observed. It is apparently due to the

deficient blood supply and is characterized by lameness, tingling, and other sensory disturbances, numbness, weakness and pain in the muscles of the legs upon the slightest exertion.

The cerebral arteries may be involved, indicated by headache, vertigo, insomnia, mental sluggishness, and hence apoplexy is common. The kidneys may next suffer, giving rise to interstitial nephritis or contracted kidney. The Stokes-Adams syndrome may be found. The arcus senilis is frequently present. (See BLOOD PRESSURE.)

Sequels.—Apoplexy, atheroma of coronary artery or chronic myocarditis, angina pectoris, interstitial nephritis, aneurysm, gangrene of the extremities by reason of embolism or thrombosis of the terminal arteries.

Prognosis.—A person with arteriosclerosis may live until late in life, and then he may be struck dead with apoplexy without any warning whatever, especially if suffering from organic disease of the heart or kidney, so that the prognosis is indefinite, depending upon hereditary influences and mode of life of the individual.

Treatment.—Seek diligently for any predisposing cause. Alcohol in any form should be absolutely interdicted. Attacks of gout and rheumatism should be prevented as far as possible by the restriction of animal foods, tea, and coffee. In these cases a vegetable diet is best. If due to heart-disease, kidney-disease, or syphilis, each will require its special line of treatment. The iodid treatment is commonly used. The iodid of potassium should be given in moderate doses long continued. Cardiac tonics are indicated. When hypertension exists, erythrol tetranitrate should be given in doses of 1/10 to 1/2 grain or glyceryl nitrate in doses of 1/100 to 1/50 grain. Recently Trunecek's artificial serum has been used. It contains the normal blood salts. It is given in tablets, 2 thrice daily, each of which contains sodium chlorid 6 1/4 grains, sodium sulphate 5/8 grain, magnesium phosphate and sodium carbonate of each 1/4 grain, sodium phosphate and calcium glycerophosphate of each 1/5 grain. Lacto-serum, serum of milk, sterilized without heat, in daily injections of 10 c.c. into the thigh, is reported to have been of marked value in arterial hypertension. The kidneys may be kept active by diuretics, such as:

℞. Lithium citrate, ʒ iss
Spirit of nitrous ether, ʒ iv
Solution of potassium citrate, ʒ ij
Water, enough to make, ʒ iij.

Two teaspoonfuls every 3 or 4 hours.

Benzoate of lithium may also be given in combination with the foregoing, or separately in doses of 5 grains every 4 hours. At the same time the skin should be kept active by proper amount of exercise, hot baths, and thorough massage.

ARTHRALGIA.—A general term used to indicate pain in a joint. It is sometimes used as a synonym for gout, rheumatism, or arthritis, to signify the pain attendant thereto. It is specifically used to mean neuralgia of a joint. It is extremely rare as an independent affection, but common as a complication. The pain is more often superficial or around the joint, than in it. The pain may be referred and unattended by local lesion, as is the case with hip-joint disease, in which the pain is referred to the knee, or as in chronic myelitis, or in locomotor ataxia, in which there are various referred joint-pains. Neuralgia of a joint may indicate some obscure lesion, as chronic inflammation of the bone. Irritation from the ovaries, the uterus, and the rectum may give rise to reflected joint-pains. The pain itself may be dull and aching, but is more often sharp and shooting. It may come in storms at periods, or be continuous and persistent.

Soreness of the joint on movement, some slight redness and heat, and swelling, with slight fixity of the joint, may be attendants. The redness and swelling, however, will generally be found to have been the result of friction or of the use of irritants. The suddenness of the onset, the absence of constitutional symptoms, the free mobility of the joint, especially under ether, and the condition and temperament of the patient must be considered in differentiating the character of the joint-affection. Disease or injury to the central nervous system, rheumatism, gout, syphilis, malaria, hysteria, neurasthenia, and neuritis may give rise to arthralgia.

The treatment of this condition is directed to the causes. Phenacetin is useful during the attacks, but morphin with his knowledge should not be given to the patient, even in severe cases. Hexamethylenamin (urotropin) in full doses, 10 grains every three hours, is sometimes effective in cases of gonorrheal or septic origin. Locally, external heat, warm flannel cloths, alone or with soap liniment, aconite, laudanum, or chloroform thereon, sometimes friction, may give relief. If any tendency to stiffness results, friction, the hot and cold douche, passive motion, and daily massage should be employed. Neurectomy and nerve stretching are last resorts. The condition of the general health should be kept in mind. See GOUT, JOINTS (Diseases), RHEUMATISM.

ARTHRECTOMY.—See EXCISION OF JOINTS.

ARTHRITIS.—A generic term signifying any disease involving a joint, but more strictly an articular inflammation. All the structures composing and surrounding a joint, including the synovial membrane, are embraced in the inflammation. It may be traumatic, rheumatic, syphilitic, suppurative, tuberculous, gonorrheal, or due to typhoid infection, to gout or to spinal lesions. It occurs as acute and chronic arthritis. See JOINTS (Diseases).

ARTHRITIS DEFORMANS. See JOINTS (Diseases).

ARTHROPATHY.—A peculiar disease of the joints similar to rheumatoid arthritis, but, according to Charcot, a distinct disease. It belongs to the prodromal stage of tabes, rapidly destroys the joint, is painless, without fever or inflammation, prefers the large joints, and is connected with hydrarthrosis and swelling of the joints. See JOINTS (Diseases).

ARTIFICIAL ANUS.—See Anus (Preternatural), Intestines (Surgery).

ARTIFICIAL EYE.—A shell of glass, made to imitate the anterior portion of the eyeball and retained in place behind the eyelid. After the healing of an enucleation a deep furrow results, into which the upper and lower rims of an artificial eye are inserted. The deeper this furrow, the better. Cicatrization may make it so shallow that it becomes impossible to wear an artificial eye. An artificial eye moves conjointly with the other eye, but its excursions are shorter.

An artificial eye may be worn 2 or 3 weeks after operation, all inflammation having subsided, and early use is advisable to prevent absorption of the orbital fat. The orbit is very tolerant of foreign bodies, but the shell should not be worn more than an hour or two at a time for the first few days.

To insert the shell, place the left hand flat upon the forehead, with fingers downward; with the two middle fingers raise the upper eyelid toward the eyebrow. With the right hand push the upper edge of the eye beneath the upper lid, which may now drop. Support the eye with the middle finger of the left hand, while the lower eyelid is raised over the lower edge with the right hand.

To remove the eye, draw down the lower lid with the middle finger of the left hand. With the right hand steady the lower edge of the eye, and gently raise forward over the lower lid. Care must be taken that the eye does not fall to the ground. An artificial eye should be taken from its orbit every night, cleansed, and placed in water overnight. In time it loses its luster, and should be replaced by a new one.

ARTIFICIAL FEEDING.—See Infant Feeding, Milk, Modified Milk, etc.

ARTIFICIAL LIMBS.—It is best to have instrument-makers take their own measurements, but the following data may be given by the patient, and may suffice for directions to make an artificial limb:

1. State whether a right or a left limb is desired.
2. Give the full measurements of the sound limb.
3. State in inches the exact spot where the amputation has been done.
4. Give a complete series of measurements (with diagram) of the stump.
5. Indicate the exact position of each joint by measurements, when the growth of one limb has not been equal to that of the other.
6. Tracings of the sound stump (hand or foot) should be given.

After Chopart's amputation of the foot, or when the thumb, a finger, or a hand is needed, a cast of the stump may be required. After Syme's operation a tracing may suffice. A boot is serviceable.

In taking measurements of the sound leg the knee should be in extension. Girths should be taken: one around the ankle and one around the calf and between the two; one should be taken between the calf and the knee, one of the knee, two of the thigh, and one of the wrist, and in each case the exact height, in inches, of each girth taken should be given. A shoe or a shoemaker's measurements should be sent, and will be of much service.

Of perpendicular heights, the height from the fork of the leg or body to the ground, that from the summit of a bent knee to the ground, and that from the middle of the calf to the ground should be taken. In the arm the elbow-joint is to be used as a fork, and as the place from which measurements are to be taken, both internally and externally.

The simpler an appliance, as a rule, the more useful it is. Especially is this so with regard to the lower extremity. The ignorant usually believe the contrary, and experience alone will convince. Elaborate and expensive artificial limbs for growing children are not to be advised. They require bucket-legs, stump-boots, etc., which may be frequently adjusted to their growing height, and suit play-ground proclivites.

ARTIFICIAL PUPIL.—See Iridectomy.

ARTIFICIAL RESPIRATION.—Methods of exciting and maintaining chest movements so as to supply air to the lungs; most useful in cases of drowning, in asphyxia in accidents during anesthesia administration, and in asphyxia of the new-born.

Precautions Necessary.—See that the air-passages are free for the admission of air, and to this end clothing that constricts the neck, chest, or abdomen must be loosened, the tongue must not be allowed to lie back to occlude the pharynx or press down the epiglottis, foreign bodies must be removed, and the trachea and bronchi should be free from fluids. The head should be turned upon one side, and generally lower than the pelvis, to provide against the inhalation of vomitus; the mouth or nares must be kept clear and open, and the tongue pulled forward. For the mechanic expulsion of fluids in the trachea or bronchi, place the patient on the face, see that the trunk is higher than the mouth, the mouth kept open and tongue forward. Exert steady, firm pressure around the margin of the thorax and the upper part of the abdomen, to expel the fluids. This should be done thoroughly and quickly, the patient on the ground, or, better, on a table of convenient height.

A knife-handle placed between the teeth will make a ready and useful gag to keep the mouth open. A button-hook is sometimes serviceable in the absence of forceps. The use of a cloth wound round a stick will, by rotatory motion, help to remove mucus and vomited matter.

Artificial respiration is a purely mechanic act, and one in which, efficiently performed, air must enter the lungs. It is most important that it is not performed too quickly nor too violently. Twelve to 16 respiratory acts a minute are sufficient. When pressure is employed on the chest-walls, it must be certain and steady.

There are five principal methods: Sylvester's method, Howard's method, Marshall Hall's method, Schaefer's method, and the method of mouth-to-mouth insufflation.

Sylvester's method is performed by grasping

the arms of the patient lying prone—or, better, with head lower than the body—above the elbows, drawing the arms steadily upward above the head, and keeping them so stretched for from 3 to 4 seconds. Next turn the arms downward, and press them firmly against the sides of the chest for from 2 to 3 seconds. These movements are to be repeated from 15 to 20 times a minute, with perseverance, if needful, for from 1 to 2 hours. An assistant may aid by pressing upon the lower ribs and the diaphragm at the same time that compression is made by the arms. If much congestion exists about the head and face, the external jugular vein may be opened. When natural respiration has been established, a warm room, a warm bed, an enema of brandy, and beef-tea may be employed, and but little water given by the mouth.

Prone Pressure Method of Artificial Respiration.

Howard's Method.—The respiratory and alimentary tracts are first cleared, as follows: The patient is placed face downward, with a pillow or roll under the pit of the stomach, the head resting upon the forearm. The attendant stands over the patient and then places his left hand on the lower and back part of the left side of the chest, while the right hand is laid upon the spinal column, about on a line with, or a little above, the left hand; firm pressure is then made, and continued while three is counted slowly, and ended with a vigorous push. These movements are repeated as long as fluid flows from the mouth.

The patient is now turned upon his back, face upward, and a roll placed under his shoulders. The hands are carried above the head and tied together. The attendant kneels astride the patient's hips and presses with his open hands upon the lower borders of the chest slowly and firmly upward and inward, with his body thrown forward until his face almost touches the patient's face. A sharp push is then made, bringing the attendant to the upright position. A rest of 2 or 3 seconds should then follow, and the movement be repeated. These measures should not be abandoned for two hours.

Marshall Hall's method is performed by placing the patient on one side and alternately rolling him on his face to compress the chest, and on his back to allow the elasticity of the ribs free movement to draw air into the lungs. The arm of the side rolled upon may be drawn above the head. Either side may be used.

Schaefer's Method, also called the prone pressure method.—This method is extremely simple, does not give rise to any complications, affords the entry of more air into the patient's lungs, and requires less physical effort on the part of the operator. There can be no doubt that this is the best method yet devised, and the technic should be acquired by all. The patient is placed on the ground, with his face downward, and with a thick folded garment or pillow under the lower part of the chest. Care must be taken that the entrance to the mouth and nose is clear. The operator places himself in a kneeling posture astride of the patient, facing the patient's head, his knees being opposite the patient's hip. He then places his hands flat over the back of the lower ribs, one hand on each side, and gradually throws the weight of his body forward, so as to make firm pressure on the lower ribs. By this means the chest is compressed and air is forced out of the lungs. The operator then brings his own body up into the semi-erect position, but still retaining his hands in position, thereby relaxing the pressure on the ribs, and enabling air to be drawn into the lungs by the elastic reaction of the chest wall. The process is repeated regularly about 15 times a minute, and should be continued for at least half an hour. The advantages claimed for this method by its originator, are: (1) Its relative efficiency; (2) the ease with which it is carried out; (3) the absence of risk of injuring the liver or fracturing the ribs; (4) the facilities afforded for the escape of fluid from the mouth, and (5) the natural tendency of the tongue to fall forward.

Mouth-to-mouth insufflation is not to be depended upon, for it is difficult to keep the larynx open or to prevent the air passing down the esophagus.

Instruments have been devised for the performance of artificial respiration, but they interfere with the first faint return movements of natural respiration.

Oxygen is indicated in many cases of artificial respiration, but its results are not satisfactory.

Tracheotomy is not to be considered in any case in which air can be made to pass, even in small quantities, through the trachea.

For **resuscitation of the new-born,** see Asphyxia Neonatorum, New-born Infant (Asphyxia), Pulmotor.

ARYLARSONATES.—Arsenical compounds used as substitutes for mercury in cases in which the latter is not tolerated. See Arsacetin, Atoxyl, Soamin.

ASAFETIDA.—A gum-resin obtained by incision from the living root of *Ferula fœtida*. It occurs in whitish tears embedded in a grayish sticky mass, of alliaceous odor and taste, soluble in alcohol to at least 60 percent, and when triturated with water it yields a milk-white emulsion. Its principal constituent is a *sulphuretted volatile oil*, consisting chiefly of allyl sulphid. It also contains a gum and a resin, with ferulaic, malic, acetic, formic, and valeric acids. Dose, 2 to 8 grains.

It is a mild stimulant to the circulatory and nervous systems, and an excellent carminative. It is also a stimulating expectorant, tonic, laxative, diuretic, emmenagog, aphrodisiac, and anthelmintic. The disgust generally felt for this drug makes its use restricted. Its odor and taste are extremely nauseous and persistent. The emulsion is highly useful in the flatulent colic of infants. The pill form is the best for administration in nervous excitement and hysteria. A suppository may be used in infantile convulsions and in the restlessness of low fever:

℞. Pulverized asafetida, 5 j
Quinin sulphate, gr. xxx
Oil of theobroma, to make 12 suppositories.

One may be used every 3 or 4 hours.

Preparations.—**Tincture of Asafetida.** Dose, 10 to 30 minims. **Emulsion of Asafetida** (*Milk of Asafetida*). Strength, 4 percent in water. Dose, 2 to 8 drams. **Pills of Asafetida.** Each pill has 3 grains of asafetida, and 1 grain of soap. Dose, 1 to 4 pills. **Mixture of Magnesia and Asafetida** (*Dewees' carminative*) has of magnesium carbonate 5, tincture of asafetida 7, tincture of opium 1, sugar 10, distilled water to 100 parts. Dose, 1/2 to 4 drams.

ASCARIS.—See Worms.

ASCITES. Definition.—An accumulation of fluid in the peritoneal cavity. Ascites is a symptom and not a disease.

Etiology.—(1) Nephritis; (2) diseases of the liver, especially atrophic cirrhosis; (3) heart-disease; (4) pressure of an abdominal tumor; (5) chronic peritonitis; (6) tuberculosis.

Symptoms and Clinical Course.—Abdominal distention, great exhaustion, dyspnea, feeble pulse, scanty urine, constipation, and generally edema of the lower extremities.

Inspection.—The abdomen is distended, the navel projects, the abdominal veins are enlarged, especially noticeable around the region of umbilicus, producing the *caput medusæ*. When the patient assumes the dorsal decubitus, the flanks project on each side.

Palpation elicits fluctuation.

Percussion confirms palpation. The fluctuation is more readily detected by having the patient press downward with the hand placed vertically below the region of the umbilicus while the examiner's hands are on each side making gentle percussion.

Movable dulness is also present. To detect this the patient should first lie on one side, when percussion is made in lower flank, and on turning to the other side the fluid gravitates, giving place to a tympanitic note where dulness previously existed.

Aspiration.—There is withdrawn a clear amber-colored fluid, of a specific gravity from 1012 to 1016.

Diagnosis.—

Ascites.	Ovarian Tumor.	Pregnancy.	Distended Bladder.
1. Frequently associated with heart- or kidney-disease.	1. Heart and kidneys normal.	1. Same as ovarian tumor.	1. Heart normal; urine suppressed.
2. Navel often protrudes; caput medusæ present.	2. Same as ascites.	2. Abdominal veins enlarged.	2. Abdominal veins normal.
3. Percussion note gives dulness, more perceptible in flanks or lower abdominal region, where the fluid gravitates; movable dulness.	3. Percussion note gives dulness rather high up; dulness not movable.	3. Same as ovarian tumor suppression of menses.	3. Dulness immovable; catheter confirms diagnosis.
4. Tumor develops from below and extends upward.	4. Tumor develops to right or left of median line.	4. Enlargement develops in area of uterus.	4. Enlargement develops in region of bladder.

Treatment consists in absolute rest in bed and a diet composed of soft-boiled eggs, beef-juice, underdone steak, stewed fruits, and vegetables. Some cases do well upon a strictly milk diet. Compound jalap powder (1/2 dram) may be given 3 times daily to produce thorough catharsis. Magnesium sulphate, 4 drams, dissolved in quarter of a glass of water may be taken daily before breakfast. Liquids should be restricted as much as possible. Should these measures fail to give relief, paracentesis abdominis may be done to withdraw the fluid.

Method of Tapping.—The bladder should first be emptied. The patient sits on the edge of the bed, or is propped up by means of pillows. The operator, after anesthetizing the parts, makes a short incision about 1 1/2 inches below the umbilicus, dividing the superficial tissues; then with a quick motion thrusts in a trocar and cannula (a sufficient distance, varying in different individuals); the trocar is then withdrawn, allowing the fluid to escape.

Pressure over the abdomen may be made by means of a 4-tailed bandage to prevent collapse. Whisky (1/2 of an ounce) may also be given while the fluid is draining away.

Any sign of faintness on the part of the patient is an indication that the operation should cease.

The operation may be repeated frequently. See PERITONITIS.

ASEPSIS.—The condition of nonputrefaction; the absence of all septic material or of pathogenic organisms. It is especially necessary in surgery and obstetrics. In surgery the method should be used only in uninfected areas. It consists of the use of moderate heat, chemic germicides, or both, to prepare the instruments, hands of operators, and the field of operation. No chemic germicide, however, is used after incision is made. If no irrigation is employed during the operation, the method is known as the "dry" method, simple sterilized sponges being used. If irrigation is employed, boiled water is used. It is impossible to render a large field of operation absolutely aseptic by any known method.

A description of the technic of **aseptic surgery** is given under ABDOMINAL SECTION (*q. v.*).

ASEPTIC FEVER. (Reactionary, simple traumatic, or resorption fever) is seen after subcutaneous injuries, such as contusions, fractures, and sprains, and after aseptic operations. It is due to the absorption of sterile products of cellular disintegration, chiefly fibrin ferment, from extravasated blood or from exudate, hence is apt to be of greater degree after the use of strong antiseptics. The only symptom is a slight rise in temperature, rarely more than 101° F., which disappears by the end of the second or third day. If the fever persists beyond this time, especially if other symptoms appear, it is almost surely due to some other cause, most likely infection of the wound. The erythematous and urticarial rashes which are sometimes described in connection with this condition are probably due to intestinal derangement, as they subside after the bowels have been freely evacuated. Aseptic fever requires no treatment.

ASPARAGIN.—See ALTHÆA.

ASPERGILLOMYCOSIS.—See PARASITES (Vegetable).

ASPHYXIA.—A term signifying, literally, pulselessness, but generally understood as the condition resulting from the interruption of the function of respiration. Apnea signifies not only the condition of suspended animation from respiratory failure, but also arrested respiration from an excess of oxygen in the blood. Asphyxia may arise from the inhalation of gases, such as carbonic acid gas, charcoal fumes, or sulphuretted hydrogen; by strangling or throttling; by the impaction of foreign bodies in the larynx or trachea; by failure of the respiratory apparatus, as in fractures of the spine above the origin of the phrenic nerve; and from poisoning with strychnin or curare, or from anesthesia, from compression of the chest, etc.; but by far the most common cause is drowning.

Death is sudden when the obstruction to respiration is complete, but otherwise it is gradual in its onset.

The excess of carbon dioxid in the blood at first stimulates, then paralyzes, the respiratory center in the medulla. Artificial respiration is therefore required in cases of sudden asphyxia. Lividity is the most prominent symptom of asphyxia, although convulsive twitchings about the mouth and limbs and prominence of the eyeballs are noticed. The lividity is most marked in the lips and tongue, which, just before death, become almost black. The heart continues beating after all signs of respiration have ceased. This has led to the various means of artificial respiration. See ARTIFICIAL RESPIRATION, DROWNING, etc.

ASPHYXIA NEONATORUM.—A pulseless condition of the new-born, generally due to mechanic interference with the circulation of the oxygenated blood in the fetus, as may happen from flooding; from premature detachment of the placenta; from pressure upon the cord, resulting in premature stimulation of the respiratory centers from the accumulation of carbon dioxid in the fetal blood; or from the inherent debility of the child from any prenatal cause.

There are two varieties. In **asphyxia livida** we have cyanosis; injected conjunctivæ; protuberant eyes; strong cardiac action; slow, full pulse; cutaneous sensation; tense musculature; umbilical pulse; intermittent respirations, with generally a favorable prognosis.

In **asphyxia pallida** we find death-like paleness; relaxation; minimum heart-beat; no umbilical pulsation; diaphragmatic respiration poorly established; sphincter paralysis; conjunctival and cutaneous insensibility, also of the palate, which, when it fails to respond to tickling with a finger, indicates an unfavorable prognosis.

Prognosis.—According to Bouchut, if careful auscultation for five minutes fails to reveal any heart-sounds, the case is hopeless; otherwise persevere so long as any action of the heart can be detected, though the duration and degree of the compression endured determines the danger of the asphyxia. It must also be remembered that even when life is preserved, there is subsequent danger from pneumonia or cerebral compression, which may produce permanent paralysis or idiocy later in life.

Prophylaxis, whenever possible, should be attempted, especially in breech presentations and prolapse of the cord, by methods described in the standard text-books on obstetrics.

Treatment.—1. When there has been premature inspiration, remove all foreign substances from the mouth and trachea, if necessary, by aspiration through a flexible catheter thrust into the windpipe.

2. Stimulate respiration by slapping the child's back and buttocks, or by sprinkling alternately with hot and cold water, or immersing in hot and cold baths alternately. The administration of brandy, ammonia, or Hoffmann's anodyne, and electric stimulation, are valuable.

3. So long as any motion of the heart can be detected, artificial respiration should be persisted in by means of either Marshall Halls', Schultze's, or Byrd's method, at the rate of not more than sixteen forced respirations a minute. See NEW-BORN INFANT (Asphyxia), PULMOTOR.

ASPIDIUM (Male Fern).—A genus of ferns the properties of which are due to a resin containing filicic acid; and valuable chiefly as a vermicide against the tape-worm.

The active principle is *filicic acid,* which is extracted in the oleoresin. It also contains a green, fatty oil, a volatile oil, resin, tannin, etc. Dose, 1/2 to 1 1/2 drams in a single dose, fasting, or in divided doses at short intervals, followed by a purgative.

The oleoresin of aspidium is an acetone extract and deposits filicic acid on standing. It should be well shaken before being used. Dose, 20 to 60 grains, in capsules, repeated every 3 hours for 2 or 3 doses.

Aspidium is an efficient vermicide against tapeworm, particularly the unarmed variety (bothriocephalus latus). The oleoresin is the best form; the patient having fasted for the previous day, or used only a milk diet, 1 dram may then be given in 4 doses 1/4 hour apart. This may be repeated the next morning and followed by three drops of croton oil in emulsion. This is one of many methods. Cusso may be combined with it advantageously. See ANTHELMINTICS.

ASPIRIN. Acetyl-salicylic Acid.—A white powder, soluble in 100 of water. It is said to be more efficient than the salicylates, producing less of the undesired side effects because of the slow liberation of the salicylic acid. It passes unchanged through the stomach, decomposition taking place in the intestine. It is most efficient in acute articular and muscular rheumatism, tonsillitis, influenza, gout, pleurisy, polyneuritis, chorea, and neuralgia. Dose, 5 to 15 grains, thrice daily.

ASTASIA ABASIA.—A symptom consisting in inability to stand or to walk in the normal manner. The condition forms a symptom-group, not an entity, and is probably a functional neurosis. As a rule, patients, though able to move the feet and legs perfectly in bed, are either unable to walk properly or cannot stand at all. Patients generally recover, especially if young persons, and relapses are not uncommon. Static electricity and the rest treatment are advised.

ASTEREOGNOSIS.—The inability to recognize objects, their nature and uses, by touch. It is usually associated with intractable hemiplegia or brain tumor.

ASTHENOPIA. Definition.—Weakness or speedy fatigue of the ocular muscles or visual powers, due to eye-strain.

Causes.—Errors of refraction, excessive use of the eyes, muscular insufficiency, and constitutional denutritive processes, such as anemia.

Varieties.—1. **Accommodative asthenopia,** generally due to hyperopic astigmatism, or to simple hyperopia, producing strain of the ciliary muscle.

2. **Muscular asthenopia,** due to weakness, incoordination (heterophoria), or strain of the external ocular muscles. Myopia, by necessitating extreme convergence and straining of the internal recti, is a common cause.

3. **Retinal or nervous asthenopia** is a rare variety caused by retinal hyperesthesia, anesthesia, or other abnormality, or by general nervous affections. In over-worked school children it is manifested by complaint of haziness and dimness of the letters, occasional diplopia, photophobia, lacrimation, and local ocular pain. In neurasthenic and hysteric adults all these symptoms are aggravated, and these patients constitute very troublesome cases.

Symptoms.—Symptoms of asthenopia are of such diversity and differ so in degree that a thorough discussion of the effects of eye-strain would necessitate a volume in itself.

As a causative factor in the production of headache, eye-strain is by far the most important. Anorexia, dyspepsia, constipation, heartburn, nausea, repeated attacks of vomiting, etc., represent some of the gastric reflexes. Amenorrhea and dysmenorrhea are menstrual anomalies sometimes caused by eye-strain. Insomnia, nightmare, chorea, nocturnal enuresis, and even epilepsy, have often owed their existence and perpetuation to uncorrected eye-strain in some form. The multiformity of the effects of eye-strain can only be properly realized when we understand how vital the function of vision is to every act, emotion, and thought. The visual centers are in the closest connection with the other brain-centers, and the slightest disturbance of the visual mechanism produces sympathetic irritation in the entire motor, sensory, and psychic systems. Happily, the manifold effects of eye-strain, so long ignored, are being appreciated and recognized more and more every day. Besides the reflex symptoms, which are often remote and only brought out by careful questioning (the usual complaint in asthenopia is discomfort in near work), the patient complains of inability to read or sew for any length of time; the print "runs together," there is heaviness of the lids, and often excessive lacrimation. Local congestion soon produces conjunctivitis or blepharitis, and it is our duty to examine the refraction in all cases of chronic conjunctival and palpebral inflammation, instead of carelessly dismissing the patient with a time-worn formula for an ointment or a wash. So long as uncorrected ametropia exists, there will be recurring attacks of inflammation.

A peculiar **rule in asthenopia** is that the amount of local or constitutional reflex is in direct proportion to the debility or neurotic tendency of the patient. Strong, vigorous men may, by accommodative and muscular effort, overcome ametropia to so great a degree as to entirely mask the condition, and such a patient may go all his life without experiencing a single uncomfortable reflex; on the other hand, a nervous school-girl or a neurasthenic woman may suffer severest headaches, or be the victim of anorexia, nausea, dyspepsia, etc., from the slightest astigmatic error. There is also noticed an **interchangeability of reflexes.** When the vision continues normal in spite of the ametropia, reflexes are present; if the vision suffers, reflexes are less conspicuous. Also intense local symptoms are usually unattended by severe reflex symptoms, and vice versa.

Diagnosis rests on a careful examination of the refractive condition of the eye and of the muscular power and muscle equilibrium. In all cases in which there is presumed to be retention of accommodative power, a mydriatic must be used.

Treatment.—In the accommodative form, rest of the eyes, abstinence from excessive near work,

and constant use of correcting lenses are necessary. Constitutional and hygienic treatment must be urged. If there is any muscular anomaly, it must be corrected by gymnastic exercise with prisms, constant wearing of prisms, or in extreme cases tenotomy and advancement. For nervous asthenopia near work must be reduced to a minimum, and outdoor exercise, good food, the administration of tonics, massage, or electrotherapy, are indicated.

ASTHMA, BRONCHIAL.—The term asthma is still loosely employed to designate dyspnea with cough. Accordingly we speak of cardiac asthma in heart-disease, renal or uremic asthma in chronic renal disease. It is doubtful whether there is any etiologic difference between cardiac and renal asthma; the shortness of breath in both forms being immediately dependent upon engorgement of the pulmonary capillaries due to failing heart action. Much confusion would be avoided by limiting the use of term to designate the disease known as bronchial or spasmodic asthma. In this sense the term is used here exclusively.

Asthma is an expiratory dyspnea that occurs paroxysmally. The dyspnea is due to a diminished caliber of the smaller bronchial tubes. As the paroxysms of asthma are often sudden in onset, last for 1 or 2 hours, cease, and leave the patient apparently in perfect health, they must be due to a lesion less slow in onset and less persistent than either inflammation or edema of the bronchioles. Sudden acute engorgement of the bronchioles might produce this dyspnea, and laryngoscopic examinations have shown that the bronchi are congested during asthmatic attacks. Spasmodic contraction of the bronchioles may also produce the symptoms. The possession by the bronchioles of an anatomic structure that makes such contraction possible has led the majority of clinicians to believe that spasm of them is the cause of asthmatic dyspnea. Whether asthma is due to active congestion or to bronchial spasm matters not; it is universally admitted that either the vasomotor nerves or nerves supplied to the bronchioles control the phenomena. An acute and temporary general emphysema is produced during each paroxysm.

Symptoms.—Asthmatic dyspnea lasts for from a few minutes to several hours. It often recurs nightly for a few days or 1 or 2 weeks consecutively, and, ceasing, does not reappear for weeks, months, or sometimes years.

Most sufferers from this malady have no premonition of their attacks. A few will be warned by symptoms that are peculiar to each, such as unusual sneezing or flatulence.

The onset is commonly sudden. The attacks occur almost exclusively at night, and generally between 2 and 4 o'clock in the morning. The patient is awakened by dyspnea. To make his breathing as comfortable as possible he soon learns to sit or stand so as to brace his shoulders, that the unusual muscles of respiration may act the better. In order that air may enter the air-passages as readily as possible, he will hold his head back and straighten his neck. When dyspnea is intense, the patient's countenance expresses both distress and anxiety. At first a warm perspiration, which becomes cold and clammy when cyanosis develops, breaks out because of the labor for breath. The temperature of the patient remains normal. His pulse becomes rapid and sometimes small, soft, and irregular.

The dilatation of the nostrils with each inspiration, the swollen cervical veins, the distended thorax, and the lifting of the whole thorax with each inspiration at once attract the attention of onlookers. Respiration is not much hurried, frequently not at all, but is very labored. The intercostal spaces are widely distended. In other words, the thorax is constantly in the position of deep inspiration. Inspiration is short, produced by the sudden lifting of the whole chest; expiration is much prolonged. In children the lower part of the thorax is often retracted during inspiration. Percussion reveals no change in resonance or a moderate increase. The area of pulmonary resonance is enlarged by the downward displacement of the liver, and by the displacement of the heart and overlapping of its edges by the distended lungs. It is not necessary in most cases to place an ear to the patient's chest to hear the noisy breathing, which is usually described as crowing or whistling or a combination of both. The short inspiratory sound and prolonged whistling expiratory one can often be heard many feet from the patient.

In frankly spasmodic cases of asthma coughing does not occur until near the end of the paroxysm. A few small, glossy plugs of mucus may then be coughed up and expectorated. If they are examined microscopically, in addition to a few epithelial cells, numerous eosinophile cells will generally be seen, and often Charcot-Leyden crystals and spiral threads, known as Curschmann's spirals.

In the intervals between paroxysms respiration, the bronchial tubes, and lungs seem to be normal.

Many cases are associated with coryza and bronchitis. When the latter is present, dyspnea is likely to be more persistent, because the bronchioles are narrowed simultaneously by spasm and by inflammation of their walls.

Diagnosis is not difficult, as a rule; sudden attacks of dyspnea of short duration leaving the air-passages normal are not produced by any other malady. It may be distinguished from capillary bronchitis by the persistence of dyspnea, the hurried breathing, and increased temperature that occurs in the latter. Chronic emphysema is not paroxysmal. In it dyspnea is constant. Stenosis of larynx or trachea causes inspiratory, not expiratory, dyspnea. In cardiac dyspnea the characteristic sibilant râles are not present and the vesicular character of the breath sounds is at first unaltered. If pulmonary edema develops fine moist râles are heard usually limited to the inferior-posterior portions of the lungs. The dyspnea is not predominantly expiratory. It must be remembered that asthma and cardiac dyspnea may be associated.

Asthma occurs at all ages, but most frequently

between the twentieth and fortieth years. Men are somewhat oftener affected than women. A neurotic temperament is very evident in most sufferers. The malady is occasionally hereditary, appearing in many generations, and sometimes in several individuals of each generation.

Etiology.—The immediate exciting cause of asthma is commonly irritation of the nasal, pharyngeal, or bronchial mucous membrane, or rarely of the stomach or uterus. The dyspnea is provoked reflexly by such irritation. In a few instances attacks have been known to have a mental origin. Certain objects—for instance, a painted flower as readily as a real one—will suggest, and therefore provoke, a paroxysm of asthma in certain individuals.

A large number of cases of asthma are provoked by irritation of unusually sensitive erectile tissue in the nose or throat. The irritant may be a certain odor to which the sufferer possesses an idiosyncrasy, or some odorless dust. The destruction of this tissue will then prevent the recurrence of asthma.

Those individuals who are liable to asthma at certain seasons—as, for instance, fall or spring, when they are attacked by coryza or bronchitis or both—should seek, by change of climate, to escape the primary catarrh. If it is hay-fever that provokes asthma in any individual, he must be advised, during August and at least the first half of September, to reside where this latter malady is unknown. In the eastern United States, the White Mountains are surer to give immunity than any other locality. Mackinac, the neighboring shore of Michigan, and many places along the shores of Lake Superior afford immunity to residents of the Central States. Very many are unaffected so long as they remain in Colorado or New Mexico. See HAY-FEVER.

Prognosis in asthma is favorable as to life, but a permanent cure is exceptional except by an entire change of climate, or a surgical operation in those cases which are dependent upon an intranasal condition. Only in the worst cases is asthma the immediate cause of death. Much discomfort is caused by the disease, which, however, may be mitigated or cut short by appropriate treatment.

Treatment.—Two indications guide the treatment of asthma: First, prevent the development of dyspnea; second, relieve it when it is established. To meet the first, drugs must be given during the intermissions of attacks. The iodid of sodium or potassium is of the greatest help in many cases. It is especially useful in averting attacks that complicate bronchitis. The drug is usually efficacious in doses of 5 to 10 grains. The following formula may be recommended as routine during intervals between attacks:

℞. Potassium iodid, 10 grams
Tincture of belladonna leaves or Tincture of hyoscyamus, 15 grams
Syrup of sarsaparilla, 30 grams
Water, enough to make 100 grams.

One teaspoonful in water 3 times a day after meals.

It must sometimes be given in twice or three times this amount. Arsenic, either in the form of arsenous acid or Fowler's solution, will prevent recurrences in a few cases. It does not act promptly. Its dose must be gradually increased to near the point of beginning intolerance of it. A number of fluidextracts that are more or less useful to relieve dyspnea have been used to avert asthma, with varying results, sometimes appearing to be helpful, at other times useless. Among these are senecio aureus, grindelia robusta, euphorbia pilulifera. They may be used as adjuvants when an iodid or arsenic is given. Just how any of them acts to prevent dyspnea is not known.

The following is a useful formula:

℞. Sodium iodid, 10 grams
Fluidextract of euphorbia pilulifera, 60 grams
Water, or simple elixir, add sufficient to make 120 grams

Of this, 1 teaspoonful may be given 3 or 4 times daily.

If, as rarely happens, the fermenting contents of stomach or intestines provoke an attack, when dyspnea starts, these organs should be promptly emptied.

When irritability of the nasal or pharyngeal mucous membranes makes one liable to asthma, it may often be aborted and sometimes avoided by the application of local anesthetics, such as cocain or eucain. A solution of cocain in water of from 2 to 4 per cent. strength, sprayed into the nostrils and pharynx, sometimes affords relief at once. In severe cases the relief is temporary, and if the spraying is frequently repeated, the toxic effects of cocain may be developed. Eucain is safer, far less poisonous, but it is slower in producing its effects, and must be used in stronger solutions. If morphin is combined with cocain, the anesthesia is prolonged. Instead of an aqueous solution of these drugs, they may be diluted by starch-powder and blown into the throat and nose. Holocain has not yet been used to relieve asthma. As it is an efficient local anesthetic, does not apparently produce toxic effects, it may yet be found useful.

Suprarenal extract should be tried, as it is often effective, both in cutting short an attack and during intervals between attacks. It is given hypodermically (10 minims of adrenalin chlorid) in solution or by inunction to the nasal mucous membrane (10 per cent. suprarenal ointment); or in triturates with sugar of milk, which are allowed to dissolve in the mouth, so as to permit absorption by the mucous membrane.

Rheumatic or gouty individuals are most promptly relieved by salicylic acid or the salicylates. An abundance of milk and water should be given, so that elimination by the kidneys will be increased. A regimen such as is essential to the treatment of these dyscrasias should also be prescribed.

When dyspnea is great and cyanosis is marked, it is best to administer a little chloroform or ether, as they lessen the sensitiveness of the nervous sys-

tem at once and cut short the paroxysm. In most cases sufficiently prompt results may be obtained from chloral administered by the mouth. It is best for an attendant to awaken the patient an hour before an expected attack, and then to give 20 grains of chloral. If necessary, a half or third of this dose may be given 1 or 2 hours later. If the patient awakens with dyspnea, a full dose of chloral should be given at once. Morphin may be given hypodermically instead. Its usefulness is increased by combining atropin with it. It will often give the greatest possible relief. These drugs undoubtedly produce their good results by benumbing the central nervous system.

Some years ago Fraser demonstrated the prompt and great good afforded by the nitrites in relieving the dyspnea of asthma. In from 2 to 5 minutes after inhaling nitrite of amyl dyspnea lessens, and in from 15 to 20 minutes often disappears. The effects of nitrite of amyl are very transitory. Those of nitroglycerin are as prompt if it is given hypodermically, and more prolonged. The effects of nitrite of sodium and erythrol tetranitrate are still more persistent. They are given in solution by the mouth in doses of from 1 to 4 grains. In most cases of asthma relief is afforded quite as quickly by the nitrites as by chloroform. They benumb the endings of sensory nerves and thus break the reflex arc, the integrity of which is necessary for the production of most cases of asthma.

Belladonna and stramonium have a similar mode of action, but produce little effect unless used in doses that will cause mild poisoning—that is, excessive dryness of skin and mouth, and obscured vision because of dilatation of the pupils. These drugs, therefore, are used as adjuvants, but are not depended upon for relief. They are sometimes given by the mouth, as in this formula:

℞.	Sodium nitrite,	2 grams
	Tincture of stramonium,	20 grams
	Fluidextract of grindelia,	30 grams
	Glycerin,	5 grams
	Water, enough to make	60 grams.

Of this mixture a teaspoonful may be taken once in an hour or an hour and a half until 2 or 3 doses have been taken, if more than 1 is needed to abort the paroxysm. Instead of nitrite of sodium, chloral may be used in this formula.

Very frequently stramonium is administered by inhalation, the leaves being mixed with tobacco or wrapped in paper and smoked, or made into pastils, burned upon a plate, and the smoke inhaled. Cigars, cigarets, and pastils are rendered much more effective if paper or some other absorbent, saturated with a strong solution of niter, is added to the stramonium leaves. When burned, the niter is converted into a nitrite.

The following are favorite formulas: Thirty grams of dry leaves of Datura stramonium are added to a solution of 2 c.c. of the aqueous extract of opium in 25 c.c. of water. When the leaves have again been dried, they may be rolled in cigaret paper and smoked.

Cigarets may be made still more effective by saturating the stramonium leaves with an 8 per cent solution of nitrite of potassium, and a solution of arsenite of potassium, of such strength that each cigaret will contain about 0.05 gram. Frequently, a mixture of stramonium, hyoscyamus, and belladonna leaves is used as a basis for these cigarets, and sometimes tobacco is mixed with them.

The inhalation of compressed air in the pneumatic cabinet is efficacious. See PNEUMOTHERAPY under TUBERCULOSIS, PULMONARY. The new treatment by vaccines, preferably autogenous, seems encouraging. See VACCINE THERAPY.

ASTIGMATISM. Definition.—An error of refraction usually due to some irregularity of the curvature of the refracting surfaces of the eye. The cornea is most often the faulty structure, but lenticular astigmatism is not uncommon; in fact, it is said that all eyes possess some irregular astigmatism in the lens, and for this reason the point of light at a great distance is not seen as a point, but as a star. However, it must be remembered that light coming from the heavens travels through media of different refractive powers. In simple myopia or hyperopia, while the refraction is faulty, the corneal meridians are all of equal curvature. In astigmatism the curvature of the meridians is different; one principal meridian may be of proper curvature while the other is markedly defective. It must be remembered that astigmatism does not depend upon the length of the globe, but upon the curvature of the cornea and lens.

Varieties.—**Regular astigmatism** is present when the two principal meridians—*i. e.*, those of greatest and least curvature—are at right angles to each other.

Irregular astigmatism is a condition in which the unequal curvatures of the cornea bear no definite relation to each other. There are no principal meridians, and different parts of the same meridian may have different refractive powers. This form of astigmatism is usually due to cicatrices of the cornea following injuries, surgical operations, or destructive inflammations. If the cornea is clear and apparently regular, we are safe in attributing irregular astigmatism to a difference in the refractive power of the different sectors of the lens, or to its oblique position.

Causes of Regular Astigmatism.—As previously stated, the chief factor in the production of regular astigmatism is imperfect curvature of the cornea. Regular astigmatism may be congenital or hereditary. Congenital malformation of the cornea may be a part of a general anatomic defect in the bones of the face and skull.

The causes of acquired regular astigmatism are not exactly understood, but as almost every person is slightly astigmatic, among civilized nations regular curvature of the corneal surface is the exception rather than the rule. However, the excessive use of the eyes in modern life is attended by so much muscular and accommodative effort that it seems probable that both tension on and torsion of the coats of the eyeball by the muscles are

prime factors in the meridional change in corneal curvature. Pressure of the lids, particularly in ametropia and when they are hypertrophied and uneven after some marked conjunctival inflammation, is often suggested as a cause. Finally, after operations on the cornea or sclerotic, the subsequent changes during cicatrization may produce a high degree of astigmatism.

Disadvantages.—An astigmatic eye sees a point as a line; hence images are distorted and marked visual disturbance results. It is believed that there is an involuntary effort on the part of the ciliary muscle, and even the external muscles, and to remedy the astigmatic defect. By constant unequal contraction the ciliary muscle partly compensates for moderate inequalities in the curvatures of the cornea. Such continuous and unequal accommodative effort must result in eye-strain and consume much of the normal nervous energy, eventually producing reflex manifestations of disturbance of the nervous equilibrium. Therefore, an astigmatic person may be able to improve his vision only at the expense of his health. Uncorrected astigmatism, particularly in delicate and nervous women, results in the worst forms of reflex asthenopic symptoms.

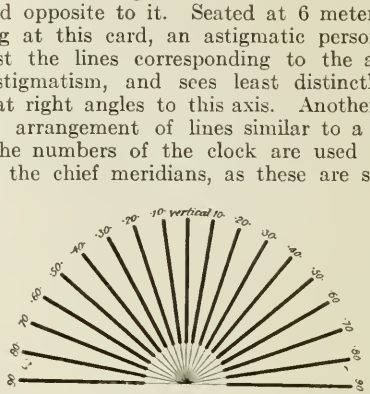
Symptoms.—Nearly every person consulting the ophthalmologist for refraction is more or less astigmatic, and in the majority of cases part of the astigmatism is masked by the accommodative effort of the ciliary muscle. Under this natural correction the visual acuity is more or less undisturbed, and in the moderate degrees of astigmatism the reflex symptoms are the most prominent signs. The patient complains of headache, nausea, anorexia, indigestion, inability to perform continuous near work, etc. In reading the letters often fade out and seem to run together. There is significant confusion of such letters. Commonly there will be noticed an inclination of the head to one side, the patient saying that he can see better with his head in that position. In very high degrees of astigmatism the pupil may be oval, and the symmetry of the cornea may be detected by simple inspection.

From the preceding remarks as to the involuntary correction action of the ciliary muscle, the use of a mydriatic in determining the full degree and correct axis of the astigmatism is necessary.

Tests for astigmatism are very numerous; there are a dozen or more valuable methods of qualitative and quantitative diagnosis of astigmatism. The astigmatic cards and dials, the stenoepic disc, and the keratoscope furnish us easy methods for simple diagnosis, while the ophthalmoscope, ophthalmometer, retinoscope, and test-lenses are valuable methods for the more exact determination of the kind and degree of astigmatism. Besides these tests we have the perforated chimney disc, the cobalt glass, etc.

The diagnosis of astigmatism by the ophthalmoscope, by the retinoscope, and by the test-lenses is described in the sections dealing with these instruments, and only those instruments especially designed for the detection of astigmatism will be here described.

Astigmatic cards and charts are of several varieties. **Snellen's cards** consist of a series of equally colored dark lines arranged like the spokes of a wheel, with the angle of inclination of each line marked opposite to it. Seated at 6 meters and looking at this card, an astigmatic person sees clearest the lines corresponding to the axis of his astigmatism, and sees least distinctly the lines at right angles to this axis. Another form is the arrangement of lines similar to a clock-dial; the numbers of the clock are used to indicate the chief meridians, as these are so well



Snellen's Card for Testing Astigmatism.

known by the patient, and can be easily indicated by him to the physician.

Pray's astigmatic letters are formed of equally black lines inclined at different angles. The letter seen the blackest is the one formed of lines at an angle corresponding to the axis of the patient's astigmatism. Many other forms of cards and charts have been suggested.

The stenopeic disc consists of a round disc of metal or hard rubber containing in one of its diameters a fine, linear, slit-like opening. It is mounted in a test-lens cell for use in the trial-frame. One eye is excluded from vision with an opaque disc, and the stenopeic *slit* is placed before the other. The patient is directed to look at the test-letters or astigmatic chart. The stenopeic disc is then rotated in the trial-frame until it reaches the position in which the letters are most distinctly seen, or in which the lines on the chart are of nearest equal distinctness. The angle marked on the trial-frame corresponding to the inclination of the *slit* indicates the least defective meridian, and also the axis of the necessary correcting cylinder, as such a cylinder would correct only the defect of the meridian at right angles to its axis (the most defective meridian). The convex or concave glass that gives the best vision is put down as the refraction of the first meridian. The *slit* is turned exactly 90°, and the second meridian is similarly refracted. If both meridians are hyperopic or myopic, the refraction of the first meridian represents the spheric defect, and the difference between them is the cylindric defect at the axis of the first meridian. If the *slit* was preferred in the vertical meridian (axis 90°), and the refraction of this meridian was +1.00 D., and the refraction of the horizontal meridian (axis 180°) was +2.00 D., the defect would be expressed thus: +S. 1.00 +C. 1.00 ax. 90.

If the refraction of the first meridian was myopic, say, −1 D., and the refraction of the 180 meridian hyperopic, say, +2 D., the defect could be expressed either −S. 1.00 +C. 300 ax. 90, or +S.

2.00 — C. 3.00 ax. 180. The first would be the better formula to use, as the meridian of least defect is generally taken for the spheric correction.

The stenopeic disc furnishes a simple means of refracting astigmatic eyes, but it is not always accurate. It is of greatest value in cases of mixed astigmatism. It has the advantage of not requiring cylindric lenses in refraction.

A ready means of detecting astigmatism is the application of a low degree cylinder before the eye, which, if preferred in any special axis, gives a strong reason to suspect astigmatism in that axis or at right angles to it.

Treatment of regular astigmatism consists in using the proper correcting glasses. The full astigmatic correction should be ordered, and, in the compound or mixed forms, combined with the spheric correction. If the degree of defect is high, or if there are symptoms of accommodative asthenopia, the glasses should be worn constantly. The patient should be urged to wear spectacles, for eye-glasses frequently get out of shape, and it is not possible to know whether the glass is applied to the eye at the proper axis. In very sensitive eyes the slightest tilting of the axis of the cylinder is provocative of the most disagreeable asthenopic symptoms, and often a proper glass wrongly adjusted will aggravate the condition.

Treatment for irregular lenticular astigmatism is worthless. For **irregular corneal astigmatism,** generally due to a corneal cicatrix, stenopeic glasses—*i. e.*, discs having small holes in the middle to prevent the rays of light from being received on any but an extremely limited corneal area, the curvature of which may be regular—have been used. However, the field of vision is so limited in these cases that the glasses are of little value. By patiently applying the test-lenses to an irregularly astigmatic eye, a cylindric combination which at a particular axis seems to improve the vision may be found.

ASTRAGALUS.—See Ankle.

ASTRINGENTS.—Agents that produce contraction of muscular fiber and condensation of other tissues, the first probably by direct irritation, the second by precipitating their albumin and gelatin. They also lessen secretion from mucous membranes. The principal astringents may be enumerated as follows:

Acids, alcohol, alum, chalk, lime, creosote, carbolic acid, tannic acid, gallic acid, catechu, gambir, galls, kino, oak-bark, uva ursi, hematoxylon, bismuth subnitrate, etc., cadmium sulphate, copper sulphate, ferric chlorid, lead acetate, silver nitrate, zinc sulphate.

Sulphuric acid, gallic acid, and lead acetate are examples of remote astringents, acting on internal organs through the blood. Those that affect the part to which they are applied are local astringents, and include most of those previously enumerated.

The metallic astringents are used most frequently to reduce the size of wounds and ulcers, and to remove exuberant granulations and form a protecting pellicle over such. Astringents lessen congestion and secretion of mucous membranes, and are used in lotions to the eye and mouth, as gargles or sprays to the throat, as injections to the urethra, vagina, and the nose, and as suppositories to the rectum. In diarrhea they are serviceable, and in lessening hemorrhage, in the treatment of hemoptysis, hematuria, and hematemesis they are made use of internally. Gallic acid and lead acetate are most valuable in these conditions.

Three mineral astringents are not only astringent, but sedative, and may, therefore, be freely used in acute inflammations. They are silver nitrate, lead acetate or subacetate, and bismuth carbonate or subcarbonate. Most other astringents possess some irritant properties.

ATAXIA.—See Locomotor Ataxia.

ATELECTASIS.—Pulmonary collapse, with failure of the air to enter the vesicles. It may be either *acquired* (apneumatosis) or *fetal.* The condition is due not to disease of the lungs, but to nerve injuries, weakness, etc. In fetal cases the lung has never been inflated, while in apneumatosis it has been inflated.

There is intense dyspnea, cough, and clinical symptoms of bronchopneumonia, with which it frequently coexists.

The physical signs are the same as those of bronchopneumonia. Prognosis is unfavorable.

Treatment.—In the cogenital variety inflate the lung by means of a catheter placed in the larynx, artificial respiration, and application of heat to extremities. If the disease is due to bronchopneumonia, institute the treatment for that disease.

ATHEROMA.—Primarily, a soft encysted tumor (sebaceous cyst); more commonly, the fatty degeneration of the walls of the arteries in consequence of chronic arteritis, and called **atheromatous degeneration. Atheromatous abscess,** resulting from chronic arteritis, is a collection of soft matter beneath the intima, while an **atheromatous ulcer** is formed by the abscess breaking through the intima. See Arteriosclerosis.

ATHETOSIS.—A symptom most frequently occurring in children, and characterized by continual change of position of the fingers and toes, and inability to keep them quiet, save in sleep. It is due to some lesion or derangement of the brain or cord. It is also called "posthemiplegic chorea," from its occurrence after hemiplegia, in adults.

Strictly speaking, it is not a disease, but usually part of a symptom-group indicating some lesion of the cerebrum. The movements are difficult to describe, being commonly observed in one hand and its fingers, occasionally in both. It is most frequently congenital, occurring usually with some form of cerebral palsy. The movements are more or less rhythmic, do not cause the patient fatigue, can usually be controlled by the will, though modified by strategy, and, as a rule, do not impair sensation. Athetosis may be a sequel of poliencephalitis, and toxic agents may affect the motor cortex or subcortex. The dura is often adherent to the pia, and this is frequently

injected, infiltrated, and adherent to the cortex, which, with the subcortex, is softened and may include the whole of the gray matter. The diagnosis is not difficult. Its movements, when contrasted with chorea, though irregular and bizarre in themselves, have a certain regularity and monotony in their method of repetition. The prognosis is unfavorable. Hysteric athetosis is possible, has been observed, and has a favorable prognosis. Little can be done in the way of treatment. Nerve-stretching will temporarily stop the movements. Galvanism has frequently been employed, but is of little permanent value. Iodids, bromids, and mercury may be tried where meningitis is suspected. Conium, gelsemium, hyoscin, and opium are only of temporary value.

ATOPHAN.—Trade name of a preparation of phenyl-quinolin-carboxylic acid; it has been suggested as a substitute for the salicylates and also as an analgesic. Its main use, however, is in the treatment of gout, where its ingestion is followed by an increase in the output of uric acid and the urates. It checks the pain and inflammation, but is probably not more of a specific than colchicin. The usual dose is from 8 to 16 grains, combined with one dram of sodium bicarbonate; this should be followed by a glass of water. This dose may be given three or four times a day. See GOUT (Treatment of).

ATOXYL.—Sodium arsanilate. An amido-benzene compound of arsenic. It is claimed to be 40 times less toxic than Fowler's solution, and has the same action. It has proved a very efficient remedy for trypanosomiasis and it has been used with good results in syphilis. The use of this drug has, however, been abandoned by many because of the danger of optic atrophy. Dose, hypodermically, 1/10 to 1/2 of a grain, gradually increased up to 3 grains. See ARYLARSONATES.

ATROPHODERMA.—Atrophia cutis, atrophy of the skin, a wasting of the skin due to innutrition. **A. albidum,** a type of xeroderma in which the skin from the middle of the thigh to the sole, more rarely from the upper arm to the palm, is in places very white, stretched, and difficult to pick up, with the epidermis extremely thinned, faintly glistening, wrinkled, and peeling off in thin, shining flakes. There is extreme sensibility on the finger-tips, palms, and soles. The condition remains stationary from the earliest childhood. **A. neuriticum,** glossy skin; an atrophy of the skin in the area of a nerve affected by disease or injury. It chiefly attacks the extremities. The skin of the affected part becomes very dry, smooth, and glossy, like a thin scar; the fingers are tapering, hairless, and almost void of wrinkles, and of a pink or deep-red color. A severe and persistent buring pain precedes and accompanies this condition. The nails become curved both longitudinally and transversely, and there is some thickening of the cutis beneath the free end. **A. pigmentosum.** See XERODERMA. **A. striatum et maculatum,** an atrophic condition of the skin of adults characterized by streaks of a pearly or bluish-white color, glistening, scar-like, from 1 inch to several inches long, and a quarter of an inch or more wide, and which follow the natural cleavage of the skin, and are situated chiefly about the buttock, anterior border of the ilium, trochanters, and thigh. The "spots" are less common, small, usually isolated, and are usually seen on the trunk and neck.

ATROPIN, $C_{17}H_{23}NO_3$.—A crystalline alkaloid derived from *Atropa belladonna.* The sulphate is a white powder of bitter taste, neutral reaction, soluble in water. *Homatropin,* $C_{16}H_{21}NO_3$, is a derivative alkaloid, the hydrobromid being used by ophthalmologists as a mydriatic, principally because its effects pass off more quickly than those of atropin. Homatropin slows the heart; atropin quickens it. See HOMATROPIN. Atropin is an irritant narcotic, a mydriatic, antispasmodic, and anodyne; in small doses a cardiac, respiratory, and spinal stimulant; in large doses a paralyzant of the cardiac and respiratory centers, the spinal cord, motor nerves, and voluntary muscles. It produces congestion and dryness of the mucous membrane of the mouth, nose, pharynx, and larynx, at first lessening the gastric and intestinal secretion, to be followed by an increase of the same. It is extensively used in ophthalmic practice to dilate the pupil, paralyze accommodation, and also in various corneal, iritic, and other ocular diseases. The usual strength is 4 grains to 1 ounce of water. It is contraindicated whenever there is increased intraocular tension, and should not be used in persons over 40 years of age, or in gouty or rheumatic subjects, in whom its instillation may light up a laten or incipient glaucoma. Its therapeutic uses in general medicine are also manifold, *e. g.,* in inflammatory affections and the pain of cerebral and spinal hyperemia, atonic constipation, cardiac failure, hypersecretions, etc., and as a physiologic antagonist in opium-poisoning. Dose of atropin sulphate, 1/120 to 1/100 of a grain.

Atropin is used in poisoning by opium, physostigma, and hydrocyanic acid; in ptyalism from mercury, pregnancy, etc.; in the sweats of phthisis, in sudden cardiac failure, and by eye-surgeons to paralyze accommodation, dilate the pupil, contract the vessels, and lessen pain. In opium-poisoning it should be given in very small doses, and repeated for effect, as most of the unsuccessful cases of its use reported in this connection were due to overdosing with the antagonist, superinducing belladonna narcosis upon the opium narcosis. In cases of heart-failure from chloroform or ether inhalation, the hypodermic injection of atropin has saved lives when all other methods of resuscitation had failed. It is highly efficient in lead-poisoning, if used in combination with potassium iodid; and has given the most satisfactory results as a hemostatic in profuse metrorrhagia after abortion, in metrorrhagia of obscure origin, and in phthisical hemoptysis.

Symptoms of **poisoning** are those of belladonna —tickling and dryness in the throat, vomiting, diarrhea, redness of the face, and quick and irregular pulse. These symptoms are generally mild and of short duration, and are usually produced during mydriasis from the drug. Full doses of some preparations of opium are indicated as a physiologic antagonist. See BELLADONNA, MYDRIATICS.

In whooping-cough:

℞. Atropin sulphate, gr. 3/4
Pulverized sugar, white, ʒ ijss.
Give a grain and a half 3 times daily to a child of 5 years.

A sedative application:

℞. Atropin sulphate, gr. iv
Morphin sulphate, gr. viij
Rose-water, ʒ ss
Glycerin, ʒ iijss.
Mix into a liniment. Rub into the part.

In Iritis:

℞. Atropin sulphate, gr. iv
Water, ʒ j.
Make into an eye-wash. Instil a dozen drops during the day. Purge with calomel.

To produce mydriasis for refraction purposes:

℞. Atropin sulphate, gr. j
Distilled water, ʒ ij.
Instil 1 drop in each eye 3 times a day for 2 days.

AURA.—A sensation sometimes like a gentle current of air rising the limbs or body to the head; a frequent forerunner of an epileptic attack —*aura epileptica.* The term is also applied to any slight symptom preceding an attack of any disease or paroxysm, as the *aura hysterica, aura vertiginosa,* etc. See Epilepsy, Hysteria, etc.

AURANTIUM (Orange).—Aromatic and tonic, also more or less bitter, but has little action except a mild stimulant influence on the nervous system, due to its volatile oil. In medicine its use is chiefly for flavoring purposes. The bitter orange may be used as a gentle tonic and stimulant to the digestion, but usually with other more active agents. The tincture, water, and aromatic elixir are the favorite preparations.

Orange occurs in two official varieties of fruit and preparatons of their flowers, *Citrus vulgaris,* the bitter orange, and *Citrus Aurantium,* the sweet or Portugal orange. The official titles are: **Aurantii Amari Cortex,** *bitter orange peel*—the dried rind of the unripe fruit of *Citrus vulgaris,* characteristics well known. **Aurantii Dulcis Cortex,** *sweet orange peel*—is the fresh outer rind of the ripe fruit of *Citrus Aurantium.* It contains a volatile oil differing from that of the bitter orange, and less of the bitter principle.

Preparations.—Fluidextractum Aurantii Amari, *fluidextract of bitter orange peel.* Dose, 10 to 60 minims. **Tinctura A. Amari,** *tincture of bitter orange peel*—strength 20 percent. Dose, 1 to 2 drams. **Tinctura A. Dulcis,** *tincture of sweet orange peel*—strength 20 percent. Dose 1 to 2 drams. **Syrupus A.** Tincture of sweet orange peel 5, magnesium carbonate, 1 citric acid 5, sugar 82, water to 100. Dose, 1 to 2 drams. **Syrupus A. Florum,** *syrup of orange flowers*—sugar 85, orange-flower water to 100. Dose, 1 to 2 drams. **Spiritus A. Compositus,** *compound spirit of orange*—oil of orange peel 20, oil of lemon 5, oil of coriander 2, oil of anise 1/2, alcohol to 100. Dose, as for alcohol. **Aqua A. Florum Fortior,** *stronger orange-flower water*—is water saturated with the volatile oil of fresh orange flowers. Dose, indefinite. **Oleum A. Corticis,** *oil of orange peel*—a volatile oil, obtained by expression from the fresh peel of either orange. Is soluble in about 4 times its volume of alcohol, and is an ingredient of the official spirit of orange and also of spiritus myrciæ (bay rum). Dose, 1 to 5 drops. **Elixir Aromaticum,** *aromatic elixir (simple elixir)*—has of the compound spirit of orange 1.2, purified talc 3, syrup 37 1/2, alcohol and distilled water to 100. Dose, 1 to 8 drams or more.

AURICULO-VENTRICULAR BUNDLE (Gaskell's Bridge, Bundle of His).—The remains of the primitive cardiac tissue which passes from the auriculo-ventricular node to the right and left ventricles. See Heart Block.

AURICULO-VENTRICULAR INTERVAL.—The interval between the auricular and carotid waves in tracings of the jugular pulse. Normally it is equal to one-fifth of a second. See Pulse.

AURUM.—See Gold.

AUSCULTATION.—Listening to the sounds produced within the chest during the act of respiration, coughing, or speaking, furnishes the most reliable means of studying the condition of the lungs, and is, therefore, the most valuable method of discriminating between the various conditions that may affect the lungs.

Auscultation is either *immediate or mediate.*

It is *immediate* when the ear is applied directly to the chest, which may be either denuded or thinly covered.

It is *mediate* when the sounds are conducted to the ear by means of a tubular instrument, termed a *stethoscope.*

For ordinary purposes *immediate,* or direct, auscultation is sufficient, but when it is desirable to analyze circumscribed sounds, as in diseases of the heart, or when the patient objects to this method on the score of delicacy, or the auscultator objects on account of the uncleanliness of the person to be examined, the stethoscope is to be preferred. Moreover, there are certain parts of the chest that can be explored satisfactorily only by the aid of a stethoscope, and, again this instrument has the additional advantage of *intensifying* the sound.

In auscultation the following rules, formulated by Da Costa, should be observed.

"1. Place yourself and your patient in a position that is least constrained, and permits of the most accurate application of the ear or stethoscope to the surface. Above all avoid stooping, or having the head too low.

"2. Let the chest be bare, or, what is better, covered only with a towel or a thin shirt.

"3. If a stethoscope is employed, apply closely to the surface, but abstain from pressing with it. This may be obviated by steadying the instrument, immediately above its expanded extremity, between the thumb and the index finger.

"4. Examine repeatedly the different portions of the chest, and compare them with one another while the patient is breathing quietly. Making him cough or draw a full breath is, at times, of

service; especially the former, when he does not know how to breathe."

See CHEST (Examination).

AUTOINFECTION.—Infection resulting from a primary focus in the organism as, for instance, the dissemination of the bacillus of tuberculosis or diphtheria, or the metastatic abscesses of pyemia. See AUTOINTOXICATION.

AUTOINTOXICATION.—Autointoxication is, as the name implies, a poisoning caused by substances which are formed under the influence of the vital processes of the organism. Accepting this definition, then, intoxication by infection, by resorption of products of cryptogenetic infection, and by absorption of alimentary poisons (meat, sausage, fish poisons—ptomains) is not considered as an autointoxication. The substances causing autointoxication may be produced:

1. By the tissues and organs of the body.

2. By altered function in the gastrointestinal tract.

1. Under this heading are grouped manifestations of altered nuclein metabolism (gout, rheumatism), of altered fat metabolism (acetonuria), of altered carbohydrate metabolism (diabetes with resultant acidosis), also such obscure intoxications resulting from altered functions of organs as uremia (kidney), cholemia (liver), exophthalmic goiter, and myxedema (thyroid), tetany (parathyroids), acromegaly (hypophysis cerebri), Addison's disease (adrenals). The above are not regarded as autointoxications in the sense in which the term is ordinarily used.

2. Autointoxication as generally understood is spoken of wrongly as acidosis, acid intoxication, and properly as gastrointestinal autointoxicaton. It is an expression of qualitative or quantitative changes of normal digestion. The development of our knowledge of autointoxication has been the result of constant research on the part of the French school, at whose head Combe stands, as the champion of the subject.

The qualitative and quantitative alterations taking place in normal digestion, which produce symptoms of autointoxication, have been studied for the most part from the side of protein decomposition, carbohydrate and fat metabolism having been practically neglected. The changes normally undergone by the protein molecule under the influence of the various ferments in the gastrointestinal tract are:

Normal Digestion.—I. *Gastric Juice. Pepsin.*

1. Noncrystallizable bodies, albumose, peptone.
2. Ammonia.
3. Diamino acids—lysin, arginin, histidin.
4. Monamino acids.

a. Aromatic Series.—Phenylalanin, tyrosin, tryptophan.

b. Fatty Acid Series.—Leucin, glycocoll, alanin, serin, cystin, valin, prolin, oxyprolin, aspartic and glutamic acids.

II. *Intestinal Juice.*—The chief ferments of protein digestion are erepsin and trypsin.

1. **Erepsin.**—Its only function is to transform albumose and peptone into crystallizable bodies, and it has no action on native albumin.

2. **Trypsin.**—This ferment breaks down the albumin molecule into exactly the same split products as the gastric juice, only more quickly and more completely. It may be stated that normally the gastric juice conducts digestion of protein only as far as ablumin and peptone, at which stage the food is expelled into the intestine to be digested still further by erespin and especially trypsin.

Action of Bacteria on Food.—In addition to the change wrought in the food by enzymatic action, powerful alterations are produced by microbic activity. The split products of bacterial decomposition are of utmost importance in the causation of autointoxication and differ materially from those brought about by ferments. By bacterial action the following bodies are produced:

I. Albumose—peptone.

II. Ammonia.

III. Diamino Acids.—Lysin, arginin, histidin.

IV. Monamino acids:

1. Aromatic Series.—Phenylalanin, tyrosin, tryptophan.

2. Fatty Acid Series.—Leucin, glycocoll, alanin, serin, cystin, valin, prolin, oxyprolin, aspartic and glutamic acids.

V. Fatty Bodies.

1. Butyric, caproic and valeric acids.
2. Ptomains.

VI. Aromatic Bodies.

1. Oxyacid Group.—Paraoxyphenylacetic and paraoxyphenylpropionic acids.
2. Phenol Group.—Phenol, paracresol.
3. Indoxyl Group.—Indol, skatol.

VII. Gases.

Methane, hydrogen, carbon dioxid, hydrogen sulphid, methylmercaptan.

Fate of Products of Digestion.—Under normal conditions, the carbohydrates and nitrogenous substances are broken up by bacterial action in the small intestine and large intestine respectively, but when putrefaction is intense, proteolysis may be carried on in the small intestine. The end-products of digestion included under headings I, II, III, and IV are capable of being utilized by the body to cover its nitrogen losses, and they assist in the maintenance of nitrogen equilibrium. The substances under V, VI, and VII are dead losses to the organism, and hence bacterial decomposition must be regarded both as a needless waste of protein material and as a generator of toxic agents. It would lead too far afield to discuss the place of origin, the toxic action and the portal of excretion of each one of the toxic agents included under V, VI, and VII, but information can be obtained from some of the larger works on the subject.

The outline of the chief split products of protein digestion given above, shows that nitrogenous food, broken down under the action of ferments, is completely utilized and to a certain extent the same is true of the split products of bacterial decomposition. However, there are substances formed under the influence of microbic activity which are decidedly toxic to the organism when produced in excess or when the power of the organism to overcome the same is weakened.

Defenses of the Body Against Autointoxication.—As is the case with all injurious substances, the products of bacterial decomposition are opposed in the body by an elaborate system of defense, which is fully able to cope with the poisons, so long as these poisons are not produced in too large quantities. The defensive means of the body, limiting the formation of autotoxins, are three in number:

I. **Line of Defense within the Intestinal Canal.**
1. Acidity of gastric juice.
2. Bile
3. Pancreatic juice.
4. Bacterial flora of small intestine.
5. Acidity of small intestine.
6. Flora of large intestine.

II. **Line of Defense Immediately Surrounding Intestinal Canal.**
1. Mucosa of intestine.
2. Liver.
3. So-called Antitoxic Glands—thyroid, hypophysis, suprarenals.

III. **Line of Defense apart from Gastrointestinal Canal.**
1. Respiratory tract.
2. Saliva.
3. Sweat.
4. Urine.
5. Feces.

Causes of Autointoxication.—It will readily be seen that the causes of autointoxication are easily grouped under two headings:

1. Those which have to do with excessive formation of the toxins.

2. Those which cause a diminution of the factors of safety.

I. **Increased function of toxins** is seen in any condition of the gastrointestinal tract whereby food is improperly digested, improperly absorbed, or remains an abnormally long time in the stomach or intestines. The protean manifestations of such disturbance are usually called dyspepsia or indigestion, either gastric or intestinal in origin, but, were such cases more closely observed, it would be seen that the cause of the dyspepsia could be covered by one or more of the following: Too frequent, too rapid, and too free eating; bad quality of food—too coarse, too rich, bad cooking; insufficient digestive juices; gastric stasis—dilatation from any cause; intestinal stasis, ptosis, constipation, dilatation of colon, inflammation of gastrointestinal tract.

Diseases of the nose and throat, and intestinal parasites are other causes responsible for increased production of toxins.

II. **Diminution of Factors of Safety.**—Under this heading are grouped diseases which primarily or secondarily cause alteration of function in the structures constituting the three lines of defense of the organism.

Symptoms of Autointoxication.—As is the case with any school that is eagerly and enthusiastically publishing researches and claims in favor of a new symptom-complex, the French school has seen fit, satisfactorily to itself, to group under the diagnosis autointoxication, every conceivable manifestation of alteration in nervous, respiratory, digestive, muscular, urinary, cardiac and vascular function. To give in detail the various symptoms for which autointoxication has been held responsible, would be to reproduce any book on symptomatology. There is no need to lean to the extreme views of the French; but in obscure cases of any disease of any part of the body—eye, nervous system, cardiac, etc.—for which treatment based on symptoms alone, is not beneficial, it is believed that careful study of the excretions will, in many cases, clear up some indefinite diagnosis.

Diagnosis of Autointoxication.—The diagnosis of autointoxication is based essentially on the result of the urine examination. The first definite investigation was undertaken by Bouchard who attempted to show that the toxicity of the urine increased in cases of autointoxication, that is, that it took smaller quantities of urine to kill an animal, than when the urine was obtained from a healthy person. His work will always remain a classic, but it led to nothing except to stimulate research in the direction of urinary chemistry as applied to autointoxication.

Without attempting to trace the historical development of the subject, it may be said that in view of our present knowledge, the most important qualitative changes in the urine, occurring in autointoxication, are the presence of indican, urobilin, and phenol. Besides these, albumin and casts, in the presence of indican, without any further evidence of nephritis, are seen quite frequently, and disappear coincidently with the disappearance of the indican. Acetone has also been found, but seems to indicate faulty fat metabolism or ordinary inanition rather than gastrointestinal autointoxication.

Of the quantitative changes, increase in the amount of volatile fatty acids is a quite constant finding. A most important factor is that described by Baumann and called the "Coefficient of Baumann." Normally the ethereal sulphates (B) are to the total sulphates (A) as one to ten, that is, if there are 1.50 grams of total sulphates, the ethereal sulphates should be 0.150 grams. In autointoxication, this factor is disturbed so that instead of being A : B : : 1.50 : 0.150, the following may be seen: A : B : : 1.50 : 1.00.

Another factor is the "Coefficient of Amann," which supposes in health that the ethereal sulphates should be to the total nitrogen as 1 is to 1.4. This also is sometimes altered.

The chemical examination of the feces has not made important strides.

Bacteriological examination is out of the question, and the suggestion that the dried bacteria normally should bear a certain ratio to the dried feces, and that any variation speaks for autointoxication, has not always been borne out.

The degree of fermentation has been studied by Schmidt and Strassburger by means of a very simple apparatus, which measures the amount of fermentation by the amount of water displaced. It gives no more information than does mere physical examination of a very malodorous, frothy stool.

The best way of arriving at an opinion regarding the state of the digestion is to examine microscopically the stool of the patient on an ordinary diet. Should anything be found abnormal with the protein, carbohydrate or fat metabolism, as shown by undigested meat, starch, or much neutral fat or fatty acid crystals (in place of the normally present soap), then a test diet such as devised by Schmidt should be ordered:

Morning.—Pint of milk, tea or cocoa. One roll with butter, one soft-boiled egg, a plate of oatmeal cooked with milk.

Afternoon.—A quarter pound of Hamburg steak (rare inside), fairly large portion of mashed potatoes, roll and butter, and a pint of milk, tea or cocoa.

Evening.—A pint of milk, roll and butter, and two scrambled eggs. At the time of taking this a 5-grain carmine capsule should be given, with directions that that stool be saved which immediately follows the red colored stool. The test diet should of course be continued until the examination of the stool has been completed.

By means of this test meal or diet, a fairly accurate idea of the state of digestion can be attained.

The presence of undigested starch granules is important. These are easily recognized by dropping on the feces on a slide, a drop of Lugol's solution. On microscopic examination, the poorly digested starch will be found blue. An acid stool is usually associated with faulty carbohydrate digestion.

Treatment.—Remembering that autointoxication is due in part to nitrogenous putrefaction in the intestines, and in part to decrease in the activities of the three lines of defense of the organism, the therapeutic indications are:

I. 1. To diminish nitrogenous putrefaction in the intestine in order to bring it to the normal grade, if the defenses of the organism are functionating properly.

2. To decrease the nitrogenous putrefaction *below* normal if the defenses are insufficient.

II. To stimulate the factors of safety, when they are performing their functions imperfectly.

1. Since putrefactive changes are due to decomposition of protein by bacteria, the main object to achieve is to modify the bacterial culture. This may be approached from any or all of five sides.

A. By proper dieting.

B. By introducing organisms which are antagonistic to the intestinal flora.

C. By using yeasts of various kinds.

D. By the use of intestinal disinfectants.

E. By mechanically removing the bacteria and their products (lavage).

A. Of the nitrogenous foods which increase intestinal putrefaction, meats and the leguminous vegetables (lentils, peas, string beans, lima beans) are to be put in the first rank, and to a much less degree, the whites of eggs. Fatty food increases to a great extent nitrogenous putrefaction, and even cream and butter have the same effect except that it is much less pronounced.

Of the foods which of themselves do not favor intestinal decomposition, may be mentioned milk, skimmed milk, centrifugalized milk, sour milk, butter milk, whey (from pressed cheese), curdled milk (natural or artificial), fresh cheese (cream cheese), koumys, kefir. Carbohydrate foods also tend to diminish intestinal putrefaction, and in this group are sugar, glycerin, and farinaceous foods.

To make up a diet suitable for a case of autointoxication, the following general rules may be formulated:

1. Diminish as far as possible nitrogenous food.
2. Exclude absolutely the nitrogenous foods which are most conducive to putrefaction.
3. Eggs are the best of the nitrogenous foods to use, although the whites should not be eaten.
4. Avoid fatty foods except fresh butter.
5. Use as much farinaceous food as possible.
6. Use skimmed milk, butter milk, curdled milk, and fresh cheese, starting with small amounts.
7. A diet of cereals and milk is the diet par excellence.
8. Eat slowly and masticate thoroughly.
9. Do not drink with meals, or eat when drinking.
10. Eat small amounts of food at a time, and alternate meals of liquid and meals of solid food.
11. Rest flat on the back for an hour after each solid meal, but do not sleep.

B. **Introduction of Organisms Antagonistic to Those Causing Intestinal Putrefaction.**—1. In autointoxication the intestinal flora changes its characteristics so that in this condition there is a diminution of the carbohydrate-splitting organisms and a great increase in proteolytic bacteria. The latter have a natural enemy in those organisms which ferment sugar and produce lactic acid, and it has been found that by their introduction the actively proteolytic bacteria are held in abeyance.

Yoghourt or milk curdled with the Bulgarian lactic acid bacillus is one of the most valuable means of introducing lactic acid bacilli in autointoxication, but it should not be prescribed in enteritis. The amount taken is usually 300 grams (10 ounces) taken twice a day, either fasting or with breakfast, and again in the afternoon or at bedtime.

Metchnikoff has modified the yoghourt and suggests instead pure cultures of lactic acid bacilli. Of the latter, one is especially recommended, and is called the Bulgarian bacillius, or the bacillus of Massol (isolated from yoghourt by Prof. Massol of Geneva). This does not exist normally in the intestine, but once introduced is able to combat most effectually the nitrogen putrefaction. To overcome the disagreeable odor of suet or tallow imparted by it to the milk, Metchnikoff combines with it the Bacillus acidi lactis aerogenes. The combination of these two organisms is called Lactobacillin (Metchnikoff), and may be given as such or in milk. There are now on the market innumerable preparations of the lactic acid organism in the form of tablets to be taken in that form, or as fermented milk, or as powders or tablets from which milk may be made.

Other preparations, less widely known, are:

a. Biolactyl of Fournier, which combined the

bacillus of Massol with the lactic acid streptococcus.

b. Paralactic Bouillon of Tissier. This is a mixture of the Bacillus paralactici, and the Bacillus acidi bifidus Tissier.

C. **Yeast** has for a long time been used in autointoxication, and as a treatment of furunculosis, brewer's yeast (Saccharomyces cerevisiæ) has achieved some reputation. Used in the former condition yeast attenuates the autotoxins, favors phagocytosis and intestinal fermentation, and is of great value in autointoxication. The only contraindication to the use of yeast is in gouty states, since it contains large quantities of xanthin bases. It may be used either fresh or in the dried state. In the latter form it comes in 20-centigram doses of which from 2 to 8 are to be taken in the twenty-four hours. Fresh brewer's yeast is usually given by mouth, a half teaspoonful three times a day to children, and to adults a teaspoonful three times a day before meals.

The yeast of grapes (Saccharomyces ellipsoidæus) has been recommended by Jacquemin, and it has been found to have an antibacterial action, although ephemeral. It is prescribed in doses of 4 to 6 teaspoonfuls a day before meals.

D. **Use of Intestinal Disinfectants.**—Diet of milk and cereals alone is of prime importance in decreasing the action of proteolytic bacteria, but it is incomplete and after a time there is a reaccumulation culminating in a discharge of symptoms from the side of the gastrointestinal tract of nervous system. Recourse, in addition to diet, must be had to drugs which, while improperly called disinfectants, do, nevertheless, have some effect in diminishing the number and virulence of the bacteria, temporarily at least.

Attention has been called in a preceding paragraph to the influence of disordered gastric states on the production of autointoxications, so that antiseptic drugs should be considered from two sides:

1. Gastric antiseptics.
2. Intestinal antiseptics.

1. Of these the most valuable are hydrochloric acid (40 to 60 drops a day), menthol (0.15 to 0.20 t. i. d.) and ichthyol (0.10 to 0.20 in pills t. i. d.).

2. **Intestinal Antiseptics.**—Of the intestinal antiseptics, calomel is by far the best, and below this rank creosote, salicylic acid preparations (sodium salicylate, salol, betol, eucalyptol), the last three in doses of 0.15 to 0.25 every two hours. Bismuth salicylate is also an excellent antiseptic, as is also betanaphthol. The following prescriptions will be found of service:

℞.	Bismuth salicylate,	ʒ ij
	Salol,	gr. lxxij
	Betanaphthol,	ʒ j.

Make 24 capsules and take one four times a day after meals. Two grains of menthol or one grain of thymol in capsules t. i. d., the latter to be taken with a glass of milk, are also recommended.

Free use of castor oil and of saline purges should be made.

E. **Use of Mechanical Means of Removing Bacteria.**—Lavage of the intestine with physiological salt solution (7 grams of sodium chlorid to a liter of sterile water), heated to body temperature should be employed. Contraindications are: Severe grade of enteroptosis when the water enters but there is no return; intestinal irritation. Irrigation of the intestine with drugs has been practised. Of these the best is ichthyol 10.15 grams of a 1 percent solution in 1 liter of water.

II. The emunctories must be stimulated by proper measures, bathing, exercises, diaphoretics, etc.

AUTOPSY.—See Postmortem Examination.

AUTOSUGGESTION.—A term suggested by Page for that peculiar mental condition often developing after railway accidents; it is intimately associated with the hypnotic state. In both of these conditions the mental spontaneity, the will, or the judgment is more or less suppressed or obscured, and suggestions become easy. Thus, the slightest traumatism to any member may cause a paralysis, a contracture, or an arthralgia. It is also called *traumatic suggestion*. See Railway Injuries.

AUTOTRANSFUSION.—The transfer of the blood of the body to the brain and other central organs by depressing the head, by elevating the hips and legs, and by the use of elastic bandages on the limbs. The object of the transfusion is to raise blood-pressure in the vital centers and to maintain the vital functions in shock or after severe hemorrhage. Bottles of hot water should be applied to the feet and the calves of the legs, and the temperature of the elevated portions must be maintained. See Transfusion.

AVOIRDUPOIS WEIGHT.—The common English weight used for all commodities except precious metals, gems, and medicines. The pound is equal to 7000 grains troy, or 453.54 grams, or 16 ounces. The ounce is divided into 16 drams, each of 437.5 grains. See Weights and Measures.

AVULSION.—A traumatic or surgical tearing or wrenching away of a part, as a polypus or limb, etc.

When a limb is entirely torn away from the rest of the body, various tissues of the parts give way at different levels. Skin usually separates at the highest point; muscles protrude, and appear to be tightly embraced and almost strangulated by the skin; tendons, vessels, and nerves hang out of the wound, and are of varying lengths; and the bone, shattered, forms the apex of the ragged conic stump. Hemorrhage is comparatively small in such conditions, but occasionally, as in avulsion of an entire upper limb, including the scapula or clavicle, it is directly or indirectly fatal.

Treatment.—Avulsed tissues in flaps should be cleansed, trimmed, replaced and supported, warmth being furnished. Great caution is necessary in the use of sutures in avulsed or lacerated wounds. The general principles of treatment of lacerated and contused wounds obtain. See Wounds.

AXILLA (Armpit).—The pyramidal space situated between the upper and lateral part of the chest and the inner side of the arm, the apex being directed upward toward the root of the neck, the base directed downward and formed by the in-

tegument and fascia, the anterior boundary formed by the pectoral muscles, costocoracoid membrane and clavicle, and the posterior boundary, lower than the anterior, formed by the subscapularis, teres major, and latissimus dorsi muscles. It is best demonstrated on the living body by the abduction of the arm to a right angle with the chest. Its numerous and important blood-vessels, cellular tissue, glands, and nerves make it especially important in surgery. The skin, at its base, contains thin, long, fine hairs, and is abundantly supplied with sebaceous and sweat glands, which, from their situation and structure, are the frequent seats of boils and superficial abscesses and of inflammatory eruptions, and a lurking-place for parasites.

Wounds.—Serious direct and penetrating wounds of the axilla are rarely encountered. If hemorrhage is spontaneously arrested, it is best not to interfere, but to watch carefully and keep the sufferer quiet and at rest. Pressure, if used, must be gentle and carefully maintained. Free bleeding from a wound of the axilla requires prompt securing of the bleeding point, either directly through the wound or by operation. The difficulty of finding a wounded artery is great. Ligation of the subclavian artery in the third part of its course may be necessary, and even ultimate amputation at the shoulder-joint may give the only chance for life from wounds of the artery. Wounds of the axillary vein are dangerous, not only because of the hemorrhage, but also from the entrance of air into the vein. This vessel is generally wounded or torn during removal of tumors from the axilla. A ligature should be applied immediately upon the detection of profuse venous bleeding. Phlebitis and pyemia may result if antisepsis is not obtained, which may not be practicable in an emergency.

Wounds of the large axillary vessels often result from attempts to reduce dislocations of the head of the humerus. The heel of a boot placed in the axilla to give counterextension in attempts at reduction of dislocations has caused fatal injury to the vessels in the axilla; and paralyses have resulted from injury to the brachial plexus. The vascular injury may be due to direct action of the head of the humerus, to unnecessary violence in reduction, or to puncture by the sharp end of a fragment of bone in fracture. In some cases so rapidly does the blood pour out into the soft parts of the axilla and of the chest and back, that death ensues in an hour. In other instances an aneurysm develops within a few hours or days, and in others, swelling from effused blood may take place very gradually and after a considerable time.

The prognosis in injuries of this space is most unfavorable, especially in those in advanced age, and when the injury has been of long standing. Acute cellulitis of the axilla occurs, with cellulitis of adjacent parts, and is usually rapid in its progress and needs prompt treatment to prevent septicemia. Superficial abscesses may be due to local irritation, lymphangitis, or intense cachexia, and require early opening to prevent penetration of pus into the deeper portions of the axilla and the formation of a sinus.

Glandular swellings in the axilla are those of acute and chronic adenitis, of strumous and syphilitic enlargements, of secondary cancerous infiltrations, and of lymphadenoma. Acute inflammatory swellings usually give evidence of some lesion of the lymphatics of the hand or of the thoracic and abdominal walls, and do not necessarily go on to suppuration. Chronic adenitis is usually attended by marked cachectic conditions. The dissection and removal of enlarged strumous and other glands is tedious and difficult. The knife should be discarded as soon as possible, and the blunt dissection continued, tearing being done in no rash manner, nor with too great force. The great danger is wound of the axillary vein or of some large tributary. In carcinoma of the breast careful dissection of the axillary cavity and removal of all enlarged and apparently healthy glands should be done.

Tumors of the cavity are chiefly of glandular origin—some of new growths, and some of nerve tissue. In large or rapidly developing tumors the symptoms are usually those due to compression of the blood-vessels and of the cords of the brachial plexus.

AXILLARY ANEURYSM.—This form of aneurysm is not uncommon as the result of sprains or of attemps to reduce long-standing dislocations of the shoulder.

The diagnosis, as a rule, presents no difficulty, unless the aneurysm has become diffused, when it may be mistaken for abscess.

Treatment.—(1) When the aneurysm is spontaneous, small, and well circumscribed, pressure or ligation of the third part of the subclavian should be practised. (2) When more or less diffused, as when the result of an injury to the artery in the reduction of a dislocation, the aneurysm should be cut down upon, the clots turned out, and the vessel secured above and below. If this operation is decided on, an incision should be made over the subclavian artery through the skin and fascia, so that pressure may be made on it more directly, and the circulation through the aneurysm during the subsequent operation better controlled. A small incision is then made over the aneurysm, two fingers are introduced into it, and placed on the bleeding spot in the artery, which may be known by the hot arterial blood issuing from it. An assistant in the meantime enlarges the wound, turns out the clots, and helps the surgeon to tie the artery above and below the rupture before the fingers are removed. This method is less dangerous than that practised by Syme, who made a free incision over the aneurysm, rapidly turned out the clots, and seized with forceps the bleeding point in the artery. (3) When the aneurysm is of great size and involves the subclavian, Macewen's method may be employed or the first part of the subclavian or the innominate may be ligated, or iron wire introduced, galvanopuncture or manipulation tried, or amputation at the shoulder-joint performed. All these methods, with the exception of Macewen's, are desperate expedients. See ANEURYSM.

B

BABINSKI REFLEX.—See Reflexes.

BABY.—See Fetus, Infant.

BACK, INJURIES. Sprains and Wrenches.—These are very common, especially in the flexible parts—the cervical and lumbar regions; sometimes they are chiefly muscular, as in cases of overwork, lifting heavy weights, or in sudden awkward twists; at times, when due to external violence, they involve the fibrous textures—the ligaments, fascia, and synovial membranes—as well, the muscles either being caught unawares by the unexpected jerk or being overpowered. The worst occur in railway collisions, when every muscle or ligament that has an attachment to the spine may be strained or hurt. For various reasons the spinal cord itself escapes more frequently than might be expected; it lies in the central axis, so that in all movements it occupies neutral ground; it is separated by some distance from the walls; around it there is a waterbed, probably always filled with fluid; and in the lumbar region, where the range of movement is as great, perhaps greater, than elsewhere, its place is taken by the cauda equina.

The extent of injury in these cases is extremely variable. No structure is always exempt, but probably the muscles and fibrous tissue are the greatest sufferers. In some cases the spinal nerves are hurt—stretched, possibly, as they pass out through the foramina, or compressed by extravasation—so that the effects are referred to distant parts of the body. Even the bones and joints do not escape, for, though it is rarely possible to prove the existence of definite injury at the time, it is certain that inflammation may break out in them afterward.

The complications that follow these injuries depend largely upon the state of the patient's health. Stiff neck, lumbago, and chronic rheumatism occur in some, particularly after middle life; synovitis and osteoarthritis, leaving the spine rigid, ankylosed, and perhaps distorted, occur in others; caries is exceedingly common, especially in children and young adults; and, what is still more serious, if the ligaments have been torn and hemorrhage has taken place in the vertebral canal, inflammation of the membranes or of the cord itself may follow. In most cases this is very insidious; softening sets in slowly, and steadily grows worse; in a few rare instances it is acute, suppuration commencing externally in the broken-down blood-clot or in the joints, and spreading through a rent in the membranes or along the lymphatics, until the sheath of the dura mater is involved.

Sprains of the back have acquired a peculiar significance from their frequency in railway collisions, and attempts have been made to distinguish them, when they occur under these conditions, from others. Except, however, for their severity, and for the fact that they are always associated with a very grave degree of shock that is certainly not without influence upon the subsequent progress of the case, there is no reason for such a step. See Railway Injuries.

Symptoms.—The chief are pain and stiffness; these are never absent. The former may be immediate and severe, as when the head is twisted round to look in some awkward direction, and a muscle or tendon is caught or displaced; or it may be dull and aching, not coming on for hours. Very often it is especially severe at night, when the patient is warm in bed; and usually the skin over the painful part is exceedingly tender, as it always is over muscles that have been overstrained or overworked. If the nerves are injured in the foramina, the pain runs round the trunk like a girdle, or extends into the limbs; sometimes it is attended by formication. Very often patients imagine they are paralyzed, mistaking the difficulty of movement arising from the pain for actual loss of power; this may be very misleading. It is not uncommon to find after a strain of the loins that defecation and micturition are difficult, not because the spinal cord has been injured (though it must never be forgotten that this may be the case), but because these actions depend so largely upon the integrity of the muscles that support the back. The same occurs in lumbago, when it is due to cold, without any suspicion of injury; but it cannot be denied that, especially after railway accidents, it is a very disquieting symptom.

Swelling is not common in accidents of this kind, unless there is a considerable extravasation; it may follow the outline of the muscles, as in the neck, or simply form a smooth, rounded elevation. The skin, as already mentioned, is often very tender, but, as a rule, firm pressure gives relief. Redness is seldom seen, and it rarely happens that the temperature is raised.

Hematuria is not an uncommon occurrence after sprains of the lumbar region; the urine is bright red for a day or two, and sometimes there is sufficient blood to form a clot in the ureter; then it gradually becomes smoky, until, as a rule, the whole has disappeared in about a week. It is seldom serious, but may be fatal, from rupture of one of the larger arteries.

Treatment.—Rest is the first consideration, to limit the amount of extravasation and hyperemia that follows, and then gentle passive movement, to assist in absorption and to restore the function and nutrition of the part. If there is one spot especially tender, or one particular movement that causes pain, immediate relief may sometimes be obtained by suddenly throwing the muscles concerned into vigorous action. Subcutaneous injections of morphin must generally be used, as the pain is often so severe that the patient has not the power to make this effort. In twists and strains of the neck

and loins this plan may be tried at once. When the aching, stiffness, and pain on movement are more general, and it is clear that the symptoms are due to chronic changes in the joints and muscles, and that the spinal cord is not involved, counter-irritants may be employed. Hot baths, shampooing, friction with stimulating liniments, ironing, blisters, acupuncture, and galvanism with slow interruptions of the current, are of the greatest value, but constitutional treatment must not be neglected, especially if there is any evidence of gout or rheumatism. Muscles and joints are intended for work; it they are injured, they require rest, it is true; but as soon as the damage is repaired, they become stiff and waste unless they are used; the longer they remain at rest, the stiffer they become.

In cases of more severe injury, when there is either shock or excitement, the patient should be placed in bed, and kept warm and as quiet as possible until they have entirely passed away. The urine may have to be drawn off, especially after railway accidents or other severe injuries; the bowels are almost sure to be constipated, and should be opened by a calomel purge; stimulants, unless the pulse is very feeble or actually failing, do more harm than good. Then, as soon as the acute symptoms have subsided, when the patient begins voluntarily to change his position in bed, gentle passive motion, bending the spine backward and forward, and massage may be commenced, to prevent the muscles becoming rigid. If the depression continues, or if, some weeks after the accident, the patient does not begin to rally, the prognosis becomes very grave. There is evidence than that the nervous system has been seriously affected; and in patients of a neurotic temperament, or when there is any hereditary taint, it is impossible to predict what may happen. Perfect rest for mind as well as body is essential; everything that worries or annoys must be carefully kept away, and the attention must be diverted as much as possible by change of scene or occupation. Good food, fresh air, and a moderate amount of such exercise as the patient can be induced to take are the best remedies; stimulants should be avoided. The only drugs of any service are those that improve the appetite and help to keep up nutrition; potassium bromid and sedatives or narcotics usually do harm. See SPINE (Injuries, Curvature), SPRAINS, etc.

BACTERIAL VACCINES.—See SERUM THERAPY AND VACCINE THERAPY.

BACTERINS.—See SERUM THERAPY AND VACCINE THERAPY.

BACTERIOLYSINS.—See SERUM THERAPY AND VACCINE THERAPY.

BACTERIOTROPINS.—See SERUM THERAPY AND VACCINE THERAPY.

BACTERIOLOGY, EPITOME.

CLASSIFICATION.

According to morphology	1. Microbacteria—short rods.	Bacilli.
	2. Desmobacteria—long rods.	Bacilli.
	3. Spherobacteria—globules—cocci.	
	4. Spirobacteria—spirals—spirilla.	
According to biology	1. Saprophytic.	
	2. Parasitic.	
According to necessary medium.	1. Aerobic.	
	2. Anaerobic.	
According to virulence	1. Pathogenic.	
	2. Nonpathogenic.	
According to manner of division.	1. Diplococci.	
	2. Streptococci.	
	3. Staphylococci.	
	4. Leptothrix, etc.	
According to sporulation	1. Endospore.	
	2. Arthrospore.	
According to color	1. Chromogenic.	
	2. Nonchromogenic.	
Organisms that contain no chlorophyl (fungi).	1. Hyphomycetes.	
	2. Saccharomycetes.	
	3. Schizomycetes.	

Conditions Necessary for Growth of Bacteria.—1. **Oxygen.**—Most bacteria require this element for their existence, and those that cannot be deprived of it without destroying life are called *aerobic* bacteria. Those microorganisms that can grow without its presence are called *anaerobic*.

2. **Nutriment.**—Organic and inorganic substances are required for the growth of bacteria. Of the organic materials, the albumins furnish the most essential principles.

MICRO-COCCI. BACILLI. SPIRILLA.

3. **Moisture.**—A certain degree of moisture is essential. All bacteria are destroyed by prolonged heat, or even by prolonged sunlight.

4. **Reaction of Medium.**—Most bacteria require a slightly alkaline medium.

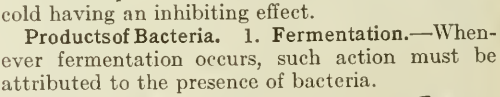
5. **Light.**—Unlike the higher forms of organisms, bacteria do not depend upon this condition for life. Many grow in abundant light, while most of them grow luxuriantly in an incubator from which light is excluded.

6. **Electricity.**—A certain amount of electricity is doubtless required for the existence of bacteria. A high current may destroy them.

7. **Movement.**—Rest is required for the best development of most microorganisms, prolonged agitation inhibiting their growth.

8. **Temperature.**—Most bacteria grow best at the normal temperature of the body, excessive heat or cold having an inhibiting effect.

Products of Bacteria. 1. **Fermentation.**—Whenever fermentation occurs, such action must be attributed to the presence of bacteria.



STAPHYLOCOCCI. STREPTOCOCCI. DIPLOCOCCI. TETRADS. SARCINÆ.

2. **Putrefaction** is a condition similar to fermentation, but occurring in highly nitrogenous or albuminous material, while fermentation occurs in carbohydrates. During the process of putrefaction certain animal alkaloids are produced called *ptomains*, many of which are violent poisons, while others are wholly inert substances. Allied to the ptomains are other products of microorganismal life entitled *tòxins* and *toxalbumins*. These bodies are highly complex molecules, and their exact formulæ or chemic composition are unknown. Certain toxins, upon introduction into the system,

are capable of producing very pronounced symptoms or death itself.

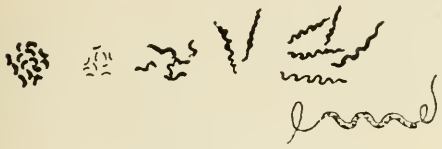
3. **Chromogenesis.**—Distinct color is produced in the medium upon which certain bacteria are growing, and these are denominated "chromogenic," in

Bacilli of Various Forms.

contradistinction to others that are "nonchromogenic."

4. **Liquefaction of Gelatin.**—Most bacteria during their artificial cultivation bring about liquefaction of this culture medium.

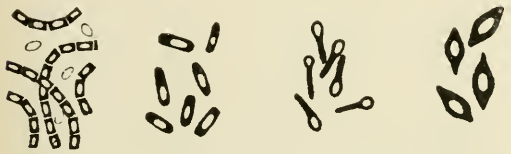
5. **Production of Gases.**—Certain gases, such as



Spirilla of Various Forms.

H_2S, NH_3, CH_4 and CO_2, are given off during the growth of many microorganisms.

6. **Production of Acids and Alkalies.**—Most microorganisms have a tendency to bring about a change in the normal reaction of the medium upon which they grow—most commonly an acid condition.



Bacteria with Spores.

7. **Production of Odors.**—Frequently, odors are eliminated during the growth of bacteria, most commonly from H_2S and NH_3.

8. **Phosphorescence.**

9. **Production of Nitrites.**

10 **Peptonization of Milk.**

Bacteria Showing Flagella.

11. **Production of Disease.**—That property of the life of bacteria which most concerns mankind is in the production of diseases, many of which are due to certain definite forms, entitled "pathogenic" bacteria, in contradistinction to others that have not this tendency, and called "nonpathogenic."

To Prove that a Given Microorganism is the Cause of a Disease. *Koch's Postulates.*—(1) The microorganism must be found in the tissues, blood, or secretions of a person or animal sick or dead of the disease; (2) the microorganism must be isolated and cultivated from these same sources; it must also be grown for several generations in artificial culture media; (3) the pure cultures, when thus obtained, must, on inoculation into a healthy and susceptible animal, produce the diseases in question, and (4) the same microorganisms must again be found in the tissues, blood or secretions of the inoculated animal.

Characteristics of Bacteria.—During the life of bacteria every form preserves certain characteristics as to shape, size, motility, manner of reproduction, and staining properties. In this way we are able to separate them into classes and to group them.

By this inherent action each form preserves its distinct identity and never changes its type. Under certain conditions, such as a change in the proportion of various ingredients in the culture medium, one type of organism may change its form to a certain extent, but never its type. Thus, the common colon bacillis may be altered in motility to an extent depending upon its age and upon the reaction of the culture medium, but never merges or becomes a coccus or spirillum; it remains a bacillus. Bacteria are named as follows: A "coccus" may be described as a single round cell. When two are grouped together, it is spoken of as "diplococcus." If in the shape of a bunch of grapes, the term "staphylococcus" is given, or if in chains, "streptococcus." Cocci that are of minute form, and can only be observed by means of a microscope, are spoken of as "micrococci.

For assistance in diagnosis the accompanying illustrations of the prominent bacilli are given.

Cultivation of Bacteria.—For the proper study and isolation of the different forms of bacteria we resort to the **culture method,** first proposed and used by Robert Koch. At the present day the original formula has undergone many changes, but the principle remains the same as formerly. According to this formula, 500 grams of finely chopped lean beef, free from fat and tendons, is to be soaked in 1000 c.c. of water for 24 hours. During this time it should remain in the ice-chest or be placed on ice. It is then strained through a coarse towel and pressed until 1000 c.c. of fluid has been obtained. To this add 10 grams (1.0 percent) of dried peptone and 5 grams (0.5 percent) of common salt (NaCl). Render neutral or slightly alkaline with a few drops of a saturated solution of soda. Keep the flask in which the fluid is contained in a steam sterilizer or water-bath, and at a boiling temperature until all the

albumin is coagulated and the fluid portion is of a clear, pale straw color. It is then to be filtered through a paper filter and sterilized in the straw sterilizer by the fractional method.

Nutrient Gelatin.—To 1000 c.c. of the meat infusion, prepared as previously directed, 10 grams of peptone, 5 grams of sodium chlorid (NaCl), and 100 grams of gelatin ("Gold Label" brand) are added, and the mixture boiled for an hour over a moderately hot flame, stirring occasionally. The liquid is then cooled and neutralized with sodium carbonate solution, using phenolphthalein as an indicator.

Agar-agar.—To 1000 c.c. of bouillon as prepared by the method of Koch add 10 grams of agar-agar and boil for an hour or two. Cool and neutralize, using phenolphthalein as an indicator.

Glycerin, agar-agar, blood-serum, potatoes, milk, and peptone solution are all used as culture media for bacteria. Culture media are used to isolate the bacteria for the purpose of studying the characteristics of each type of microorganism in a **pure culture.** This is made possible by proceeding according to any of several methods, such as **plate culture** (in Petri dishes, preferably) or **Esmarch tube.**

Bacteria with Capsules

The microorganism may then be thoroughly studied in the fresh specimen, either by means of the **hanging drop** or by different methods of **staining.**

Hanging-drop Method of Examination.—A hollow-ground slide is used, and by means of a camel's-hair brush apply a ring of vaselin about the outer edge of the concave surface. A drop of material is placed in the center of the depression upon the slide and examined.

Methods of Staining and Special Characteristics.—The reader is referred to the article upon Pathologic Technic, and under the special headings for descriptions of the most important bacteria.

BAG OF WATERS.—The fetal membranes inclosing the amniotic fluid and projecting through the os uteri early in labor. See Amnion.

BALANITIS.—An inflammation of the mucous membrane of the glans penis. Simple uncleanliness may cause it, but it is generally one of the complications of the increasing stage of gonorrhea. There are redness and other signs of inflammation, which may end with exfoliation of the epithelium and leave the glans eroded or ulcerated. Sometimes crops of vesicles appear, which may be taken for chancres. Balanitis may be caused by syphilitic chancrous erosion; in such case the absence of urethral discharge, the defined ulcer, and the induration, especially the history of the time of incubation, may show the diagnosis. It is when phimosis exists that there is difficulty in making a correct diagnosis. The scalding urine, the presence of chordee, the unmixed purulent discharge, lead to the belief that gonorrhea is the cause of the balanitis. The history of a sore, a painful and indurated spot beneath the prepuce, the mixture of blood with the discharge, and the enlargement of the inguinal glands, with the absence of chordee and scalding, would indicate a preputial chancre.

The course of balanitis is from 3 to 4 days.

The treatment must be according to the cause. Cleanliness, by washing with warm water upon retraction of the prepuce, and dusting with a powder made of equal parts of boric acid and starch, and then replacing the prepuce, will suffice. Simple cleanliness and the use of the powder, or the insertion of dry lint between the glans and prepuce, changed often, may effect a cure. Borated talc, or boric acid and subnitrate of bismuth in proportion of 1:6, are useful. Excoriations may be touched with a solution of silver nitrate of the strength of 10 grains to the ounce. See Gonorrhea, Syphilis.

BALANOPOSTHITIS.—Inflammation of the glans penis and prepuce. The treatment is the same as that of simple balanitis.

BALDNESS.—See Alopecia.

BALLOTTEMENT.—A method of diagnosing pregnancy from the fourth to the eighth month. A push is given the uterus by the finger inserted into the vagina, and if the fetus is present, it will rise and fall again like a heavy body in water. See Pregnancy (Diagnosis).

BALSAM.—**B. of Peru,** obtained from *Toluifera Pereiræ.* A thick brown liquid with an odor of benzoin and vanilla, soluble in 5 of alcohol, almost insoluble in water. It is not a true balsam, as it contains no volatile oil. Dose, 10 to 25 grains in emulsion. *Incompatibles* are ferric salts, iodoform, and hydrogen peroxid. It is antiseptic, stimulant to the circulation, and sedative to the nervous system; acting chiefly on the mucous membranes, it is tonic and expectorant, diuretic and diaphoretic. In large doses, it causes gastralgia, nausea and vomiting, colic and diarrhea. It is used locally in chronic skin diseases of inflammatory type and sore nipples, to relieve itching, cleanse bed-sores, promote the healing of wounds and ulcers, and to kill the acarus scabiei, being considered by some authorities the best of all applications in itch. Internally, it is used as a stimulant and disinfectant expectorant in chronic bronchitis and asthma, as well as in gonorrhea, gleet, leukorrhea, and other discharges from mucous membranes. **B., Canada,** a turpentine gathered from the natural blisters of the bark of *Abies balsamum.* It is much used as a mounting medium by microscopists. **B. Dipterocarpi, Gurjun balsam,** wood oil, an oleoresin similar in properties to copaiba, but it is less disagreeable and less apt to upset the stomach, also less actively diuretic. It has been used with good success in leprosy, given internally in full doses and used locally at the same time. Mixed with 4 parts of lime-water it is useful in chronic eczema, lupus and psoriasis. **B. of Fir.** Same as B., Canada. **B., Friar's.** See Benzoin. **B. of Gilead,** an oleoresin obtained from the *Balsamodendron gileadense.* **B. of Tolu,** obtained from *Toluifera balsamum.* Its properties are due to a volatile oil, *toluene.* It possesses an agreeable odor, and is a

basis for many cough-mixtures. It is a fair expectorant. *Tincture of tolu* contains 20 percent of the balsam, in 80 percent of alcohol. Dose, 20 to 40 minims. *Syrup of tolu*, tincture of tolu, 5 percent. Dose, 1 to 6 drams.

BANDAGES.—Bandages are usually strips of muslin or other material, of varying widths and lengths, used in surgery for the purpose of protecting, compressing, etc., a part, or for the retention of dressings and applications. A **simple bandage** or **roller** consists of one piece; a **compound,** of two or more pieces. *Starch, plaster-of-Paris, silica, dextrin, tripolith,* etc., are used or recommended for making stiff and **immovable dressings or bandages.** According to their direction, bandages are classed as: (1) **Circular,** circular turns about the part; (2) **figure-of-eight,** the turns crossing each other like that figure; (3) **oblique,** covering the part by oblique turns; (4) **recurrent,** the turns returning successively to the point of origin; (5) **spica,** the turns resembling the arrangement of the husks of an ear of corn; (6) **spiral,** each turn covering one-half of the preceding; (7) **spiral reverse,** the bandage is reversed in order to better adapt it to the part. Bandages are also classed according to the part to which they are applied.

Bandages are made of unglazed muslin, flannel, linen, calico, cloth, or india-rubber, in lengths of from 2 to 10 yards, and in widths to suit the purposes for which they are needed; ordinarily, unbleached muslin is preferred.

A bandage should have a width of 3/4 of an inch for the fingers or toes, from 2 to 2 1/2 inches for the upper limbs, 3 inches for the lower limbs, and 6 inches for the body.

When applying a bandage, the dresser should grasp the roller in one hand, holding the loose end in the other; apply it to the limb so that the *outer surface* may be against the skin, and so that the bandage will lie close to the limb.

The spiral bandage is most frequently employed in the treatment of affections of the extremities or trunk. In applying the *spiral* each turn must cover at least one-third of the one below. Owing to the enlargement of the limbs at the outer part, it is impossible to apply the bandage without making "turns" in it; such a turn is called a "reverse," which is the folding of the bandage upon itself, so that it will fit snugly to the limb. To divide this properly, it is well to remember that a turn should never be made over a prominence of bone, and, if possible, it should be made on the outside of the limb; also, that when making the reverse, the bandage should be held quite loosely, so that with a single movement of the wrist the turn can be made, carrying the hand from supination to pronation. In making the turn the hand should be held slightly above the level of the limb, and great care must be taken not to unroll more bandage than is actually required.

Figure-of-eight bandages are made by passing the roller alternately upward and downward as it enwraps the limb. They are used when the enlargement is too great and too irregular for reverses to lie evenly, as over the ankle- and elbow-joints.

A cylindric portion of the body is covered by a circular bandage, each turn covering the previous one by overlapping it about one-third of its width. A conic part is covered by a spiral bandage. Each turn of a spiral bandage is tighter at its upper part and loose at its lower edge, to correct which the reverse spiral bandage is used. To make this spiral reverse bandage, with about 6 inches of slack, holding the roller in the right hand, place the thumb of the left hand across the fresh turn, turning and folding down the bandage with no traction until the turn is well around the limb. The figure-of-eight bandage is used to cover a projecting point, also the groin, breast, shoulder, or axilla, each turn covering about two-thirds of the previous one. The peripheral turns should be tighter than those nearer the body in bandaging an extremity. A tight bandage applied to a leg or an arm should include the foot or hand. A finger or toe should be left exposed in firm dressings to indicate the state of the circulation in the part.

Bandages should be firmly and evenly applied, and care should be taken to place the part in the position it is intended to occupy. Generally, a bandage should run from the inner to the outer side as it passes over the anterior surface of a limb.

To remove a bandage, the terminal portion of it should be taken up by one hand and passed behind to the other, taking in the slack as it is transferred from one hand to the other.

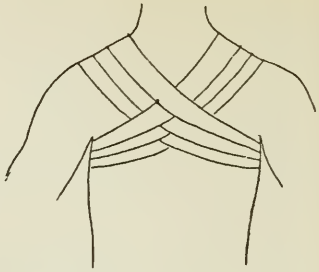
The **triangular** or **Esmarch bandage** is made by cutting diagonally across a piece of calico, or like material, about 40 inches square. The longest side is called the lower border. It is very useful on account of its wide applicability as a temporary bandage: *e. g.*, to make a sling, or shawl-cap, to retain dressings on the breast, etc.

Two important rules in bandaging are: (1) Bandages should not be permanently applied about joints until all swelling has subsided; (2) in bandaging a limb always avoid circular compression and rely on lateral compression over splints.

The bandages for the head are: (1) *Circular, of the forehead,* to retain dressings upon the head. (2) *Circular, of the eyes.* (3) *Crossed, of the eyes,* to hold dressings upon one or both eyes. (4) T, *of the eye,* a small piece of muslin cut in the shape of a right-angled triangle, and sufficiently large to cover the eye, is sewed by its base, with the perpendicular toward the ear, to a horizontal strip of a length to encircle the head. The apex of the triangle is sewed to a vertical strip long enough to pass under the jaw and meet the horizontal strip on the opposite side. (5) *Crossed, of the angle of the jaw,* to support the parts in fracture of the angle of the jaw. (6) *Knotted, of the head,* a double-headed roller with compress, to make compression in wound of the temporal artery. (7) *Recurrent, of the head,* a single-headed or double-headed roller, to retain dressings upon the head. (8) *Four-tailed, of the head,* a piece of cloth 8 inches wide and long enough to pass over the head and under the chin, is torn from each end to within 3 or 4 inches of the middle. The body of the bandage is placed on the top of the head, the posterior ends are tied under the chin, and the two anterior ends carried backward and tied at the nape of the neck. (9)

Crossed bandage of both eyes.

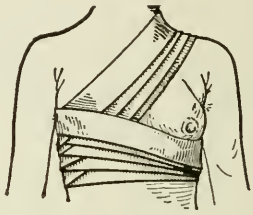
Barton's bandage.



Posterior figure-of-eight bandage of the chest.

T-bandage of the eye.

The six-tailed bandage of Galen.



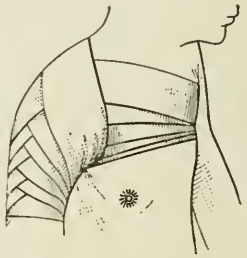
Suspensory and compressor bandage of the breast.

Recurrent bandage of the head.

Transverse recurrent of the head

Four-tailed bandage of the head.

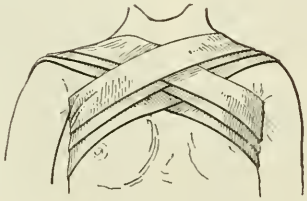
Agnew's bandage.



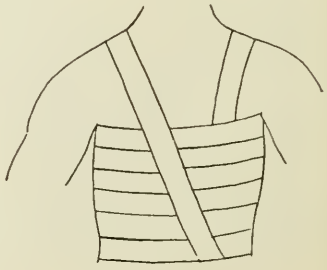
Spica bandage of shoulder.

Four-tailed bandage of the head.

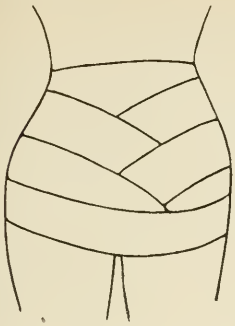
Gibson's bandage



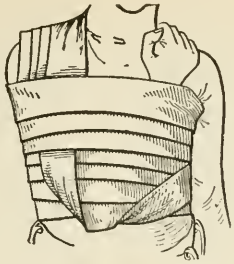
Anterior figure-of-eight bandage of the chest.



Spiral of the chest.

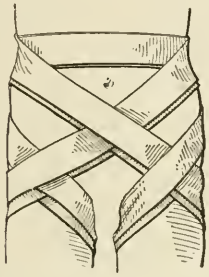


Eight-tailed bandage of the abdomen.

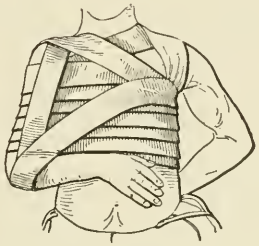


Velpeau's bandage.

Gauntlet bandage.

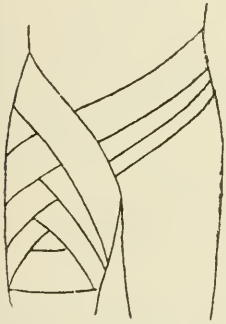


Double spica bandage of the groins.

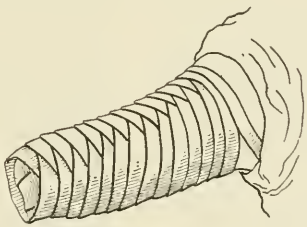


Desault's bandage.

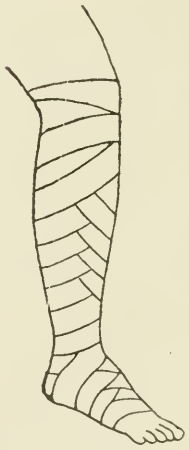
Demigauntlet bandage



Ascending spica of the groin.



Recurrent bandage of stump.



Modified figure-of-eight bandage of the lower extremity.

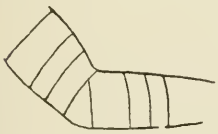
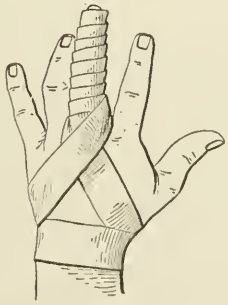


Figure-of-eight of the elbow.

Spiral reversed of the forearm (or leg).



Spiral bandage of the finger

Spica of the foot.

Gibson's, for the body of the lower jaw, to support the parts in fracture. (10) *Rhea Barton's,* for the same purpose. (11) *Capeline* or *mitra Hippocratis,* made by a *double-headed roller* (one which is rolled from each end, the two heads lying on the same side of the bandage and being of equal size). One roll being taken in each hand, the intervening strip is applied low down over the center of the forehead, and the bandage unrolled on each side until the two heads meet posteriorly below the occipital protuberance. From this point the two rollers are applied in different directions, one passing continuously around the head in a circle, the other forward and backward over the cranium until the latter is entirely covered. (12) *Galen's six-tailed bandage;* the bandage is so arranged that it has 3 strips at each end. The middle portion is placed on the crown of the head, the anterior ends are tied at the back of the neck, the middle under the chin, and the posterior at the forehead. (13) *Garretson's,* a bandage for the lower jaw, passing above the forehead and back again, to cross under the occiput, and finally ending in front of the chin. (14) *Pressure-bandage,* an eye-bandage applied with a considerable degree of firmness in order to afford pressure. (15) *Protective bandage,* a bandage for the eye, lightly applied. (16) *Hamilton's,* a form of compound bandage for the lower jaw, consisting mainly of a firm leather strap to support the jaw. (17) *Liebreich's,* a variety of bandage for the eye, made from a knitted cotton band. (18) *Thillaye's,* a compound bandage for joining the edges of the wounds in harelip operation.

The bandages of the trunk are: (1) *Circular, of the neck;* (2) *figure-of-eight, of the neck and axilla,* to retain dressings upon the shoulder or in the axilla; (3) *anterior figure-of-eight, of chest,* to draw the shoulder forward and to retain dressings on the anterior surface of the chest; (4) *posterior figure-of-eight, of chest,* to draw the shoulders back in fractured clavicle, or to retain dressings on the posterior surface of the chest; (5) *crossed, of one or both breasts,* to support the breasts in excessive lactation or in mammary disease; (6) *spica, of shoulder,* to retain the head of the humerus in place after dislocation; (7) *spiral, of the chest,* to make compression in fracture of the sternum or ribs; (8) *circular, of the abdomen,* to support the abdominal walls; (9) *spiral, of the abdomen,* to compress the abdominal walls or to retain dressings; (10) *spica, of one or both groins,* to compress groin or retain dressings; (11) *spiral reverse, of the penis,* to retain dressings upon this organ.

The bandages of the arm are: (1) *Circular, of the wrist.* (2) *Figure-of-eight, of wrist,* to compress the joint or retain dressings. (3) *Figure-of-eight, of elbow.* (4) *Circular, of arm or forearm.* (5) *Oblique, of arm or forearm.* (6) *Spiral, of arm,* to retain dressings. (7) *Spiral reverse, of upper extremity,* to support the arm in dislocations, fractures, etc. (8) *Velpeau's,* used to support the arm in fracture of the clavicle, the neck, or acromial process of the scapula. The hand of the injured side being placed on the sound shoulder, an oblique turn is made from the axilla of the sound side, across the back of the chest to the opposite shoulder, covering the fracture, down under the elbow in front to axilla of the sound side, then across the back over the outside of the point of the elbow to the axilla of the sound side, thus continuing the oblique and circular turns alternately, and advancing over the arm until it is held firmly. (8) *Desault's apparatus* consists of an axillary pad held by tapes around the neck, a sling for the hand, and two single-headed rollers. The forearm is placed at right angles with the humerus, held in place by many circular and oblique turns about the shoulder and body. (10) *Boyer's,* a form of apparatus consisting of a chest-belt, an arm-belt, and an axillary pad. It is used in treating fractured clavicles.

The bandages of the hand are: (1) *Spiral, of the finger;* (2) *spiral, of all the fingers,* or *gauntlet;* (3) *spiral, of palm,* or *demigauntlet;* (4) *spica, of thumb.* All the bandages of the hand are used in cases of fracture or to retain dressings.

The bandages of the lower extremity are: (1) *Figure-of-eight, of ankle,* to cover the part or retain dressings; (2) *figure-of-eight, of knee,* to cover the part or compress it; (3) *figure-of-eight, of thighs,* to compress the part after wounds or operations; (4) *spica, of instep,* to compress the parts; (5) *spiral reverse, of whole lower extremity,* to support the limb after fracture, etc.; (6) *Baynton's,* a series of straps of adhesive plaster used in the treatment of chronic leg ulcers; (7) *Ribbail's,* a spica bandage of the foot.

BANTING TREATMENT.—A treatment, named after its inventor, for the reduction of corpulence or obesity by the withdrawal of the starches and farinaceous articles of food and the use of a diet of nitrogenous food. See OBESITY.

BANTI'S DISEASE.—The terminal stage of splenic anemia (*q. v.*), associated with cirrhosis of the liver and ascites. The disease may be prolonged for ten or more years.

BARBADOS LEG.—See ELEPHANTIASIS.

BARBER'S ITCH.—See RINGWORM OF THE BEARD.

BARIUM.—Ba = 136.8; quantivalence II. A metal of the alkaline group, of pale yellow color, characterized by a strong affinity for oxygen. Neither the metal nor its salts are much employed in medicine, all are poisonous; none of the salts are official, but the chlorid, dioxid, and sulphid are occasionally used. **B. chlorid,** $BaCl_2.2H_2O$, soluble, used as a reagent, and also as a cardiac and vasomotor stimulant in the treatment of aneurysm, and for mitral insufficiency. Dose, 1/2 to 2 grains. **B. dioxid,** BaO_2, used for making aqua hydrogenii dioxidi. **B. sulphid,** BaS, is occasionally used as a depilatory.

Incompatible with barium salts are: Carbonates, chlorates, oxalic acid, oxalates, phosphoric acid, phosphates, sulphuric acid, sulphates, tannic acid, tartaric acid, tartrates.

BARLEY-WATER.—A decoction made by pouring a pint of cold water over a tablespoonful of washed pearl barley, boiling for two hours and adding boiling water as needed to maintain the original quantity. After adding a pinch of salt, the decoction is strained and kept on ice until

wanted. Barley-water makes a nutritious, demulcent drink in fevers and inflammatory conditions, especially when the gastric mucous membrane is involved. Its principal use is as a temporary substitute for milk in enterocolitis of infants.

BARRENNESS.—See STERILITY.

BARTHOLIN'S GLANDS.—Two small mucous glands, about the size of a pea, situated on each side of the vagina just posterior to the bulbs. They terminate by a narrow duct about half an inch in length that has its orifice in front of the hymen, about the middle of the vaginal ostium.

Inflammation and suppuration of Bartholin's glands constitute a rather common affection. It is most frequently gonorrheal in origin, although it may be the result of other forms of infection. It is accompanied by severe pain, and, finally, swelling and edema. The swelling is pear-shaped, with the large end toward the perineum. There may be fever, and, later, fluctuation may be obtained. Spontaneous evacuation may occur, resulting in one or more persistent fistulas.

In the chronic state the gland is indurated, hypertrophied, and contains a few drops of greenish pus. Usually but one side is affected.

The treatment in the acute stage consists in early incision and drainage. The incision should be made in the lower part of the swelling, at the junction of the skin and mucous membrane; the pus should be evacuated; the cavity irrigated and packed with gauze. Healing by granulation will take place in the course of a week or ten days.

Should the abscess return, or should it be chronic in character when first seen, the entire gland must be dissected out and the wound closed with a few interrupted stitches.

Cysts of Bartholin's glands may be the result of inflammation, or they may be primary in origin. The duct of the gland becomes occluded and the contents are retained. The cyst is filled with a colorless fluid, although at times it may be dark, and rarely exceeds the size of an egg.

Treatment consists in evacuation and packing, or, better, in complete extirpation of the gland.

BASEBALL FINGER.—This is the result of a blow of a baseball on the palmar surface or, more frequently, on the end of the finger. The injuries may be divided into two groups. In the first, one of the interphalangeal joints is tender and swollen, and a fusiform enlargement persists long after the injury. The lesion may be a sprain or a dislocation, but in many instances there is a fissured fracture of the end of one of the phalanges, hence a skiagram should always be taken. The *treatment* is the reduction of any deformity that may be present, a palmar splint for three weeks, and later massage. In the second group (*mallet finger*) the extensor tendon is stretched or torn, as described in the next paragraph.

Mallet finger is a drooping of the distal phalanx as the result of rupture or overstretching the end of the extensor tendon, such as may be caused by sudden and violent hyperflexion of the end of the finger. In the early stages it is treated by the application of a splint. If the deformity persists, the tendon may be sutured to the periosteum (Stewart).

BASEDOW'S DISEASE.—See EXOPHTHALMIC GOITER.

BASHAM'S MIXTURE.—A solution of iron and ammonium acetate, officially known as *liquor ferri et ammonii acetatis*, forming a very useful and elegant preparation of iron, acting as a diuretic, diaphoretic, and chalybeate, and very useful in Bright's disease. It is made as follows:

Tincture of the chlorid of iron,	2 parts
Dilute acetic acid,	3 parts
Solution of ammonium acetate,	25 parts
Aromatic elixir,	6 parts
Glycerin,	6 parts
Water,	to 50 parts

The dose is from 2 to 6 drams, well diluted, and taken through a glass tube or quill, to protect the teeth. See IRON.

BATH.—A medium in which the body is wholly or partly immersed. As therapeutic agents, baths are classified accordingly as water, vapor, air, etc., is used; according to the temperature, as hot, tepid, cold, etc.; according to the end desired, as nutritional, medicinal, stimulant, etc.

Special Forms of Baths.—B., Acid, add 1 1/2 ounces of nitric acid and 1 to 3 ounces of hydrochloric acid to 30 gallons of warm water in a wooden or earthenware vessel, and immerse the patient in this for from 10 to 20 minutes. For a foot-bath, add 1/2 ounce of nitric acid and 1 ounce of hydrochloric acid to 4 gallons of warm water. This is said to be useful in cases of dyspepsia with sluggish liver and constipation. **B.s, Acratothermal,** baths prepared from natural mineral waters of high temperature, but in which the gaseous and saline constituents are small in quantity and of feeble therapeutic action. Syn., *indifferent thermal baths; simple thermal baths; unmixed thermal baths.* **B., Air-,** a bath in which but little water is employed, the body being exposed freely to the air. It is employed in those cases in which there is a tendency to catch cold on slight exposure. **B., Alcohol,** one in dilute alcohol, used to reduce temperature in fever. **B., Alkaline,** add 3 ounces of potassium carbonate, or 6 of sodium carbonate, to 25 or 30 gallons of hot water. It is used in chronic squamous skin diseases, chronic rheumatism, and lithemia. It should be taken in a wooden, earthenware, or enameled tub. **B., Animal.** 1. One prepared from dung of cattle or the contents of the first stomach of a freshly slaughtered ox. 2. The introduction of the whole body or the part affected with rheumatism into the body-cavity of an animal just slaughtered. **B. Antimonial,** one containing 1 to 2 ounces of tartar emetic; it is used in skin diseases. **B., Antirheumatic,** one containing, in sufficient water for the purpose, 100 grams of oil of turpentine, 10 grams of oil of rosemary, 50 grams of sodium carbonate. **B., Antisyphilitic,** a solution of 15 grams of mercury bichlorid in 500 grams of water, to be added to the bath at the time of using. **B., Astringent,** one prepared with tannin or other astringents, to control sweating or in the treatment of skin diseases. **B., Astringent, Most's,** a bath for extensive burns, con-

sisting of a solution of 200 grams of alum in 6 to 8 pailfuls of cold water and 1 pailful of curdled milk. **B., Balsamic,** one containing tar, turpentine, or the buds and bark of terebinthaceous plants. **B., Blanket,** a method employed in chronic nephritis to stimulate the diaphoretic action of the skin. The patient is placed in bed and closely wrapped in blankets, a hot poultice being applied at the same time to the loins, and renewed as often as it becomes cool. **B., Bog,** a bath formed by mixing bog earth (generated by the decomposition of plants in the presence of water, and found at iron and sulphur springs) with warm water to form a pulpy or mushy consistence. This is used as a mud bath. **B., Borax,** borax, 4 ounces; glycerin, 3 ounces; water, 30 gallons. It is used in the same class of cases as bran bath. **B., Bran,** boil 1 pound of bran in 1 gallon of water, strain, and add 30 gallons of water. This is a soothing and emollient bath, and is of service in squamous and irritable conditions of the skin. **B., Brand,** cold bath. The tub is filled with water at 68° F. The patient is given a stimulant of from 1/2 of an ounce to 2 ounces of brandy, the face and chest are laved with ice-water, an ice-cap applied to the head, and then he is gently placed in the water. The attendants should gently pass the flattened outstretched hands over successive parts of the body to dilate the superficial cutaneous vessels. Remove the patient as soon as his teeth begin to chatter, or if cyanosis of the lips or face appears. Usually, the bath should be continued 15 minutes. The patient is then placed wet on a sheet and quickly wrapped from head to foot. After drying, hot water is applied to the feet. See Typhoid Fever. **B., Buff,** one in which the bather is nude. **B., Chemic,** in chemistry, an apparatus for regulating the temperature of chemic processes by surrounding the substance with water, sand oil, or mercury, through which the heat is communicated. **B., Cold,** a bath of cold water, the temperature of the latter varying from 32° to 70° F. It is used to reduce fever, and as a general stimulant. See Bath (Brand). **B., Dipolar,** a hydroelectric bath in which the patient does not come in contact with either of the electrodes, but these are immersed in the water at each end of the tub. **B., Effervescent,** a liquid bath containing a free gas, which is given off with effervescence. **B., Egyptian,** a modification of the Turkish bath, with rise of temperature to the maximum point, followed by lowering of temperature to the initial point. **B., Electric,** one in which the medium of the bath and the bather's person are included in the circuit of a galvanic current. **B., Electric-light,** exposure in a closed chamber to the rays from an arc light. See Phototherapy. **B., Electrotherapeutic,** a bath furnished with suitable electrodes and used in the application of electricity for curative purposes. **B., Electrothermal,** a hot bath combined with exposure to the influence of electricity. **B., Foot-,** a bath for the feet, used as a derivative agent in cases of cold, etc., **B., Fucus-,** one containing seaweed, or a decoction of it, imparting sodium chlorid and a small percentage of iodin. **B., Full,** one in which the patient's body is entirely covered by water, so that his chin just clears it. **B., Gas-,** one in which a gas is applied to the entire body or an affected part by means of a closed cabinet. **B., Gelatin,** dissolve 1 pound of common glue in hot water, and add the solution to the plain bath, or to the bran bath; it may be used for the same class of cases. **B., Graduated,** one in which the temperature of the water is gradually lowered by the addition of cold or ice water. **B., Half,** the patient is seated in a tub containing from 8 to 10 inches of water of a temperature suited to the case. A wet towel is tied around the head, and the bath water is poured and dashed over the back, head, and shoulders with the attendant's right hand while friction is practised with the left, and the patient does the same on the anterior portion of the body. The temperature of the water may be lowered if a more decided impression is desired. The bath is continued for from 5 to 20 minutes, with active friction. It is indicated in all fevers with a depressed nervous system, as shown by ataxia, delirium, or coma. **B., Herb-,** made by using the extract of pine-needles or of some aromatic herbs; used as a tonic. **B., Hip-.** See Bath (Sitz-). **B., Hot,** the temperature ranges from 104° to 110° F. It acts upon the skin, producing free perspiration, and accelerates the pulse and respiration. **B., Hot-air,** Turkish bath; the patient is placed in a box (French method), his head being outside, and the box is filled with hot air furnished by a lamp. In the ordinary Turkish bath the patient is compelled to inhale the air within a closed compartment. A much higher temperature may be borne in hot-air baths than in vapor baths. They provoke more profuse sweating, and raise the temperature of the body to a greater extent. They are useful as a diaphoretic and in catarrhal, neuralgic, and rheumatic conditions. They are contraindicated, as is also the vapor bath, in fatty degeneration of the heart. **B., Hydroelectric,** a water-bath charged with electricity. **B., Hydrostatic,** a variety of permanent water-bath in which the patient is supported without total immersion. **B., Indian,** massage in combination with a Turkish bath. **B., Internal,** lavage of the stomach or rectum. **B., Iodin-,** one to which is added a solution of 8 grams of iodin and 16 grams of potassium iodid in 600 grams of water. **B., Kinetotherapeutic,** a water-bath in which specified movements are carried out. **B., Light-.** 1. See **B., Sun-.** 2. Exposure of affected parts to rays of light by means of various apparatus; also of the whole body for inducing perspiration. **B., Lime-,** a bath to which slaked lime is added at the time of using; it is used in gout and in treatment of itch. **B., Medicated,** a bath in which medicinal substances, as mineral salt, sulphur, etc., are dissolved or held in suspension. **B., Mercurial,** for the treatment of syphilis. Calomel, 20 to 60 grains, or a mixture of 15 grains of calomel and 20 grains of cinnabar are fused over a water-bath. The patient is stripped and enveloped in one or more blankets or in a mackintosh or india-rubber blanket lined with flannel. The lamp and mercury are placed under his chair and the former lighted. In a few minutes perspiration is induced, and the

sublimed calomel is deposited upon the body. Twenty to thirty minutes are sufficient for a bath after which the patient is allowed to cool off slowly. The bath is best taken before retiring. **B., Milk,** a bath in milk, for nutritive purposes. **B., Mineral.** 1. The water of a mineral spring used as the medium. 2. One to which a solution of mineral substances has been added. **B., Monopolar,** a hydroelectric bath in which the wall of the metal tub is utilized as a large electrode. The current entering here is conducted to the entire surface of the body in contact with the water, and passes out by means of a large metal electrode the edges of which are covered by a rubber pillow so placed that the patient can lie upon it without coming in contact with the metal. See B., Dipolar. **B., Moor,** a bath in water mixed with the earth of moors. **B., Mud,** a bath prepared by mixing well-seasoned earths containing more or less mineral matter, with water containing the same substances. The body is surrounded with this mixture at various temperatures from 90° to 100° F. The patient is then rinsed with warm water. This is of value in some uterine diseases and in obstinate rheumatism. **B., Mustard,** made by inclosing from 2 to 4 ounces of ordinary mustard in a piece of muslin or thin linen, and hanging it in about 4 gallons of hot water until the latter becomes yellow. It is used as a general bath for infants in collapse, convulsions, or severe bronchitis, the child remaining in until the skin becomes ditinctly reddened. It is also used as a foot- or sitz-bath in amenorrhea. **B., Nauheim,** a natural thermal effervescent (gaseous muriated) bath. See Heart-disease, Schott Treatment. **B., Needle.** See B., Rain-. **B., Nutritive,** one containing wine, milk, or any nutritive ingredient. **B., Oxygen-,** an inhalation of oxygen to correct inadequate aeration of the blood; also a local application of oxygen gas to gangrenous ulcers. **B., Ozone-.** See B., Fucus-. **B., Pack** or **Sheet,** one in which the body is wrapped in wet cloths. See B., Sheets. **B., Peat-,** an application of bog-earth containing much vegetable matter and used in gout and rheumatism. **B., Permanent.** See Bath (Warm). **B., Pine,** prepared by adding a decoction of pine-needles, or some pine extract, to hot water. It is mildly stimulating, and is employed in hysteria, gout, and rheumatism. **B. of Plombières,** a bath to which a solution of 100 grams of powdered gelatin in hot water is first added and afterward a mixture of 100 grams of sodium carbonate, 20 grams each of sodium chlorid and sodium bicarbonate, and 60 grams of sodium sulphate. **B., Plunge-,** a bath, hot or cold, into which the patient plunges. **B., Rain,** consists of from 4 to 6 three-fourths circles of pipes secured together at a distance of 2 to 3 inches. Each pipe has 3 lines of fine perforations, from which the stream issues under pressure, striking the body of the patient at all points with considerable force. This may be used as a substitute for the dripping sheet. **B., Russian,** one in which the air of the room is saturated with steam by throwing water upon heated mineral or metallic substances, after which the bather is rubbed down, finishing with a cold douche. See Bath (Vapor). **B., Sand,** the body of the patient is surrounded in a tub with a layer of dry, warm sand that has been naturally or artificially heated, the temperature ranging from 95° to 120° F. The duration of the bath is from 1 to 1 1/2 hours. The head is wrapped in a wet towel and permitted to lie outside of the sand. The after-treatment is the same as that after a hot-air bath. This is of value as an emollient procedure. **B., Schott.** See Schott Treatment. **B., Seawater,** more stimulating and tonic in its effects than fresh water. It may be given cold, tepid or hot. It may be prepared artificially by dissolving bay-salt or rock-salt in fresh water, 4 to 9 pounds of salt to 30 gallons of water. It is useful in convalescence, chlorosis, and strumous diseases. See Sea-bathing. **B., Seaweed.** See B., Fucus. **B., Sheet,** the application of cold water to the body through the medium of a sheet or towel of fine or coarse texture, placed upon the skin. The patient is wrapped in a linen sheet, wrung not quite dry out of water at a temperture of from 63° to 70° F. A rubber cloth and a blanket are spread over the bed to protect it. As the sheet dries small quantities of water are poured with one hand from a vessel or sponge upon a limited part of the body, beginning with the chest. With the other extended hand rapid passes are made over this spot until it becomes a little warmer. Successive parts of the body are thus treated, except the forearms, hands, feet, and legs. The patient is then dried and made comfortable. This is applicable in all febrile affections with high temperatures, except in chest and abdominal diseases. **B., Shower,** a familiar form of the douche. The water is delivered from a nozzle with numerous perforations that may be attached to a hose, striking the body in a divided stream. **B., Sitz-,** one in which only the buttocks and hips are immersed in water, It is useful in pelvic inflammations, amenorrhea, and retention of urine. **B., Slime,** a bath in water mixed with the slimy deposit of organic matter found in rivers or ponds. **B., Sponge,** one in which the patient's body is rubbed with a sponge and water. It is used to reduce temperature. **B., Starch,** starch, 1 pound; water, 30 gallons. This is used as is the bran bath. **B., Sulphur,** contains potassium sulphid, from 4 to 8 ounces in 30 gallons of water; a small quantity of sulphuric acid may be added. It is used in certain skin-diseases, scabies, lead colic, and lead palsy. **B., Sulphurous-acid,** a means of applying the fumes of burning sulphur to the body. The patient is seated on a cane-bottomed chair, and a blanket or oil-cloth is placed around him, the head remaining uncovered. On the floor beneath the chair is a pan containing a little water, and in this is placed a smaller vessel containing small pieces of sulphur. A small quantity of spirit of wine is poured over this and ignited, and sulphurous acid gas is evolved. **B., Sun,** the therapeutic exposure of the naked body to the sun's rays. **B., Surprised,** an ancient and now obsolete form of bath for insane and hysteric patients, who were unexpectedly plunged into cold water. **B., Sweat, B., Sweating,** a bath to induce a free flow of perspiration; *e. g.*, a Turkish bath. **B., Tepid,** the tem-

perature of the water ranges from 85° to 95° F. It acts mainly upon the skin as a sedative, cleansing, and detergent agent; the pulse, respiration, excretion, secretion, and temperature are practically unaffected. **B., Turkish,** one in which the bather is placed successively in rooms of higher temperature, then shampooed or rubbed, and finally stimulated by a douche of cold water. See BATH, HOT-AIR. **B., Vacuum,** the treatment of parts by subjecting them to a partial vacuum. **B., Vapor,** Russian bath; this may be given, like the Turkish bath, in a box, by permitting steam from a pipe to permeate it, providing for its escape; or the patient may inhale the vapor within a closed compartment, the whole surface being at the same time exposed to its influence. A higher temperature can be borne than in the hot-water bath, though for a shorter time. It is useful to provoke profuse perspiration. It should be followed by brisk frictions. **B., Warm,** the tub is filled with water at any temperature near that of the body—say, 90° to 104° F. The patient lies quietly in it, and obtains the effect of warmth, moisture, and water-pressure. It is used to calm the nervous system, produce sleep, and allay reflex instability. The *continuous warm bath,* called by Hebra the *permanent bath,* is made by suspending a sheet in the tub as a hammock. The patient lies upon this surrounded by water that is kept at an equable temperature (warm) by a proper arrangement of in-and-out flow. It is used in the treatment of extensive burns and wounds. **B., Water-,** a bath of water. It may be cold (60° to 75° F.), tepid (85° to 95° F.), or hot.

BATTERY.—This term is usually applied to a series of cells producing electricity (voltaic or galvanic battery); also frequently to a single cell. The way in which the cells are coupled depends upon the nature of the current that is desired and the relation between the external and internal resistance. For example if the cells are arranged, in series—the copper of the first with the zinc of the next, and so on—the result is to give the maximum electromotive force; on the other hand, if the zincs are connected and the coppers connected, the electromotive force is the same as for a single cell, but the internal or battery resistance is diminished, and hence the strength of the current or the quantity of electricity may, under certain conditions, be much increased. The first method is popularly spoken of as the arrangement for intensity; the second, as the arrangement for quantity. A primary battery is a combination of a number of primary cells that form a single battery. A secondary battery is a combination of a number of storage cells to form a single electric source. In the following table the storage or secondary batteries are not included. The common form of these is a series of lead plates carrying masses of lead oxid. See ELECTRICITY.

NAMES, ELEMENTS, FLUIDS, ETC., OF THE PRINCIPAL BATTERIES

NAME OF CELL.	POSITIVE ELEMENT.	NEGATIVE ELEMENT.	EXCITING AGENT.	DEPOLARIZING AGENT.	E. M. F. IN VOLTS
Beetz	Zinc	Copper	Zinc sulphate in plaster-of-Paris.	Copper sulphate in plaster-of-Paris.	1.04
Bunsen	Zinc	Carbon	Sulphuric acid, dilute	Nitric acid	1.75 to 1.96
Callaud	Zinc	Copper	Solution of zinc sulphate.	Cupric sulphate	1.0 to 1.14
Daniell	Zinc	Copper	Zinc sulphate	Cupric sulphate	1.0 to 1.14
Edison-Lelande	Zinc	Cupric oxid and carbon.	Potassium hydroxid	Cupric oxid	0.75
Fuller	Zinc	Carbon	Zinc chlorid	Potassium dichromate and hydrochloric acid.	1.5
Gaiffe	Zinc	Silver	Zinc chlorid	Silver chlorid	1.02
Gravity. See *Callaud*					
Grenet	Zinc	Carbon	Sulphuric acid and potassium dichromate.	Chromic acid	2.0
Grove	Zinc	Platinum	Sulphuric acid, dilute	Nitric acid.	1.94 to 1.97
Latimer-Clark	Zinc	Mercury	Mercuric sulphate	Mercuric sulphate	1.436
Leclanché	Zinc	Carbon	Ammonium chlorid	Manganese dioxid	1.42
Lelande Chaperone	Zinc	Copper or iron	Potassium hydroxid	Cupric oxid	0.98
Maische	Zinc scraps n a bath of mercury.	Platinized carbon.	Common salt solution	None separate	1.25
Marié Davy	Zinc	Carbon	Sulphuric acid, dilute	Mercuric sulphate	1.52

NAMES, ELEMENTS, FLUIDS, ETC., OF THE PRINCIPAL BATTERIES.—*Continued.*

Name of Cell.	Positive Element.	Negative Element.	Exciting Agent.	Depolarizing Agent.	E. M. F. in Volts.
Maynooth	Zinc	Iron	Sulphuric acid, dilute	Nitric acid (strong).	
Niaudet	Zinc	Carbon	Common salt solution	Chlorated lime	1.63
Poggendorf	Zinc	Carbon	Potassium dichromate and sulphuric acid.	Chromic acid	1.98
Schanschieff	Zinc	Carbon	Mercurial solution	None separate	1.56
Scrivanoff	Zinc	Silver	Potassium hydroxid	Silver chlorid	1.5
Smee	Zinc	Platinized silver	Sulphuric acid, dilute	None	0.5 to 1.0
Walker	Zinc	Platinized carbon	Sulphuric acid, dilute	None	0.66
Warren de la Rue	Zinc	Silver	Ammonium chlorid	Silver chlorid	1.05

BEARBERRY.—See Uva Ursi.

BEARING-DOWN PAINS.—The true pains of labor. They become most marked and assume their characteristic bearing-down quality during the second stage of labor. See Labor.

BECHTEREW'S DISEASE.—Osteoarthritis of the spine. See Spondylitis Deformans.

BECQUEREL'S RAYS.—Radiation given off by uranium and some of its compounds. They are luminous, actinic, and skiagraphic. They may give rise to a dermatitis.

BED-SORES.—Local patches of moist gangrene caused by undue pressure and irritating secretions; a crease or fold in a sheet, a crumb of bread, a feather, or a bit of string on the sheet may cause them. Especially is this so when the skin is irritable from excessive perspiration, inefficient washing, or involuntary passages of urine. Bed-sores are particularly common in spinal disease and injuries, and in all wasting diseases.

Treatment consists in reducing the pressure, careful repeated washing, drying, and dusting with zinc oxid, and subsequent protection with lint or cotton-wool, etc. Leather-backed adhesive plaster may be applied over bony prominences, or, if seen early, collodion may be used. Frequent rubbing with alcohol, and changing the position of the patient may prove a preventative. When congestion appears, a water-bed or air-cushion may be used. Spirit of camphor or glycerol of tannin may be rubbed in twice daily, to harden the skin. Other preparations are salt and alcohol (2 drams to 1 pint), or the following:

℞. Powdered alum, ℥ ss
Tincture of camphor, ℥ ij.
Whites of 4 eggs.

℞. Corrosive sublimate, gr. ij
Alcohol, ℥ j.

℞. Oil of copaiba, } equal parts.
Castor oil, }

A solution of silver nitrate may be used when the skin is about to break, in the strength of 20 grains to the ounce; and in solution of 10 grains, daily, when the skin breaks. The sloughs should be removed as fast as they form. Stimulation, good nourishment, and sleep are valuable in treatment.

BEEF.—The flesh of domestic cattle. Good beef should be of red color, possess firm texture, and be free from unpleasant odor. Beef consists of albuminoids, 20 3/4, fat 2 3/4, extractives 1 1/2, salts 1 1/2, water 73 1/2, and also a minute quantity of creatin.

Beef-essence or **extract** is made by pouring 8 ounces of soft water upon 1 pound of finely chopped, fresh beef, free from fat, adding 5 or 6 drops of hydrochloric acid and from 50 to 60 grains of salt, stirring well, and leaving in a cool place for 3 hours. Pass through a hair sieve, pressing the meat slightly, and adding, gradually, 2 ounces of water. It is of red color, has the taste of soup, may be taken cold or warm, a teacupful at a time.

Beef-tea is made by putting a pound of minced lean beef into a pint of tepid water in an earthen jar, where it is left for an hour. It is then strained, and the juice squeezed out of the meat, placed on the fire and slowly brought to the boiling-point, being stirred all the time. Season to taste.

Or, in 3 ounces of cold water place 2 pounds of meat, lean and boneless, in a jar, which may be placed in a saucepan of water and allowed to simmer for 4 hours.

BEE-STING.—See Bites and Stings

BELCHING.—See Eructations, Flatulence.

BELLADONNA (Deadly Nightshade).—The *Atropa belladonna* is a herbaceous, perennial plant, having dark-purple, bell-shaped flowers, and glossy, purplish-black berries about the size of cherries. It is indigenous in the mountainous districts of central and southern Europe and Asia, and is cultivated in Europe and in the United States. It contains the official alkaloid *atropin;* also the alkaloids *belladonnin, hyoscyamin, hyoscin,* and *atropamin.* It also contains albumins, gums, and a coloring principle, *atrosin.*

Belladonna leaves are ovate and tapering, brownish-green above, grayish-green below, of faint odor, and bitter, disagreeable taste. Stram-

onium leaves are more wrinkled, hyoscyamus leaves are more hairy. Dose, 1/2 to 1 1/2 grains gradually increased.

Belladonna root is seen in cylindric, tapering, wrinkled pieces, 1/2 to 1 inch thick, nearly odorless, taste bitter and acrid. Dose, 1/2 to 1 grain, cautiously increased.

Therapeutics.—Belladonna is used to relieve pain, relax spasm, to allay excessive secretion, as a valuable vasomotor stimulant, and as a mydriatic. In asthma, with morphin, it is a sovereign remedy as a prophylactic and as a cure. It is of great service in intestinal spasm, griping, and cramps, spasm of the sphincter ani or of the urethra and bladder, chordee, dysmonorrhea, hiccough and whooping-cough, sore throat, and exophthalmic goiter. It is especially useful in the pain of inflammation, particularly that of rheumatism, gout, neuralgia due to peripheral disturbance, sciatica, cancer, and pelvic affections. In cerebral and spinal hyperemia, congestive headaches, encephalitis, meningitis, and myelitis it proves one of the very best remedies. In erysipelas of superficial and nonvesicular character, and when cerebral, it is really curative administered locally and internally. Inflammations of the lungs, iris, bladder, kidneys, and breasts are all treated with it. In constipation from atony of the bowels it is remarkably efficient, and in the enuresis of children it is equally so, if used freely—10 to 20 drops of the tincture thrice daily.

Its local application is efficient in ulcers of the rectum, anal fissure, abscesses, boils, carbuncles, and other superficial inflammations. In scarlet fever it relieves many of the symptoms, and is especially indicated in this disease when the rash is imperfect, the pulse feeble, and the condition one of adynamia. Its prophylactic power against scarlet fever is believed in by many of our best practitioners, though questioned by many others.

Its chief active principle is the alkaloid *atropin* which is insoluble in water. Atropin is used to obtain the same effects as belladonna. See Atropin.

Poisoning.—Belladonna in full doses produces flushing of the face, dryness of the fauces, dilated pupils, and sometimes an erythematous rash resembling that of scarlet fever, and slight delirium. It excites the brain and spinal cord, quickens the pulse, raises arterial pressure, increases intestinal peristalsis, and checks all the secretions except the urine. It is especially well borne by children. It is rapidly diffused and quickly eliminated, particularly by the kidneys.

Opium is the physiologic antagonist to the effects of belladonna on the cerebrum, pupil, heart, respiration, arterial tension, and kidneys. Physostigmin, aconite, pilocarpin, and quinin are each antagonistic to some of its effects; muscarin, to most of them. In poisoning by this drug tannic acid and emetics should be used; then morphin, physostigmin, or pilocarpin for the nervous disturbance. Caustic alkalies decompose atropin, and are therefore incompatible with the preparations of belladonna.

Poisoning by belladonna is treated by the application of external heat if collapse ensues, and by the use of strychnin if respiration fails. The physiologic antagonist (opium) should be given in small graded doses, especially when respiration is faulty.

Incompatible with **Belladonna** or **Atropin** are: Alkaloidal precipitants, alkali hydrates, or acids with heat, tannic acid, vegetable decoctions or infusions. Physiologically incompatible are: Aconitin, bromal hydrate, chloral hydrate, hydrocyanic acid, jaborandi, morphin, muscarin, physostigmin, phytolacca, pilocarpin, quinin.

Preparations.—The preparations of the **leaves** are: **B., Extractum.** Dose, 1/10 to 1/2 grain. **B., Tinct.,** 10 percent. Dose, 1 to 15 minims. **B., Unguent.,** contains extract 10, dilute alcohol 5, benzoated lard 65, hydrous wool-fat 20 parts. **B., Emplast,** contains 30 percent of the extract.

From the root are prepared: **B., Fluidextractum.** Dose, 1/2 to 2 minims. **B., Linimentum,** fluidextract 95, camphor 5.

Atropin. Dose, 1/160 of a grain. **Atropin Sulphate.** Dose, 1/200 to 1/100 of a grain. See Atropin. **Oleatum Atropinæ,** a 2 percent solution of the alkaloid in alcohol, 2, oleic acid 50, and olive oil to 100. Dose, 1/200 to 1/60 of a grain.

BELL'S PALSY.—See Facial Paralysis.

BENDS, THE.—See Caisson Disease.

BENEDICT'S TEST FOR SUGAR.—See Urine (Examination).

BENEDIKT'S SYNDROME.—This consists of: (1) Hemiplegia on one side of the body; (2) oculomotor paralysis of the opposite side; and (3) a tremor on the hemiplegic side. It is found in diseases of the midbrain.

BENZIN.—A distillate from petroleum, consisting of hydrocarbons, chiefly of the marsh-gas series; a transparent, diffusive, inflammable liquid, soluble in about 6 of alcohol, readily soluble in ether, chloroform, etc., insoluble in water. Its vapor, mixed with air and ignited, explodes violently. **B. Purified.** A valuable solvent for oils fats, resins, caoutchouc and some alkaloids, and a vermicide against tape-worm. Dose, 5 to 10 drops, on sugar or in mucilage.

BENZOIN.—A resin obtained from *Styrax benzoin,* a tree native to Sumatra and Siam. It is composed of resins 80 percent, benzoic acid 10 to 20 percent, and a trace of volatile oil. Some varieties also yield cinnamic acid. It is sparingly soluble in water, cold alcohol, and ether, and crystallizes in shining prisms, melting at 134° F. It is used as a remedy for bronchitis and in making court-plaster. It occurs in tears consisting of several resins agglutinated by a balsam. It yields benzoic and cinnamic acids, is antiseptic and disinfectant, and is used mainly as a stimulant expectorant in chronic bronchitis. Sodium and potassium compounds are sometimes used in place of like salicylic acid compounds. They render the urine acid and increase its quantity. Benzoin is irritant to the fauces, and the powder inhaled excites sneezing and coughing. Benzoin is principally used as a stimulant expectorant, especially in the chronic

bronchitis of the aged, and by atomization in laryngeal affections. The compound tincture, 1 dram to 1 ounce in a pint of boiling water, is a useful sedative inhalation. For sore nipples and chapped hands, 1 part of the compound tincture to 4 parts of glycerin and water, is useful. As a cosmetic, to remove freckles and other skin affections, and in urticaria, it is of service. In foul-smelling wounds it is excellent. *Benzoic acid* is used to acidify the urine, and is, therefore, useful in cystitis, phosphatic deposits, excessively alkaline urine, and, rarely to remove phosphatic calculi. Benzoin has the property of preventing rancidity in ointments. It is an ingredient in cosmetic washes, in aromatic or fumigating pills or pastils, and in court-plaster or black sticking-plaster.

Incompatibles with *Benzoin*, alkalies, acids, and water; with *Benzoates*, acids, ferric salt.

Preparations.—**Adeps Benzoinatus,** benzoinated lard, contains 2 percent of benzoin. **B., Tinct.,** 20 percent of the resin in alcohol. Dose, 10 to 20 minims. **B., Comp. Tinct.,** friar's balsam, benzoin 10, Aloes 2, storax 8, balsam of tolu 4, alcohol, to 100 parts. Dose, 10 to 40 minims. **Benzoic Acid,** $H.C_7H_5O_2$, alcohol the best solvent. A constituent of opii tinct. camphor. Dose, 5 to 10 grains, in wafers. **Ammonium Benzoate,** water the best solvent. Dose, 5 to 30 grains. **Lithium Benzoate.** Dose, 5 to 30 grains. **Sodium Benzoate,** water the best solvent. Dose, 5 to 30 grains.

BENZONAPHTHOL.—Prepared from beta-naphthol by the action of benzoyl chlorid; it occurs as a white, tasteless powder, almost insoluble in water. It is used as an intestinal antiseptic and disinfectant in typhoid and tropical dysentery. Dose, 5 to 15 grains.

BENZOSALIN.—Methyl benzoyl salicylate. After passing unchanged through the stomach it is said to be split up into benzoic and salicylic acid in the intestines. It is said to have the same action as its constituents without producing any unpleasant by-effects. Dose, 7 to 15 grains.

BENZOSOL.—Benzoyl guaiacol. Guaiacol benzoate. It is split up in the intestines into guaiacol and benzoic acid which are absorbed and excreted in the urine. Compared with guaiacol, this agent has the advantage of being almost tasteless; hence it can be given in large doses without digestive disturbance and disagreeable eructations, and without the local irritant effect. In doses of 4 grains, gradually increased to 12 grains, thrice daily, it is said to give as good results as creosote in the treatment of pulmonary tuberculosis.

BENZOSULPHINID.—See Saccharin.

BERBERIS (Barberry).—The root of the common barberry. Its properties are due to an alkaloid, *berberin*. It is an astringent, bitter tonic; in large doses, a cathartic. It is used locally in conjunctivitis, and internally in malarial and typhoid fevers. **B. Fluidextract.** Dose, 10 to 40 minims. *Berberin*, the alkaloid, is a tonic to the capillary vessels, and increases the blood-pressure. It is recommended as a tonic and an antiperiodic, and is an ingredient of various lotions for the mucous membranes; it is useful in nasal catarrh, etc. Dose, 1 to 10 grains. The hydrochlorid is an efficient injection in gonorrhea.

BERI-BERI (Kakké).—A disease of certain tropical regions, believed by some to be excited by a microorganism, and by others regarded as a specific multiple neuritis, resembling that of lead and alcohol, and of a peripheral character. Poor diet is a marked etiologic factor. Deficiency of the vitamines is now believed to be the real cause of the disease. Beri-beri resembles pernicious anemia. The general symptoms are those of anemia and anasarca.

Symptoms.—There are 4 forms: (1) An incompletely developed or rudimentary form; (2) an atrophic form; (3) a dropsical or dropsical and atrophic form; and (4) an acute pernicious or cardiac form. The rudimentary form may set in insidiously, with or without prodromes, while catarrhal symptoms are frequently present, soon followed by weakness in the lower extremities, numbness, and edema. Days, weeks, or even months may thus ensue with gradual recovery. In the atrophic form the onset may be insidious or abrupt, consisting in loss of power and wasting of the affected muscles. Improvement takes place slowly. The dropsical form is characterized by general and widespread anasarca, involving the serous cavities as well as the subcutaneous tissues. Recovery is gradual. The acute pernicious form attacks preferably young, robust persons, and is characterized by acute cardiac insufficiency.

The most conspicuous and most constant symptom of beri-beri is the impairment of motion. This begins in the lower extremities, and is of ascending type and of variable degree. The paretic muscles waste. Cutaneous anesthesia or hyperesthesia is of variable distribution. Paresthesias are common and varied, as hyperesthesia is uncommon. There is little pain, either spontaneous or induced. Palpitation of the heart, oppression and dyspnea, epigastric pulsation, precordial distress, acceleration of pulse, diminution of arterial tension, cardiac hypertrophy and dilatation, and functional cardiac murmurs are common. The blood shows no distinctive alteration.

The usual termination of the disease is in recovery. In chronic cases death may take place from general exhaustion.

The **prognosis** is uncertain, and must be based upon the circulatory condition.

Treatment.—The first measures are attention to diet and to clothing, protecting against changes of temperature and against wet and cold. The dropsy is treated on general principles with potassium acetate, digitalis, and squill, and occasionally calomel, etc. The chief indications are to regulate intestinal function, to remove edema, to increase the action of the skin, and to give tone and vigor to the muscular fiber. Change of climate is of great importance. Elevation is to be preferred, and a sea voyage may be curative. Laxatives have always been looked upon as serviceable. In acute cases salicylic acid and sodium salicylate have been strongly recommended. Digitalis is an indispensable remedy. In acute cases with

cardiac insufficiency venesection may be resorted to. In chronic cases arsenic, iron, and quinin are indicated. In atrophic cases subcutaneous injections of strychnin are useful, and the pareses may be materially improved by electricity. With regard to the diet, Stitt says: "It must be remembered that not only is rice, from which the neuritis-preventing vitamine has been removed by excessive milling, productive of beri-beri but that the same applies to other cereals which have been similarly deprived of their vitamines. The same result may be obtained by the employment of excessive sterilization for canning. Fresh meat is as valuable as fresh vegetables in prophylaxis, but if either kind of food be subjected to excessive heat, as in the case with tinned meats, etc., they not only do not prevent beri-beri but in a negative way are beri-beri producing."

BETANAPHTHOL (Naphthol).—A derivative of naphthalene, or naphthalin, a hydrocarbon product of coal-tar; feebly soluble in water, but freely so in alcohol, ether, and chloroform. It is a white, crystalline powder, of phenol-like odor and pungent taste. It is an efficient antiseptic and parasiticide. It is used to dress wounds and ulcers, and is employed in skin diseases, such as ringworm, psoriasis, scabies, and eczema, in the form of an ointment of 30 to 60 grains to the ounce. Internally, it may be used in diarrhea, dysentery, enteric fever, and in cholera. In the summer diarrheas of children, in the dose of 1/6 to 1/4 grain, every 2 or 4 hours, it is useful. It is given in emulsion or as a powder, with sugar, in wafers or capsule, and is flavored with oil of bergamot. To prevent intestinal fermentation it should be taken after meals. Dose is from 3 to 6 grains in pill.

BETANAPHTHOL BENZOATE.—Benzonaphthol. It is used as an intestinal antiseptic in typhoid fever and diarrhea. Dose, 3 to 8 grains.

BETOL.—Salicylate of betanaphthol, of alleged value in rheumatism, cystitis, intestinal catarrh, and gonorrhea. It resembles salicylic acid in its properties. Dose, 2 to 8 grains.

BIER'S HYPEREMIC TREATMENT.—Upon the theory that increased blood supply means destruction of bacteria and their products, increase in the opsonic index and regeneration of tissues, Bier has made use of hyperemia as a curative agent, both in the active and passive form. When treating chronically diseased joints alternately by active and passive hyperemia, Bier discovered that by hot-air hyperemia the edema sometimes occurring after constriction hyperemia rapidly vanished. This result led him to use hot-air hyperemia in the treatment of elephantiasis, and in the edema that is present after healed fractures of the extremities. This treatment by hyperemia has an action on the tissues that is not only solvent, absorbent, nutritive, and bactericidal, but also analgesic.

Active hyperemia as produced by the hot-air treatment is advocated in sciatica, lumbago, neuralgia, sprains, traumatic synovitis, chronic rheumatic arthritis, and rheumatoid arthritis, thrombosed varicose veins, fractures, especially Colles' and Pott's. It is claimed to be beneficial in treating gangrene, diabetic or senile. The part affected is placed within a box of proper shape and size into which a current of hot air (144 to 230° F.) is conducted through a tube, the degree of heat being regulated and not so high as to be painful. In neuralgias and threatening gangrene, the Bier-Eschbaum hot-air douche is used. Unpleasant after-effects in weak patients can be avoided by applying a cold compress to the forehead during the treatment, and by avoiding the exposure of large surfaces to the hot air. Hot air should not be applied for longer than one hour in the day. Treatment should not be given during the menstrual period. Hot air is contraindicated in joint tuberculosis as it provokes abscess formation.

The indications for passive hyperemia cover a wider field than the active by reason of the great nutritive and especially the bactericidal effect.

For the production of passive hyperemia, Bier has adopted (1) constriction and (2) suction—the elastic bandage and the vacuum cup respectively. Careful and correct technic is requisite for the success of the treatment.

(1) Applied correctly the venous outflow of the parts is obstructed by pressure on the veins while the pressure is insufficient to affect the arteries. The bandage is especially adapted to diseased joints and should be applied firmly but not too snugly for a definite length of time, depending on the case, one hour being the maximum. Abscesses should first be incised. Constriction hyperemia has been used with success in joint affections such as tuberculosis, rheumatoid arthritis, acute gonorrheal arthritis, acute and chronic gout, infective inflammations, cellulitis of the arm, beginning whitlow, septic wounds of the head and extremities, tenosynovitis, osteomyelitis, lymphangitis, lymphadenitis. Contraindications are advanced tuberculosis, large abscesses, beginning amyloid disease, heart disease, arteriosclerosis. Hydrops tuberculosis is first treated with iodoform injections until the hydrops disappears.

(2) In acute lymphadenitis, mastitis especially, boils and small carbuncles, contusions or black eyes, sinuses, abscesses as of the axilla, acute purulent otitis, etc., glass caps are used from which the air is exhausted by means of a rubber bulb or suction pump. They are made of various shapes to fit different regions. The treatment is intermittent, 5 minutes on and 3 minutes off, for 3/4 of an hour daily. See HOT-AIR TREATMENT, INFLAMMATION, JOINTS (Diseases).

BILHARZIASIS.—See SCHISTOSOMIASIS.

BILIARY CALCULI.—See GALL-BLADDER (Diseases).

BILIOUS FEVER.—See MALARIAL FEVERS.

BIMANUAL EXAMINATION.—See GYNECOLOGIC EXAMINATION.

BIRTH.—See LABOR.

BIRTH-MARK.—See NEVUS.

BIRTH, PREMATURE.—See ABORTION, LABOR, MISCARRIAGE, NEW-BORN INFANT.

BIRTH, STILL.—See VIABILITY.

BISKRA BUTTON.—See FURUNCULUS ORIENTALIS.

BISMUTH.—Bi = 210; quantivalence I, III, V. A pinkish-white crystalline metal, not used in medicine in its metallic form. Its commercial salts are likely to contain arsenic. The insoluble salts of bismuth are feebly astringent, and are useful in disordered digestion, diarrhea, acne, eczema, etc.

The action of bismuth salts is chiefly a local one, they being sedative to the end-organs of the nerves. They are also feebly astringent, and produce constipation after a time, coloring the stools and tongue a dark clay color from their conversion in part into the sulphid. Toxic effects, when occurring, are ascribed to arsenic, with which the commercial preparations may be contaminated. The bismuth salts, however, have toxic powers of their own.

Bismuth as an intestinal sedative should be given in large doses—from 20 to 30 grains. An antiseptic, like carbolic acid, creosote, salol, etc., may be combined advantageously with it. It is given in pills, in powders, and suspended in mucilage of acacia. Freely given, the odor of garlic is imparted to the breath.

Bismuth subnitrate is used locally in skin-diseases. Dermatol, or bismuth subgallate, is a fine yellow powder, unaffected by exposure to light and air, entirely odorless, astringent in action, and antiseptic. It is less poisonous than iodoform, which it was intended to supplant. It is of use in skin-diseases in which there is much secretion—as weeping eczemas—as a dusting-powder or in ointment.

Preparations.—**B. Citras**, a white, amorphous powder, odorless and tasteless, insoluble in water or alcohol, soluble in water of ammonia. Used only for pharmaceutical purposes. Dose, 1 to 3 grains.

B. et Ammonii Citras, a combination of the citrate with aqua ammoniæ, and has no definite chemical composition. Small, pearly scales, very soluble in water, sparingly in alcohol. Dose, 1 to 5 grains.

B. Subcarbonas, a white or yellowish-white powder, of somewhat varying chemical composition, tasteless and odorless, insoluble in water or alcohol. Dose, 5 to 20 grains in powder or emulsion.

B. Subnitras, a heavy, white powder, of somewhat varying chemical composition, odorless and almost tasteless, of slightly acid reaction; insoluble in alcohol, almost insoluble in water. Dose, 5 to 20 grains several times a day, in powder, pill, or milk; often combined with opium, morphin or belladonna.

B. Subgallas (*Dermatol*), fine, odorless, saffron-yellow powder, insoluble in all ordinary solvents. Dose, 5 to 20 grains.

B. Subsalicylas, should yield not less than 80 percent of pure bismuth oxid; almost insoluble in water, insoluble in alcohol. Dose, 5 to 15 grains.

B. betanaphtholate. See ORPHOL.

B. oxyidogallate. See AIROL.

B. tetra-iodo-phenol-phthalein. See EUDOXIN.

B. tribrom-phenol. See XEROFORM.

For persistent nausea and vomiting:

℞. Bismuth subnitrate, ʒ iij
Tincture of aconite, ʒ j.

Divide into 10 capsules. Give 1 every half hour.

℞. Carbolic acid or creosote, gtt. x to xx
Bismuth subnitrate, ʒ iij.

Divide into 10 capsules. Give 1 every hour.

For choleraic diarrhea in children:

℞. Bismuth subcarbonate, ʒ ij
Syrup of acacia, } each, ℥ ij.
Cinnamon water, }

One teaspoonful every hour.

For acute gastrointestinal inflammation:

℞. Morphin sulphate, gr. j
Bismuth subnitrate, ʒ ss
Creosote, gtt. vj.

Divide into 12 powders. Give 1 powder every 2 or 3 hours.

For chapping of hands or cheeks from exposure:

℞. Bismuth subnitrate, } each, ʒ iij
Oleate of zinc, }
Lycopodium, ʒ ij.

BITES AND STINGS.—These are usually punctured, sometimes also lacerated, poisoned wounds, the treatment of which depends upon the individual case; that is, whether the bite was by a dog, cat, rat, or venomous serpent, etc., or whether the sting was by a tarantula, scorpion, centipede, or spider, bee, wasp, etc.

If the patient is otherwise in good health, a **dog bite** needs the simplest antiseptic treatment, with no probing of the wound. If there is cause for suspicion, in addition to cleansing the wound an application of ammonia may be made, and the wound may be scrubbed and soaked under hot water, and the Pasteur treatment should be instituted at once. Dog bites should never be cauterized with silver nitrate. Sucking the wound is a foolish custom, and is often the origin of infection. It is most foolish immediately to kill a dog that has bitten anyone. Observation of the animal only is desirable. Hydrophobia has been said to exist exactly in proportion to the common belief in it and the public discussion of the subject. Very many of the cases reported as hydrophobia are perhaps not hydrophobia at all. See HYDROPHOBIA.

The treatment of bites by **cats and rats** consists of simple cleansing, and, perhaps, squeezing the wounds under hot water. Subsequent inflammation requires general treatment.

Stings of Bees, Wasps, etc.—There sometimes remains in the flesh the sting or a portion of the body of the insect, appearing as a black speck at the seat of the bite. This may be removed by pressing over it with a watch-key, or by pulling or sucking. Death has followed a bee-sting. A few drops of ammonia and water may be applied with relief. Camphorated chloral will arrest the severe pain. Cold and wet applications—even wet earth—are soothing.

Mosquito Bites.—A weak solution of carbolic

acid is an excellent preventive agent, not only as regards the mosquito, but also one tending to keep off numerous other pests—ticks, fleas, lice, horse-flies, etc. Carbolic-acid soap may suffice.

If resorted to before retiring, the protection usually lasts during the sleeping hours. An emulsion of common kerosene or petroleum is an excellent substitute. A few drops of petroleum held in an open receptacle a few inches under the insect causes the latter to drop dead.

A 1:1500 solution of potassium permanganate, distributed in mosquito-haunted marshes or grasses, will render the development of the larvæ impossible.

An ointment containing 1/2 of a dram to the ounce of betanaphthol reduces the irritation caused by the bites and stings of any insect.

Aqua ammoniæ does not penetrate the tissues, but it reduces the suffering. Menthol may be rubbed over the surface.

Neal recommends the following mixture for local application:

℞. Pulverized ipecacuanha, ℥ ss
Alcohol, } each, ℥ ss.
Ether, }

Ottinger affirms that the best results are obtained from the application of ichthyol.

Brocq and Jacquet recommend the following:

℞. Camphorated oil of camomile, 100 parts
Liquid storax, 20 parts
Peppermint essence, 5 parts.

Also,

℞. Peruvian balsam, 5 parts
Storax ointment, 25 parts
Olive oil, 20 parts.

When violent local tumefaction and congestion result, a cold lead-water poultice forms a very soothing application. Lemon-juice is also useful.

Gnats.—The remedial and preventive measures recommended for mosquito-bites are equally useful for gnat-bites.

Leech-bites.—The Philippine Islands are infested with a blood-thirsty land-leech, most tormenting, but not dangerous, whose attacks in certain districts are not to be avoided except by the use of stout, tight-fitting, canvas leggings. The whites are obliged to protect themselves by means of leech-gaiters, the cloth being woven so closely as to be absolutely impermeable. In those of robust health, leech-bites merely cause annoyance, the only difficulties sometimes encountered are the bleeding, slight inflammation, and itching like that experienced from mosquito-bites; but in those of degraded habits, with the germs of tropical fever in their blood, the punctures, if rubbed or scratched, are liable to degenerate into ulcers that may lead to loss of limb or life.

Chigoe.—An insect that, in Cuba, Porto Rico, and the West Indies generally demands to be specially guarded against in the chigoe, or jigger. It is the female only that is annoying, and she is especially likely to work her way beneath the skin of the feet. Having buried herself, an intolerable itching results, at first rather agreeable than otherwise, but after a few hours merging into most violent pain. At the same time a small, white, bladder-like tumor, about the size of a pea with a dark spot in the center, develops under the skin.

Mexican guides apply a lighted cigaret to the spot, the heat of which penetrates sufficiently to destroy the insect. Negro women remove the skin from the little ball with a fine needle, making pressure with the thumbs, squeezing out the sac of eggs; the cavity is then filled with snuff or tobacco. The unacclimated persons and all new-comers are especially subject to the attacks of the chigoe. Excruciating, violent inflammation and even gangrene have resulted from neglected chigoe-sores.

Vivigagua.—An ant that lives in the West Indies, chiefly in and about the sugar-cane fields. This insect bites with great fierceness, producing the impression that one has been pierced by a red-hot needle. There is no protection to be had from its onslaughts, or those of the ticks and *Diablito colorado*, except by carefully burning over the ground before camping, or using a liberal sprinkling of insect-powder, or of poke-root and borax mixed. A certain amount of immunity may be secured by wearing tight, closely-woven canvas leggings or high-topped boots.

Ticks.—Blood-sucking ticks bury the whole head in the flesh, and any attempt at removal leaves the head behind to create trouble.

The head should be removed with needle or knife and the wound subsequently dressed antiseptically. Turpentine applied to the rear end of the insect sometimes causes it to loosen its hold. Again, a drop of chloroform injected with a hypodermic syringe frequently brings about the same result.

Spiders.—Corrosive sublimate solution, 1:500 or 1000, and keeping the wounds constantly wet with the same, is advised. A liniment made of ordinary ammonia-water, olive oil, and laudanum, well rubbed over the bitten part, and a few drops of the ammonia water in a tumbler of water, if administered internally, is also useful. Guaco is a remedy of some repute. Ipecac paste or poultice proves a perfect specific. Any of the preparations recommended for mosquito-bites are also useful for spider-bites. In severe cases the local injection of a 5 percent solution of potassium permanganate may prove advantageous, the patient's strength being simultaneously sustained by means of strychnin and, if need be, stimulants. Strong coffee is considered valuable.

Scorpions.—Scorpions are peculiar to the tropics and subtropics, and are equally abundant in the Philippines, Canaries, Porto Rico, and Cuba. They generally hide under stones, fallen tree-trunks, in roofs, cracks in the walls, thatch and dark corners of deserted huts, and obscure parts of inhabited dwellings; they have an unpleasant way of hiding overnight in one's boots, stockings, or trousers. Scorpion-stings, though painful, are not dangerous to a person in good health, and are easily relieved by camphor, rum, lemon-juice, or solution of carbolic acid, though inflammation

may persist, sometimes with slight fever, for several days.

No specific has been found. As a means of overcoming the distressing, burning pain so common in scorpion-stings, chloral hydrate, used locally by rubbing into the affected part, proves most efficacious.

Cocain has been used with magic relief. One grain of the drug in from 10 to 15 drops of pure water is given hypodermically in the neighborhood of the bite. Camphorated chloral (equal parts of camphor and chloral hydrate) gives almost instant relief from the acute pain produced by the venom of the scorpion. For the collapse that supervenes in some cases, milk and brandy are recommended.

Aromatic spirit of ammonia in 30 minim doses in very hot water every half hour is a valuable remedy.

Centipede.—Its bite is about as venomous as the sting of the scorpion, and may prove serious in children and persons weakened by excessive fatigue, disease, and the inordinate use of alcohol.

The centipede in our country is harmless, and, in fact, as its aim is to destroy cockroaches and feed upon them, it may be regarded as a welcome visitor rather than as an enemy. The venomous species may be recognized by the legs, which are quite short, and each segment of the body bears a single pair of legs.

The treatment of centipede-bites is the same as that of the sting of the scorpion.

Snakes.—Venomous snakes are generally nocturnal or crepuscular or both, and when encountered during the daytime, their presence is due to accident. No venomous serpent will ever be found in or on a tree, and most of them have clubbed, instead of slender, tails. Rattlesnakes prefer, as a rule, the more dry, elevated, and stony districts.

Rattlesnake wounds are not so universally fatal as is popularly believed. The prevailing physiologic views are those of Weir Mitchell and Reichert, who consider that the blood is rendered uncoagulable, the blood-corpuscles being disintegrated through the destructive influence of the venom upon protoplasm. Blood-extravasation occurs as a result; there is profound depression of the respiratory nerve-center, medullary hemorrhage, etc.

The first step is to apply a ligature—a tightly tied and twisted cord or handkerchief—about the bitten part, and above the wound, and then as soon as possible seek the services of a medical man. As the poison exerts its chief effect upon the brain and nervous centers, every effort should be made to combat the two former and sustain the heart and respiration, which is best done by violent exercise. Not only will this sustain the heart and respiration, but it will tend to increase the cutaneous elimination of the toxic products. Alcohol, except when given by a medical man to stimulate and sustain a flagging heart and circulation, is detrimental rather than beneficial. Large drafts of strong coffee are, on the contrary, of great value.

Suction is considered dangerous by some observers. The dry cup instead of the mouth is preferable. Serious effects may follow in a person who performs suction of a poisonous wound.

Hypodermic injections of strychnin in large doses are useful. Its action is regular and prompt, and after a time ceases entirely, but it should not be employed until unmistakable symptoms of snake-poison are perceptible. The patient must be watched for 24 hours after the disappearance of the last symptoms, in order to be able to combat, in time, a sudden relapse.

The conclusions reached by Duke are that the hypodermic injection of strychnin is the only remedy to be relied upon; it must be carried out with boldness, but only after the symptoms of snake-poison have become pronounced. If a proper amount of snake-poison to counteract the strychnin is not present in the blood, the latter may itself cause death. If the patients are moribund when seen—*i. e.*, pulseless, and respiration has ceased—the intravenous method may be adopted. A remedy now considerably employed in the treatment of venomous bites is a 1 percent solution of permanganate of potassium.

Antivenene is serum taken from an immunized ass or a horse. If injected in sufficient quantity into persons bitten by snakes, it prevents the action of the venom of all snakes, provided intoxication is not too far advanced. It must be injected as soon as possible after the bite. Generally it is efficacious an hour and a half after the bite in adults. Usually, 2 1/2 fluidrams are sufficient for children under 10 years, and 5 fluidrams for adults. When the bite is that of a very dangerous species, it is advisable to give one single injection of a double dose at once. The wound is washed with a solution of hypochlorite of lime diluted to 15 1/2 grains to 2 fluidounces of water previously boiled. The dose of serum must be injected into the subcutaneous cellular tissue in the right or left side of the abdomen, and with the usual antiseptic precautions. Then, with the same syringe, 2 or 2 1/2 fluidrams of the 1:60 solution of hypochlorite of calcium are to be injected in the different parts surrounding the bite and into the bite itself. These injections are intended to destroy, in and around the wound, the venom that has not yet been absorbed. After these procedures the bandage may be removed from the limb, the patient rubbed, given coffee or tea, and warmly covered, so as to cause abundant perspiration. The administration of ammonia or alcohol must be avoided. Cases in which the use of chlorid of lime produced favorable results have also been reported. See Serum Therapy.

BLACK DRAUGHT.—See Senna.

BLACK DROP.—See Opium.

BLACK EYE.—This may be the result of traumatism directly to the lids or adjacent structures, or may be due to injury to remote parts, such as fracture of the orbit or of the lower skull. In the last case the hemorrhage does not appear until some time after the injury, and occupies particularly the edges of the upper lids.

Treatment is not absolutely necessary; the extravasated blood will disappear of itself in a few weeks. If the contusion is seen soon after the

injury, ice-cold applications should be ordered to prevent extravasation. If seen after the stage of effusion, hot compresses, lead-water and laudanum, or a pressure bandage, may be ordered. Incising very puffy lids is a bad practice, as the swelling soon disappears of itself, or, at least, on the application of heat and pressure. For cosmetic effect, the discolored lid may be painted a flesh tint.

BLACK VOMIT.—See YELLOW FEVER.

BLACK WASH.—See MERCURY.

BLACK-WATER FEVER.—See MALARIAL FEVERS (Hemoglobinuria).

BLADDER, ATONY AND PARALYSIS.—Both terms are applied to insufficient contractile power in the muscular coat to expel the contents of the bladder; but in atony the want of power is the result of loss of tone in the muscular fibers, while paralysis is due to the failure of nervous influence. Both conditions must be distinguished from the mere inability of the bladder to empty itself on account of obstruction to its outlet. See URINE (Retention).

Atony may be due to: (1) Simple overdistention (2) gradual distention owing to enlarged prostate or stricture; (3) cystitis.

Symptoms.—The patient complains of inability to hold his urine, or that it constantly dribbles away, or that he has to pass it very frequently. The involuntary flow occurs at first during sleep; afterward on any exertion causing contraction of the abdominal muscles. These symptoms, although often improperly spoken of as incontinence, are really those of retention, the bladder being fully distended, but unable to empty itself, and the excess flowing involuntarily away.

The treatment consists in passing a catheter at regular intervals, and as often as may be necessary to empty the bladder completely, while, in the meantime, the condition leading to the atony must be treated by appropriate measures. Thus, if the result of overdistention, strychnin and galvanism may be tried; if the result of gradual distention from enlarged prostate or stricture, these conditions must be treated in the way mentioned under their respective heads. In both paralysis, and atony, cystitis, dilatation of the ureters, pyelitis and disorganization of the kidney rapidly ensue if the cause of the bladder disturbance cannot be relieved.

True paralysis of the bladder is nearly always the result of disease or injury of the brain or spinal cord and does not occur except in general paralysis. The bladder, being paralyzed, cannot empty itself, and becomes distended as in atony; and when it can hold no more, the excess overflows through the sphincter, which is also paralyzed.

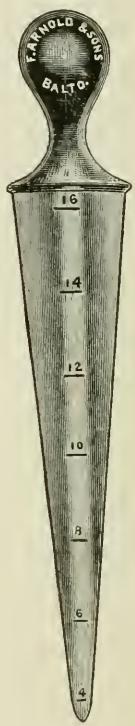
Reflex paralysis, however, often occurs after an injury or surgical operation, especially that for hemorrhoids. The local treatment consists in the regular passage of a catheter 2 or 3 times daily.

BLADDER, EXAMINATION.—In the female the bladder and urethra may be examined in the following manner: The woman is placed on the table in the lithotomy position, with the hips elevated 15 to 20 inches by means of pillows; the urine is drawn off with a catheter, and the urethra is anesthetized by the application of a solution of cocain, 10 grains to 1 fluidounce. The urethra is gently dilated—by the instrument shown in accompanying illustration—up to about 12 mm. The vesical speculum is next introduced; the obturator is withdrawn, and the examiner inspects the interior of the bladder by means of reflected or direct light. As the urine accumulates in the bladder, it is removed by means of small balls of absorbent cotton held in longtoothed-forceps. The elevated position of the hips allows air to enter the bladder as soon as the urethra is dilated, and thus the walls are separated, which permits thorough inspection of every part of the organ.

As the speculum is withdrawn, the walls of the urethra may be examined.

In the Male.—For inspection of the urethra and bladder see ENDOSCOPE and CYSTOSCOPE.

BLADDER,EXTROVERSION.—The malformation in which, in consequence of arrested development, the posterior wall of the bladder is pushed forward by the pressure of the abdominal viscera, and protrudes as a red, velvety tumor. It is associated with epispadias, and with failure of union of the pubic bones at the symphysis. The testicles are frequently retained. It is attended with extreme discomfort from the constant dribbling of the urine.



URETHRAL DILATOR; THE FIGURES INDICATE DIAMETER IN MILLIMETERS.

Treatment.—Many operations having for their object the closing-in of the bladder by flaps of skin taken from the adjacent abdominal wall have been performed. Various attempts have also been made to turn the ureters into the colon or rectum, but without success. Recently, Trendelenburg has succeeded in reducing the gap between the pubic bones by separating the sacroiliac synchondroses, so that he was enabled at a subsequent sitting to bring the margins of the mucous surface of the bladder in contact, and then to unite them by a plastic operation. The newly formed bladder is in this way lined with mucous membrane instead of having its front wall closed in by skin. The objection to the skin flap is the growth of hair into the bladder at puberty, and its incrustation with phosphates. If no operation is undertaken, a properly shaped urinal must be worn.

BLADDER, FOREIGN BODIES.—Under the head of foreign bodies in the bladder are included every kind of solid substance introduced into the bladder from without. Renal and vesical calculi are not included.

They are more common than would at first glance seem possible. Among them are included: (1) Various surgical instruments, such as portions

of catheters, sounds, bougies, or portions of any of the ordinary instruments used in operations within the bladder; (2) substances introduced through perverted sexual instinct into the bladder by way of the urethra; (3) projectiles thrown from firearms or cannon; and (4) foreign bodies entering the bladder by means of a fistulous opening from adjacent tissue or organs.

These foreign substances rarely become encysted, but usually soon become incrusted with the urinary salts, and thus form the center of a vesical calculus.

Symptoms.—The symptoms depend somewhat upon the mode of entrance, but if external or fistulous wounds are closed, they differ in no particular from those of ordinary calculus.

The diagnosis is greatly facilitated by the use of the cystoscope, but the presence of foreign bodies may be detected by the sound.

The treatment necessarily depends on the manner of introduction of the foreign body and the sex of the patient. In the female the urethra may usually be dilated sufficiently to allow the removal of the foreign body through the natural channels. In the male, extraction is performed by means of the lithotrite or cystoscopic forceps. In this way, pieces of catheters, bougies, threads, rubber and other small objects are in most instances readily removed. This procedure is contraindicated when the foreign body has become incrusted with salts or is so large that its withdrawal would injure the urethra. Under such circumstances suprapubic cystotomy is the proper procedure.

BLADDER, INFLAMMATION.—See Cystitis.

BLADDER, INJURIES.—The bladder may be injured by stab or gunshot wounds through the abdominal walls, the rectum, or the vagina; it has been punctured through the sacrosciatic foramen; it may be torn by one of the pubic bones in fracture of the pelvis, or wrenched from the triangular ligament by separation of the symphysis; it may be bruised to such an extent in parturition, or by the presence of the retroverted uterus, that the wall sloughs and gives way; and when it is distended, it may be ruptured by compression. If the tissues are healthy, the force necessary to effect rupture must be considerable; if, on the other hand, they are diseased in any way, it may be altogether insignificant; even muscular action is enough. Rupture of the bladder, therefore, is said to be either traumatic or idiopathic.

The most frequent cause of bladder injury is a blow upon the lower part of the abdomen, but rupture may be produced by contraction of the abdominal muscles, as in lifting heavy weights; and perhaps, for the same reason, by violence applied to the back. In one or two instances in which it has been due to a fall in a sitting position, it was probably the result of a sudden impact of the fluid against the base. The bladder must be distended, or it cannot be torn, though it may be punctured; and partly for this reason, partly because in alcoholism the protecting influence of the muscles is in abeyance, it is peculiarly likely to occur in drunken men. The rupture may be either intraperitoneal or extraperitoneal.

Symptoms.—The typical symptoms are the feeling as of something giving way, collapse, severe pain, inability to stand upright or walk, and desire, but want of power, to urinate. No one of these symptoms is invariably present, and the only evidence that can be relied upon is that obtained by passing a catheter; the bladder either contains only blood, or a small quantity of blood-stained urine. Collapse may be absent. Inability to urinate cannot be relied upon, for partial and even complete power has been retained, especially in extraperitoneal cases. Sometimes there is no pain; and, particularly when the accident has occurred during drunkenness, so that no history can be obtained, and it is merely a matter of conjecture whether the bladder was full at the time or not, the diagnosis may be a matter of the greatest difficulty, especially during the period when treatment is most valuable.

1. **Intraperitoneal Rupture.**—Immediately after the accident the bladder collapses, and the urine enters the peritoneal cavity, collecting at first at the lower part, but soon becoming diffused by the movement of the intestines. Healthy urine does not immediately give rise to peritonitis; the abdomen has been opened on several occasions, more than 24 hours after extravasation, without any evidence of inflammation. If, however, urine is retained, or if it comes from a bladder already inflamed, as when the wall of a sacculous slough or a cancerous ulcer gives way, peritonitis sets in within a very few hours, and becomes general, the abdomen becoming distended, the face pinched and drawn, and the pulse rapidly failing.

2. **Extraperitoneal Rupture.**—In this the urine is poured out either into the loose tissue that lies in front of the neck of the bladder, or behind, between the bladder and the rectum or the uterus. Sometimes there is a free exit, the perineum or the vagina or the rectum being torn as well. If there is no exit, the ordinary symptoms of extravasation of urine set in, and inflammation, followed by sloughing and septic poison, spreads rapidly into the iliac fossæ, the front wall of the abdomen, and even ino the scrotum, through the inguinal canal. Generally, the peritoneum becomes involved as well before the patient dies.

Prognosis.—Gunshot injuries are not so fatal as might be supposed; the urine escapes through the wound, and retention and decomposition are prevented. The same occurs when the bladder is wounded by foreign bodies pushed into it through the rectum or vagina, or when it sloughs in consequence of pressure during parturition. When there is no external wound or easy exit for the urine, it accumulates, decomposes, and acts as a virulent poison.

Treatment.—The first indication is to remove the urine that has already escaped; the second is to close the rent in the bladder so as to prevent further extravasation. The patient is placed under an anesthetic; a rubber bag is introduced into the rectum to raise and fix the floor of the bladder; and an incision made in the middle line, ending just below the upper border of the pubic symphysis. The extraperitoneal portion of the

bladder is examined first by gently pushing the folds of peritoneum upward. If there is no extravasation of blood there, or evidence of bruising, the peritoneal cavity itself is laid open and the rest of the bladder carefully examined. If there is a rupture, the edges are steadied and drawn forward by hooking up the nearer end with a blunt and rounded retractor (a suture is unnecessary, and only inflicts further injury), and then a series of Lembert sutures passed close together, commencing in the sound tissue beyond each end of the rent, being careful to avoid including any of the mucous membrane. Grieg Smith recommends a double row, one to transfix the cut muscular surface, the other (Lembert's) outside this; and that all should be passed before being tied. The intestines are held back out of the way, in the meantime, with a soft, flat sponge. Then the abdominal cavity is cleared of all blood-clot and urine that may have found their way in, and irrigated either with warm water—temperature, 100° F. (37.7° C.)—or with a dilute solution of some nonpoisonous antiseptic. The wound should be closed in the usual way, introducing a drainage-tube only when peritonitis is already present. If there is any doubt as to the security of the sutures in the walls of the bladder, they may be tested first by distending the cavity, with milk, through a catheter. Silk is the best material, and the sutures should not be more than 1/8 of an inch apart; catgut, even if it were as certain, is difficult to knot securely when the wound lies deep in the cavity of the pelvis. In one or two cases the difficulty has been so great that it was necessary to make a short transverse incision through the peritoneum on each side.

After the operation the bag in the rectum is emptied and withdrawn, a suppository or a hypodermic injection of morphin given, and the patient kept warm and quiet in bed, receiving no food but a small quantity of ice to suck or a few teaspoonfuls of milk. At first there is very little urine secreted, and if the sutures are sufficiently closed, there is no need to pass a catheter, much less to tie one in or to perform cystotomy; the bladder is able to empty itself without risk.

Extraperitoneal rupture must be treated on the same principles. If the rent can be secured from the front, an opening should be made over the pubes, and Lembert's sutures passed as before; but as it is impossible to remove the urine from the loose cellular tissue around the bladder, the abdominal opening should not be closed and a large drainage-tube should be inserted. Wounds involving the rectum or vagina, if not very large, may remain untreated for a time; very frequently they close in or contract so that the resulting fistula is much smaller. Wounds in other parts are usually complicated by other injuries (Moullin).

BLADDER, PARACENTESIS.—This may be needed either as a temporary measure, to give relief until the natural passage can be reopened, or as a permanent means of exit in impermeable stricture or enlargement of the prostate. It may be performed either over the pubic symphysis, through the perineum (going either through or behind the prostate), or through the rectum. Of these three methods, the first named is the only one recognized at present. In exceptional instances when, as in cases of extravasation of urine or advanced cystitis, the object is rather to drain the bladder than to relieve retention, the prostatic portion of the urethra may be opened in the middle line, at the apex of the gland (*la boutonnière*); and sometimes this is done in case of stricture (Cock's operation).

Suprapubic Paracentesis.—This may be performed either with an aspirator or with an ordinary, but somewhat curved, trocar and cannula. When the bladder is distended, there is abundant room, but, especially in old cases of cystitis, the posterior surface of the symphysis must always be followed. If the relief required is only temporary, the aspirator may be used, a small incision being made in the skin with a scalpel, and the trocar pushed through it into the bladder, downward and backward. No extravasation follows, as the mucous membrane glides upon the muscular coat when the bladder collapses, and the orifice becomes valvular. If necessary, this may be repeated 2 or 3 times without much danger; but if it is continued, there is always a risk, either of leakage taking place through the wall of the bladder or, without any direct opening being present, of an abscess forming in the loose cellular tissue, between the layers of the transversalis fascia, possibly due to the escape of irritating material from the end of the cannula as it is withdrawn.

When a permanent opening is required, a large trocar (with a linear, not a triangular, cutting-edge) and cannula may be introduced in the same way. On withdrawing the trocar, a soft india-rubber tube is passed down the cannula, and left when this is removed. The other end of the tube may be carried under the bed clothes to a receptacle. After a few days the tissues become consolidated and form a short, straight canal, which can be fitted with a rubber tube and stop-cock. Owing to the contraction of the sinus there is no leakage.

In exceptional cases, after suprapubic cystotomy for enlargement of the prostate or tumor of the bladder, the opening has been allowed to contract to a sinus and the same arrangement made use of.

BLADDER IN PREGNANCY.—Certain diseases of the bladder and abnormalities of the urine at times complicate pregnancy; the most important are the following:

Irritability of the Bladder.—This is a frequent complication of early pregnancy. It is purely functional in character, and is caused by pressure of the gravid uterus. Occasionally it may be neurotic.

If **treatment** is demanded, it should consist in the administration of nerve sedatives, such as the bromids and chloral. If the condition is due to a displacement of the uterus, this should be corrected.

Retention of Urine.—This usually occurs in the early months of gestation, and is caused by a retrodisplacement of the uterus; occurring later, during the last month of pregnancy, it may be due to pressure caused by the descent of the presenting

part of the child and lower uterine segment into the pelvis (subsidence of the uterus).

As the urine accumulates in the bladder, it is gradually expelled drop by drop through the urethra. This is called the *incontinence of retention.*

Treatment should consist in relieving the cause as quickly as possible; a backward displaced uterus should be replaced; later in pregnancy an abdominal binder may relieve pressure and thus do good. Sometimes catheterization becomes necessary; this should be done under the strictest aseptic precautions.

Vesical Hemorrhoids.—This condition is due to pressure upon and engorgement of the pelvic blood-vessels. As a rule, no symptoms arise unless rupture of a small vessel occurs, when hematuria will be present. If this should become annoying, rest in bed, free purgation, and the administration of gallic acid by the mouth (20 grains) 3 times daily will usually effect a cure. Occasionally it may be necessary to irrigate the bladder with some astringent solution.

Vesical Calculi.—These may be present before, or they may originate during, pregnancy.

It is important that they be recognized and removed before labor, as otherwise a vesicovaginal fistula may be formed from sloughing of the tissue compressed between the calculus and the advancing head.

Cystitis.—This is a somewhat rare complication of pregnancy. Its causes, symptoms, and treatment are the same as in nonpregnant patients.

Albuminuria.—This occurs in about 6 percent of all pregnant women. See NEPHRITIS OF PREGNANCY.

Glycosuria.—This is a rather common affection, occurring in from 15 to 50 percent of cases. Usually it is lactose absorbed from the breasts, and is therefore found just before and after labor. Diabetes mellitus may occur, being intensified in all its symptoms and frequently producing abortion.

Treatment should consist in the ordinary management of these cases uncomplicated by pregnancy, aided by the induction of abortion should the patient's condition become critical.

Polyuria, lipuria, chyluria, peptonuria, and **hematuria** may occur, but their pathologic significance is slight, and treatment is, as a rule, not demanded.

BLADDER, RUPTURE.—See BLADDER (Injuries).

BLADDER, STONE.—**The causes** are not entirely known, but residence in certain districts or countries, poor living, abuse of alcohol (especially in the form of malt liquor), excess of nitrogenous food, want of sufficient exercise, and anything that induces the excessive formation of uric or oxalic acid in the urine are regarded as predisposing causes. Retention of urine from prostatic enlargement and the presence of a foreign body in the bladder are exciting causes. In a few cases a nucleus has been formed for a calculus by a piece of necrosed bone that has reached the bladder from a fractured pelvis or carious spine.

Varieties.—The three most common varieties of calculi found in the bladder are the uric acid, the oxalate of lime, and the phosphatic. They may occur almost pure or they may be mixed. According to Sir Henry Thompson, the uric acid and urates form one-half of the number met with; the phosphatic, one-fourth; the mixed, one-fourth; and the oxalates only 3 percent of the whole. A description of the various forms of calculi is given under the head of URINARY CALCULI (*q. v.*).

The character of the stone may to some extent be determined by the state of the urine. Thus, if the urine is acid, it will probably be either oxalate of lime or uric acid; if alkaline, phosphatic. Calculi vary in size from that of a hemp-seed to a large mass weighing many ounces.

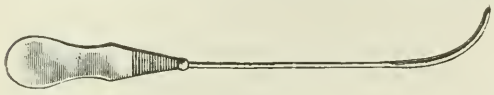
The calculus may be variously situated in the bladder. It is usually free just behind the prostate, but it may be in the upper fundus behind the pubes, or in one of the sacculi so often found in long-standing diseases of the bladder (encysted). Calculous matter may sometimes be deposited upon growths in the bladder or upon the ulcerated mucous membrane.

The Terminations of Stone.—If neglected, cystitis may set in, and inflammation may spread up the ureters to the kidney. In consequence, moreover, of the obstruction to the urinary outlet, the bladder may become hypertrophied, and the ureters and kidneys dilated.

Symptoms.—The three chief symptoms are: (1) Pain generally referred to the end of the penis, and worse after micturition, on account of the stone then falling on the sensitive trigone and the walls of the bladder contracting upon it; (2) frequent micturition; and (3) a little blood in the urine. These symptoms are increased on exercise, especially riding, and after the jolting of a railway journey, etc., and are least marked at night, when the patient is at rest. Other symptoms that may be present are the passage of gravel; sudden stoppage of the stream during micturition; the presence of mucopus in the urine owing to cystitis; piles in adults and prolapse of the rectum in children, due to straining; and elongation of the prepuce in boys, caused by the constant handling to relieve pain after micturition. Stone in the bladder may be simulated by cystitis, an enlarged prostate, a long or adherent prepuce, a narrow meatus, a growth in the bladder, calculous or other disease of the kidney, a peculiar choreic condition of the bladder, tubercle of the bladder, and ascarides in the rectum. An accurate diagnosis, however, can only be made by sounding the bladder, though in boys the stone may be felt by the finger in the rectum while pressure is made with the other hand above the pubes.

Sounding the Bladder.—The ordinary sound is a solid steel instrument with a short, bulbous beak. Thompson's sound is hollow, to allow some of the urine to be drawn off if desired, and has a handle like that of the lithotrite, to facilitate the necessary movements in the bladder. Having warmed and oiled the sound, pass it like a catheter, letting it glide into the bladder by its own weight without using any force. When the sound is in, gently push it onward to examine the posterior part of the bladder. Then turn the beak alternately to

either side, and depress the handle between the patient's thighs to search the upper fundus. Then turn the beak downward to examine the base or lower fundus. If the stone is not detected, allow a little of the urine to escape, or change the patient's position, or raise his pelvis and make an-



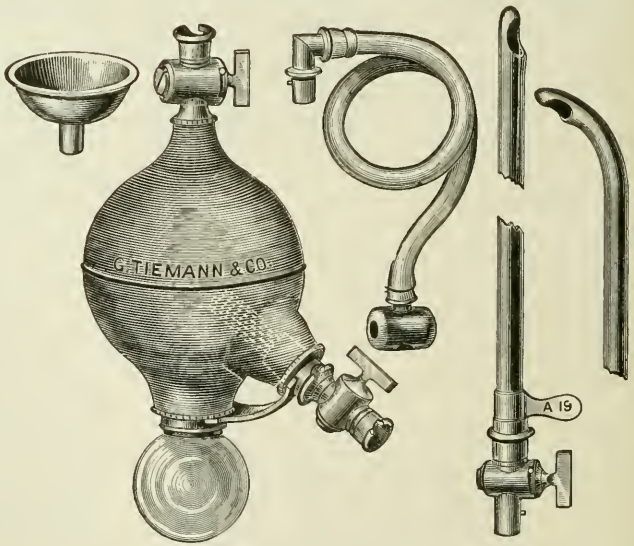
Stone Sound.

other effort. The stone may not be felt because of its small size, or because it has become encysted or entangled in a fold of mucous membrane. A guarded opinion, therefore, should be given, and a further examination made at a future time. A stone may be known to be present by the peculiar ring that is both felt and heard on striking it. This ring is quite unlike the sensation given to the sound by its coming into contact with phosphatic deposits on a roughened or fasciculated bladder, or with one of the pelvic bones. Having discovered a stone, the next care should be to determine approximately (1) its probable size and composition, (2) whether it is free or encysted, (3) whether there is one stone or more, and (4) the condition of the bladder and urethra. (1) The *size of the stone* may be roughly estimated by the amount of resistance offered on pushing it before the sound or by passing the sound over it, and by feeling it through the rectum with the other hand pressing on the hypogastrium. Its exact size can only be ascertained by seizing it with the lithotrite, the distance the blades are then apart being indicated by the scale on the handle. The *composition of the stone* may be approximately determined by (*a*) the character of the ring on striking it—the clearer the ring the harder the stone; (*b*) the condition of the surface, which is rough in the oxalate of lime, smooth in the phosphatic; (*c*) the reaction of the urine; and (*d*) the general health of the patient. (2) A *stone, when encysted,* is always felt at the same point in the bladder, and when seized with the lithotrite, cannot be moved. The sound cannot be passed all around it. There is no blood present, and the symptoms are usually less severe, and are not increased by exercise. (3) The *presence of a second stone* can only be determined with certainty by seizing one stone with the lithotrite and then striking the other (Walsham).

Treatment.—The stone may be removed by crushing (*lithotrity*) or cutting (*lithotomy*). In adults lithotrity, with but few exceptions, should be the rule. In children up to 12 or 14 years of age, lithotomy has hitherto been the recognized operation; even in very young children lithotrity, as in adults, will also be the rule, lithotomy, the exception. In adults lithotomy should be practised in place of lithotrity only when (1) the stone is very large and hard; (2) when the urethra is the seat of intractable stricture; (3) when the stone is encysted; and (4) when the bladder is sacculated. The conditions, however, most favorable for success in lithotrity are, as well expressed by Sir Henry Thompson, "a capacious urethra, a bladder capable of retaining 3 or 4 ounces of urine, absence of ordinary signs of renal disease, and fair general health."

Bigelow's Lithotrite.

Lithotrity, litholapaxy, or **Bigelow's operation** consists in crushing the stone in the bladder, and removing the *whole* of the fragments through a large evacuating catheter. To the late Professor Bigelow is undoubtedly due the credit of having enunciated the principle that the bladder is not so intolerant of instruments as was formerly supposed,



Bigelow's Evacuator.

and that it was to the presence of the fragments, rather than to the lithotrite, that the irritation, cystitis, etc., so common after the old method, should be ascribed.

The operation, as described by Walsham, is as follows: The patient having been prepared for the operation by careful attention to the general health, rest, and such local means for allaying

chronic cystitis as were pointed out under that head, should be placed under an anesthetic, with the pelvis raised a few inches, the thighs slightly apart, the knees supported on a pillow, and the body and legs well wrapped up in blankets to avoid a chill. The rectum should be emptied by a purge the day before, and by an enema on the morning of the operation. A few ounces of urine in the bladder are desirable. If necessary, incise the meatus (a stricture, if present, should have previously been dilated), warm and oil the lithotrite (Forbes' is by far the best instrument), and pass it with gentleness, letting it glide by its own weight through the spongy and membranous portion of the urethra, and do not depress the handle until the blades have reached the prostate. Then bring the shaft to an angle of 35° with the horizon, and it will glide through the prostatic urethra, over the trigone of the bladder, and may possibly be felt to graze the stone. The blades now rest in the lowest part of the bladder and point upward. Hold the handle tightly with the left hand, and, without moving the instrument, open the male blade by drawing out the wheel-shaped end with the right hand. Pause a few seconds to allow the currents set up in the urine by this movement to subside. Then gently press in the male blade, and the stone will probably be caught. If so, continue the pressure on the wheel to retain the stone between the blades, while the button is moved by the thumb to convert the sliding into the screw movement. Rotate the instrument slightly to make sure that the mucous membrane is not caught by the blades; depress the handle slightly to raise the blades from the walls of the bladder, and screw home. The stone will probably be felt to crack and break into fragments. If the stone cannot be seized in this way, systematically explore the bladder thus: Open the blades and rotate 45°; pause and close. Do this first to the right, then to the left. Then raise the blades slightly by depressing the handle; rotate alternately to right and left 90°; raise the blades further and rotate 135°. Finally, reverse the blades by rotating half a circle. In this way the stone will probably be found. In these maneuvers the blades should be opened before rotating them, in order that the stone may not be displaced by the male blade, and after rotating, a pause should be made before closing them to allow the currents to subside. Having crushed the stone and larger fragments, withdraw the lithotrite, first screwing tight home to insure complete closure of the blades, in order to prevent laceration of the urethra. Next introduce a large evacuating catheter (No. 16, or larger); let the urine escape, and inject 2 or 3 ounces of warm water. Attach the aspirator, previously filled with water at a temperature of 98°, and compress the india-rubber bulb, driving some of the water into the bladder. Let the bulb expand and the outward current will bring away some of the fragments and débris, which will fall into the receiver and be prevented from returning into the bladder by the trap on again compressing the bulb. Continue compressing and relaxing until fragments cease to come away. Then, if any are felt by the evacuating catheter, reintroduce the lithotrite, or a smaller one, and crush again and aspirate as before, repeating this *until all the fragments are removed.* The operation frequently lasts from an hour to an hour and a half or longer.

After-treatment.—Opium, if no serious kidney-disease is present, may be given; and hot hip-baths if there is much pain. If there is retention, the catheter should be used at regular intervals, or tied in if its passage causes much irritation and pain. Complete rest in bed for a few days or longer should be enjoined. If cystitis follows the operation, Sir Henry Thompson strongly recommends a weak injection of silver nitrate (1 grain to 1 fluidounce). As a rule, however, no after-treatment is required, even in young boys.

After-complications.—(1) Rigors and fever; (2) retention of urine; (3) acute cystitis; (4) prostatitis and abscess, and (5) orchitis and epididymitis, occasionally occur. More rarely, (6) hemorrhage; (7) suppression of urine, and (8) phlebitis of the prostatic plexus of veins, followed by pyemia. The impaction of a fragment of the calculus in the urethra (formerly common when the fragments were left in the bladder) cannot occur if the bladder has been thoroughly evacuated.

Causes of Death.—Death may occur from (1) acute nephritis, (2) pyelitis, (3) cystitis, (4) perforation or rupture of the bladder, (5) peritonitis, (6) sapremia or pyemia, or (7) exhaustion. A fatal termination is rare, except when there is some chronic kidney-disease.

Lithotomy, or cutting for stone, may be performed through the perineum or above the pubes. Perineal lithotomy is a slovenly and uncertain procedure, rarely practised at the present time. When a cutting operation is deemed advisable, it is best to resort to suprapubic lithotomy, which permits an adequate survey of existing conditions.

Suprapubic lithotomy consists in opening the bladder between the pubes and the peritoneal fold. It is the method that should be employed for the removal of very large stones, and for certain forms of tumor in the bladder. First, pass a Petersen's india-rubber bag into the rectum and dilate it with water, and distend the bladder with a weak antiseptic solution; it will then rise well into the abdomen and appear as a prominent tumor, dull to percussion above the pubes. Make an incision in the middle line immediately above the symphysis, and having divided with scissors the tissues forming the linea alba, expose the wall of the bladder by gently separating the fatty tissue that lies in front of it with the finger or director, avoiding the peritoneal fold, and, if possible, the large veins that ramify in this situation. The bladder having been fixed by inserting a sharp hook into its walls, make an incision into it; introduce the finger to ascertain the size of the stone; enlarge the wound, if necessary, by cutting toward the pubes, and extract the stone with the finger and scoop or with the forceps. After the removal of the calculus, the bladder is washed with silver nitrate solution and closed either entirely or with the exception of a small opening. If hemorrhage was not severe

and the bladder not badly infected it is better to close it completely and insert a retention catheter through the urethra.

BLADDER, TUBERCULOSIS.—Vesical tuberculosis is very intractable. It may be primary. or secondary to tubercle in other parts of the genito-urinary tract, especially the testicle and prostate. It is most often met with in boys and young adult males. The tubercle which is deposited in the submucous tissue soon caseates, leading to small multiple circular ulcers with undermined edges. There is pain, hemorrhage, irritability of the bladder and other signs of chronic cystitis; but the diagnosis will depend on the exclusion of other diseases such as stone, tumors, etc., and the presence of tubercle in other organs, and of the tubercle bacillus in the urine. With the cystoscope the ulcers may be seen especially in the area of the trigone. The general constitutional remedies for tubercle should be employed, together with such local remedies as are indicated for cystitis and for the assuaging of the pain. Iodoform emulsion may be injected into the bladder or lactic acid up to 20 percent. Guyon recommends instillations of bichlorid of mercury from 1:10,000 to 1:1000, and Rovsing employs injections of carbolic in the strength of 6 percent, using 50 c.c. These failing to relieve, suprapubic cystotomy may be done and the bladder washed out, and such caseous masses of tubercle as permit of it scraped away. In the female this may be done through the dilated urethra. Tuberculin is being used, both administered generally and injected into the bladder, with varying results.

BLADDER, TUMORS.—The tumors found in the bladder are: (1) *The fibrous*; (2) *the mucous*; (3) *the villous* or *papillomatous*; (4) *the malignant. The fibrous* and *mucous* spring from the submucous coat, and protruding the mucous membrane in front of them, assume a polypoid or warty shape. They are very rare. *The villous* or *papillomatous* spring from the mucous membrane, and appear as soft, flocculent growths resembling the villi of the chorion. They are the most common of the innocent growths. *The malignant* spring either from the mucous or the submucous coat, and may form a large mass, often nearly filling the bladder, or assume a villous appearance or merely infiltrate the walls. They have either a carcinomatous or a sarcomatous structure.

The symptoms common to all are those of a foreign body in the bladder, with hematuria and absence, on sounding, of stone. In using the cystoscope a measured quantity of fluid should be left in the bladder, which should be previously irrigated if the urine contains blood or pus, until the fluid returns clear. See Cystoscope.

Treatment.—The removal of the tumor, unless it is malignant, or is causing very little trouble, should generally be attempted. This may be done either through the operative cystoscope or through a suprapubic incision. If the pedicle of the tumor can be reached, the former method is preferable, provided of course that the services of a skilled cystoscopist are available. When suprapubic cystotomy is performed the growth may be removed by the cold wire or galvanocautery loop or by forceps, or may be burned off by the acutal or galvanocautery. Tumors infiltrating the anterior wall, if not too large, may be removed by raising the peritoneum, excising the growth with the infiltrated wall, and uniting the edges of the wound with sutures. When removal is contraindicated, relief, when there is obstruction to the urinary outlet, may be obtained by suprapubic puncture; hemorrhage should be restrained by astringents, and pain assuaged by opium.

BLADDER, ULCERS.—These may be due to tuberculosis, cystitis, injury, burning with the cystoscope, or malignant growths. Under the heading *simple ulcer* there has been described a solitary ulcer usually situated at the base of the bladder. It is most frequent in anemic women, occasionally perforates, and has been compared to a peptic ulcer. The **symptoms** of ulcer of the bladder are those of chronic cystitis, the diagnosis being made by the cystoscope. The **treatment** is that of chronic cystitis. Ulcers have been curetted and local applications made through an operating cystoscope. In progressive cases the bladder should be opened, the ulcers curetted and cauterized, and drainage established; perforation is treated in the same way as rupture of the bladder. See Bladder (Injuries).

BLASTOMYCOSIS.—A chronic infectious inflammation especially of the skin due to a yeast fungus, the blastomyces. The cutaneous lesions begin as small papules and become pustular. Secondary involvement of various organs may result. The lungs may be infected primarily by inhalation of the fungus. The symptoms are mainly respiratoy in the generalized type of the disease. The infection runs a protracted course, lasting 10 to 12 years as a rule.

Diagnosis is made by examination of the pus under the microscope.

Prognosis is good in the cutaneous type if treatment is begun early, 3 to 12 months sufficing for a cure. In the systemic type the prognosis is grave.

Treatment consists in large continuous doses of potassium iodid (1 to 1 1/2 drams daily) and local antiseptics, radium, the X-rays, and excision of subcutaneous abscesses. A vaccine made from autogenous filtrate has been used in a few cases, with apparently good results.

BLAUD'S PILL.—A pill of iron carbonate made by mixing about 2 1/2 grains of ferrous sulphate for each pill with potassium carbonate, sugar, tragacanth, althea, glycerin, and water. The dose is 1 or 2 pills after meals. It is largely used in amenorrhea and in the various forms of anemia. See Iron.

BLEACHING.—The most important bleaching agents are the following. *Acids:* hydrochloric, nitric, sulphuric; *carbonate of potassium* (K_2CO_3)—its value depends upon the percentage of carbonate it contains; *caustic soda* (Na OH), a coarse white powder; *chlorid of lime*, a white powder with a chlorinous odor—it is the most important of all; *hydrogen dioxid* (H_2O_2), a colorless, odorless liquid—it is called "Golden Hair-dye;" *permanganate of*

potassium ($K_2Mn_2O_8$); *soaps*—tallow, rosin, and olive oil; *soda ash* (Na_2CO_3)—its value depends on the amount of Na_2O it contains; *soda crystals* ($Na_2CO_3.10H_2O$).

BLEEDERS.—A popular term for those who are subjects of the hemorrhagic diathesis. See Hemophilia.

BLEEDING.—The artificial abstraction of blood from the body. When local or topical, it is done by **scarification, cupping,** and **leeching,** and is useful in certain inflammatory conditions, particularly about the eye and ear. When general, it is done by **venesection** or **phlebotomy,** and **arteriotomy.** Bleeding reduces the heart's action and diminishes the quantity of the blood in vessels.

In the early stages of pneumonia and other acute inflammation in which there is a strong, full pulse, blood-letting is very serviceable if done early. In apoplexy, except when the heart is enfeebled, it is serviceable. In eclampsia and venous engorgement, in uremia, in plethora, and in peritonitis when vigor is maintained, in pleurisy, in uremic asthma and in spasmodic bronchial asthma, in emphysema, in disorders of menstruation, in shock, fever and sunstroke, it has its uses. It is necessary always to bear in mind the age, the sex, the general temperament and condition of the individual in considering the expediency of blood-letting. The very young, the old, the feeble, and the cachectic do not bear it well. Hemophiles are a dangerous class to bleed. See Cupping, Leeching, Venesection.

BLENNORRHAGIA.—See Gonorrhea, Vaginitis.

BLEPHARITIS.—An inflammation of the free edges of the eyelids.

The synonyms are blepharitis simplex, blepharitis marginalis, blepharitis ciliaris, blepharitis ulcerosa, blepharitis hypertrophica, blepharadenitis, ophthalmia tarsi, tinea tarsi, sycosis tarsi, and eczema of the lid-edges.

Causes.—Uncorrected ametropia; some inflammatory process, such as conjunctivitis, keratitis, etc.; inflammation of the roots of the cilia; or the condition may be the result of strumous diathesis. The disease is said to accompany general disturbances of the sexual organs and syphilis. Lice are sometimes a cause. There is also reason to attribute it to special bacteria. Dirty children are very susceptible to blepharitis. Continued eye-strain undoubtedly lies at the bottom of many obstinate cases. Obstruction of the lacrimal apparatus is a cause not to be overlooked.

Symptoms.—The lid-edges are swollen and reddish, and may cause intolerable itching and soreness. There is a gummy and yellowish secretion in the lashes and on the skin near the lid-edge, which, when dried, deposits as scabs and crusts. The lids are glued together after being closed for some time, particularly in the morning. The eyes tire easily. Eczema may be present about the lid-edge, and possibly in other parts of the body. The cilia are often dwarfed or entirely absent, causing a disagreeable disfigurement. In the hypertrophic variety the lids may be everted, exposing the puncta lacrimalis and causing the tears to overflow, thus keeping up the condition, and, indeed, aggravating it, as the edge of the lower lid soon becomes water-soaked. The most annoying **sequel** of blepharitis is trichiasis, a condition in which the lashes become misplaced and scratch the cornea, and which leads to actual entropion.

Treatment.—As this is a frequent affection, it is well to thoroughly discuss the treatment. These cases are sometimes very obstinate, and despite all efforts at relief they cause the patient long years of discomfort, and produce a most annoying facial blemish. First of all, search for one of the causes enumerated. It is advisable to examine the refraction of the affected eyes, and be sure that the lacrimal apparatus is unaffected. Treat any possible cause. All the scales should be removed and the lid-edges kept clean and fresh. For this purpose warm water or a weak boric or bichlorid solution (1:5000) should be used. In the eczematous variety bichlorid in itself is an efficient remedial agent. The local treatment by massage, with a weak Pagenstecher ointment, is probably the best at our command. Ulcers may be painted with a 2 percent solution of nitrate of silver. The treatment of the trichiasis consists in epilation of the distorted cilia, their destruction by electrolysis, or operation. Disease of the conjunctiva and cornea should be treated simultaneously with the blepharitis.

℞. Yellow oxid of mercury, gr. j
Vaselin, ʒ iij.
Rub up well and put in a collapsible tube. Use at bedtime.

BLEPHAROPHIMOSIS.—See Eyelids.

BLEPHAROSPASM.—A spasmodic contraction, clonic or tonic, of the orbicularis, often affecting both eyes. In its mildest form it consists of fibrillary twitchings which may result from overexertions of the eyes or eye-strain. It is observed at times after the instillation of eserin. It is generally reflex, from irritation of the conjunctiva or cornea by a foreign body, or from inflammation of some kind in these regions. It is a disagreeable accompaniment of corneal ulcer. Often the irritation caused by an inverted eyelash is the cause of the trouble. Photophobia often leads to blepharospasm. If no local cause is discernible, ametropia is frequently the cause, or some reflex from a distant irritation, such as a decayed tooth. The spasm may be of central origin.

Treatment of the cause is the only way to attack the spasm. Pressure on the facial nerve at its exit at the styloid foramen is said to stop the spasm. Galvanism is useful. By all means examine the refraction. To examine the eyes of a child with corneal disease and consequent blepharospasm, it is sometimes necessary to plunge the face under cold water, or even to partially anesthetize.

BLINDNESS, CAUSES.—Partial or total loss of vision may result from toxic agents such as tobacco, lead, alcohol, quinin, salicylates, uremia, diabetes. Migraine and hysteria or severe hemorrhages may be responsible. Traumatism is some-

times the cause. The loss of sight may be found in one eye alone due to disuse by reason of high compound astigmatism or strabismus. Blindness is also due to corneal opacities, cataract, intraocular hemorrhage, disease of choroid and retina, neuroretinitis, retrobulbar optic neuritis, optic atrophy (which may be due to cerebral disease, pressure from tumors, embolus). The chief cause of blindness in children is ophthalmia neonatorum.

BLINDNESS, TESTS.—Hysteric amblyopia is not uncommon, but many cases so diagnosed are properly the sequence of asthenopia. Malingering by the declaration of amblyopia, or blindness, is usually found in insurance examination and in military life, and often to procure damages after alleged injuries. Many ingenious devices have been adopted to expose the simulant, all depending upon the fact that in ordinary visual perception there is no account taken of the exact participation of the two eyes. If a book is held before the patient's eye and a pencil is interposed in front of the eye supposed to be active, the reading will be slightly interrupted if the other eye is amblyopic; if, however, the amblyopia is feigned, the other eye will escape the pencil and the reading will be uninterrupted. Another way is to interpose a highly convex lens in front of the eye supposed to be well, and if test-type is removed beyond the focal distance of the lens and is still legible, we know that the other eye participates in vision. The production of double images by the interposition of prisms also proves binocular vision. Still another method depends upon colored letters placed upon a dark background, which cannot be seen through glasses of complementary colors. A person looking at green-blue letters on a dark ground through a red glass over the sound eye, and a white or green glass over the alleged blind eye, will be unable to see the letters if the allegation is true. See COLOR-BLINDNESS, FIELD OF VISION.

BLISTERS.—See COUNTERIRRITATION.

BLOOD, EXAMINATION.—**The specific gravity** varies from 1050 to 1060.

The constituents of the blood are the plasma (serum and fibrin) and the corpuscles and plates.

The red corpuscles (**erythrocytes**) are the oxygen carriers, and are present in healthy males to the number of about 5,000,000 to the cubic mm., and in females to the number of about 4,500,000.

The white corpuscles (**leukocytes**) number from 7000 to 9000 to the cubic mm. They are classified as follows: (1) **Large** polymorphonuclear neutrophiles (about 65 percent); (2) **small** lymphocytes (about 25 percent); (3) large lymphocytes and **transitional forms** (about 5 percent); (4) eosinophiles (0.5 to 5 percent); (5) basophiles, "mast" cells (0.1 to 0.5 percent). The last three forms are so called by reason of small bodies contained within them which have an affinity for eosin stains (**eosinophiles, acidophiles**), or for neutral violet stains (**neutrophiles**), or for basic anilin stains (**basophiles**). The basophile cells contain both coarse and fine granules. Pathologic blood may contain, in addition to the above in altered proportions, neutrophile myelocytes, eosinophile myelocytes, and basophile myelocytes. For detailed descriptions of the various types of leukocytes, the reader is referred to text-books on hematology.

The blood-plates occur in grape-like arrangement in masses to the number of 200,000 to the cubic mm.

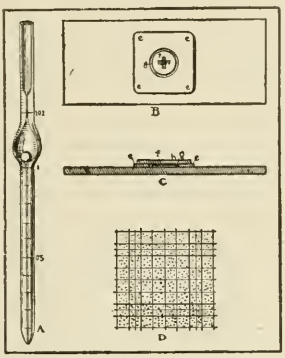
Diminution of the red corpuscles occurs in pernicious anemia, secondary anemia, leukemia, severe hemorrhage, advanced malignant disease, etc. This condition is known as **oligocythemia**, and may be so extreme as to show but 500,000 red corpuscles to the cubic mm. The opposite condition, **polycythemia**, sometimes occurs in health and forms part of a symptom-complex with cyanosis and splenic enlargement. (See POLYCYTHEMIA.) The red cells may number as much as 9,000,000.

Leukocytosis—increase of white corpuscles (especially of the polymorphonuclear form)—may be physiologic or pathologic. *Physiologic leukocytosis* occurs (1) during digestion; (2) after exercise, massage and cold bath; (3) during pregnancy; (4) in the new-born. *Pathologic leukocytosis* is observed (1) after hemorrhage; (2) in cachectic states, as certain forms of anemia, especially leukemia, carcinoma and sarcoma. In **leukemia** the increase is **permanent** and may be as high as 200,000 to the cubic mm. (4) Immediately before death, agonal leukocytosis, if death does not occur suddenly. (5) In **toxic conditions**, such as uremia, cholemia, prolonged chloroform or ether narcosis, ptomain poisoning, gas poisoning, quinin poisoning, and following the injection of tuberculin, thyroid and other animal extracts, and the intravenous injection of saline solution; and after the administration of certain drugs as antipyrin, salicylates, pilocarpin; (6) inflammation and suppuration.

Inflammatory leukocytosis is generally present in the following diseases; Lobar pneumonia, pericarditis, empyema, acute articular rheumatism, erysipelas, acute ulcerative endocarditis, cerebrospinal-meningitis, typhus fever, relapsing fever, Asiatic cholera, bubonic plague, yellow fever, and in septicemic and pyemic conditions; follicular tonsillitis, diphtheria, scarlet fever, small-pox; actinomycosis, trichiniasis, glanders, secondary syphilis; appendicitis, cholangitis and cholecystitis, empyema of the gall-bladder, acute pancreatitis, gonorrhea, abscesses, osteomyelitis; and in a number of inflammatory skin diseases; in herpes zoster, pellagra, etc. Leukocytosis usually signifies some pyogenic infection. In general, it represents the reaction of the individual to the disease. If the patient's resistance is poor, or the toxemia is intense, or the infection a very mild one, leukocytosis may be wanting.

Leukopenia.—The number of leukocytes is normal or diminished in malnutrition or starvation, and in certain infections and toxemias. Among these are typhoid fever, paratyphoid fever, Malta fever, malaria, influenza, measles, miliary tuberculosis and other forms of tuberculosis if unaccompanied by suppuration; pernicious anemia, splenic anemia, Hodgkin's disease, and following the continued use of certain drugs such as atropin, cocain, camphoric acid.

Counting the Corpuscles.—The apparatus most useful is the *Thoma-Zeiss hemacytometer*, an instrument almost universally adopted. It consists of a counting slide and one or two pipets, one for the red and the other for the white blood-corpuscles. The slide is of ordinary size, made of thick polished glass, having at its center a thin square of glass cemented on the surface. The latter has a central circular opening nearly filled in by another glass disc, 1/10 of a mm. thinner



Thoma-Zeiss Blood Counter, showing pipet, counting chamber and ruled field.—(*Greene.*)

than the square surrounding it, thus forming a chamber with a depth of 1/10 of a mm. The surface of the disc is divided by a series of microscopic lines into 400 squares, each having a square area of 1/400 of a mm. and a cubic capacity of 1/4000 of a mm. Each quadrant of 16 squares is inclosed by additional lines placed between the lines marking the square; in other words, 3 parallel lines on each side form the frame of a quadrant. The pipet consists of a graduated capillary tube expanded near its upper end into an ovoid chamber that contains a glass pearl for mixing the blood with the diluting fluid. The capacity of the tube is 1 mm., while that of the chamber, between the marks 1 and 101, is 100 mm. Thus, by drawing up the blood to the mark 1, a dilution of 1:100 is obtained, while when drawn up to the mark 0.5, the dilution is 1:200. The second pipet for counting the white blood-corpuscles is similarly constructed, except that the bore is larger and the tube is graduated for a dilution of 1:10 and 1:20. The instrument is also supplied with cover-glasses with ground surfaces.

To make a successful blood-count, strict attention must be paid to details. These are apparently insignificant, and yet failure will follow the efforts of the careless investigator who does not observe all the precautions here laid down: (1) Have everything ready for immediate use before you obtain the drop of blood. (2) Observe the most scrupulous cleanliness, not for aseptic purposes, but to prevent the smallest particle of dirt or any other foreign body from obscuring the field of vision, and thus interfering with counting. The diluting fluid, therefore, *must be filtered every time it is used* the slides washed in plain water and carefully dried (no alcohol or ether should be used, as the cement is likely to be dissolved out); the cover-glasses to be cleansed in acid alcohol; the pipet, above all, perfectly clean and dry. (3) Carry out the first stages of the procedure as rapidly as possible. The successive stages are as follows: (*a*) Clean the part from which the drop of blood is obtained with alcohol and ether. (*b*) Make a puncture either in the pulp of the finger or the lobe of the ear (in the case of children, the toe is to be preferred), free enough to allow a flow of two or three large drops. (*c*) Suck a drop into the capillary tube of the pipet up to the mark 0.5 to obtain a dilution of 1:200, or to 1 for a dilution of 1:100 if marked anemia is known to be present. (*d*) Having rapidly wiped off the end of the pipet, transfer it at once into the diluting fluid and draw up the latter to the mark 101. (*e*) Keeping the tips of the fingers on the ends to prevent spilling, shake the pipet vigorously for about 2 minutes. (*f*) Reject the first two or three drops, and then deposit one on the center of the disc, or, as some do, fill in the entire chamber. (*g*) Place the cover-glass on the fluid, carefully avoiding air-bubbles, and press firmly at the sides (not in the center) until you see Newton's rings. (*h*) Place the slide on the stage of the microscope and, after allowing a few minutes for uniform distribution of the corpuscles, take up the process of counting (Robin). Normally, the blood-corpuscles are so numerous and so tightly packed that to count them on so small an area as 1/4000 of a cubic mm. is absolutely impossible, not to mention the fact that the coagulated blood will form a layer of sufficient thickness to cover entirely the lines that mark the squares. It is therefore necessary to dilute the blood, for two reasons: (1) To prevent its coagulation, preserving the integrity and shape, as well as distinctness, of each corpuscle; and (2) to dilute it to a degree sufficient to permit the counting. For that purpose we use one of the following solutions:

Gowers' solution:

℞.	Sulphate of sodium,	gr. cxij.
	Acetic acid,	ʒ v.
	Water,	ʒ iv.

Hayem's solution:

℞.	Corrosive sublimate,	0.5 gm.
	Sodium sulphate,	5.0 gm.
	Sodium chlorid,	1.0 gm.
	Distilled water,	200.0 c.c.

Or **Toisson's solution,** prepared according to the following formula:

℞.	Methyl-violet,	0.025 gm.
	Chlorid of sodium,	1 gm.
	Sulphate of sodium,	8 gm.
	Glycerin (neutral),	30 c.c.
	Distilled water,	160 c.c.

The latter is the one universally preferred. It possesses the distinct advantage of staining the

white blood-corpuscles, thus enabling the beginner to avoid them in the count. Besides, in looking over the entire field with a low power, one may approximately judge of the proportion of the white corpuscles to the red.

Be careful to avoid any pressure on the parts, as it will dilute the blood by causing a transudation of serum. In sucking up the drop, always keep the point of the pipet under the surface, to prevent the entrance of air-bubbles. The latter should also be carefully avoided when the cover-glass is placed on the disc. For this purpose it is best to place it by a sliding motion, expelling the air-bubbles as the cover-glass is moved from right to left. Should any air-bubbles remain on the disc, the manipulation is repeated after cleaning the slide. Once the blood is mixed with diluting fluid, the counting may be done at leisure. The blood-corpuscles are best seen and most conveniently counted under a moderately high power (1/5 or 1/6 objective). The illumination should be adjusted to suit each case and conditions present. The position of the substage condensor, mirror, and diaphragm should be so modified as to render the squares distinctly visible, and, as a rule, a dark illumination is best.

Having placed the slide in position, locate first the squares. This can be done by the low power. Then find a quadrant of 16 squares inclosed within a frame made of 3 parallel lines, and commence counting from the left-hand upper corner. Count the corpuscles of each square of the upper row, then the lower from right to left, then the third from left to right, and, finally, the last from right to left. This order may be reversed either from the right first or from above downward. The number of corpuscles in each square should be marked down on the paper in the order in which the counting is done. This will not only relieve the memory, but will always show how many and which squares have been counted. Some of the corpuscles will be found astride on the line or slightly overriding it. To avoid counting these twice, make some rule by which to be guided. For instance, count all corpuscles within the square and all on the upper and left side border, not counting any on the lower or right side lines. Having counted 16 squares, divide the sum total by 16 in order to get the average of each; then multiply by the dilution, either 100 or 200, as the case may be, and, finally, multiply this by 4000, which will represent the number of corpuscles in each cubic mm. For example: The first square contained 12, second 10, third 11, fourth 9, and so on, the total number being 192. This, divided by 16, gives an average of 12 corpuscles to the square. The dilution, we may suppose, was 100; the number of corpuscles in 1 mm. will be $12 \times 100 = 1200$. Each square has a cubic capacity of 1/4000 of a cubic mm. Consequently, the number of corpuscles in a cubic mm. will be $1200 \times 4000 = 4{,}800{,}000$. This calculation can easily be remembered by the following formula:

$$\frac{\text{Corpuscles} \times \text{dilution} \times 4000}{\text{Number of squares counted}} = \text{corpuscles in 1 cubic mm.}$$

To obtain most accurate results, two or three quadrants of the same drop should be counted, or two or three fresh drops used. In the latter case the pipet should always be thoroughly shaken before a new drop is expelled.

A similar procedure is employed in **counting the white blood-corpuscles,** only the diluent fluid is 1/2 percent acetic acid, to which a little gentian-violet may be added if a stain is desired. Strict cleanliness at every step of the procedure is even more necessary in counting the leukocytes, than in the case of the red cells, in order to avoid clumping of the cells. The tip of the pipet must never be allowed to touch the finger, either of patient or physician, and must be wiped off with clean dry cotton, after drawing up the blood, and again after dilution has been made. The acetic acid destroys the red corpuscles, while the white become more prominent. In cases in which the question of expense enters largely into consideration, the counting of both red and white may be done at the same time; in this case the dilution should always be 1:200, and at least 256 squares counted. The white cells are stained, and, therefore, easily recognized, and the whole field can be gone over in a few minutes. Having determined the entire number of white corpuscles, proceed with the calculation in the manner previously described.

The normal proportion of red blood-corpuscles is 5,000,000 to the cubic mm., but this will vary under different circumstances, even in health, and a slight variation below or above the normal limit is not to be looked upon as pathologic. In this connection it is also well to bear in mind that after a severe diarrhea the number of red corpuscles is considerably increased, reaching as high as 7,000,000 to the cubic mm., this being due to the withdrawal of plasma from the blood. On the other hand, copious drinking may temporarily diminish the number of corpuscles by the reverse effect. The proportion of white blood-cells is normally even more variable, the variation extending from 1 to 300 to 1 to 700 red. Having completed the blood count, invariably clean the apparatus. *Never put away the pipets without thoroughly cleaning them.* To clean the pipet, first run through it distilled or clean water, then strong alcohol, then ether, and, finally, a current of dry air to evaporate the latter. (The pipet is dry when the glass pearl is freely movable and does not cling to the sides.) The washing and drying are best accomplished by a double bulb from an atomizer. This not only saves time, but also one's lungs. Should there still remain some particles of dirt, clean with some strong acid, alkali, or acid alcohol (Robin).

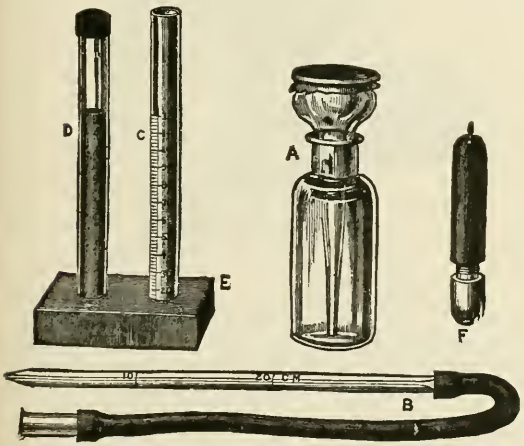
Hematocrit.—Another method for determining the relative proportion of red blood-corpuscles is by means of the hematocrit (Hedin-Daland). It consists of a metal frame in the shape of two arms, each carrying a small graduated capillary tube. One tube is completely filled with blood by means of a rubber tube connected with a dropper. Both ends of the tube are quickly covered with a little vaselin, so as to prevent the blood from adhering to the part of the frame with

which the terminal ends come in contact. The tube is then inserted in the arm. The whole is adjusted to a double-speed centrifuge, or an electric centrifuge and rotated at a speed of 70 revolutions of the crank, or 10,000 revolutions by the electric motor, a minute, for 2 minutes. The tubes are then removed and the percentage read

Hematocrit.

off, the scale being rendered visible by a magnifying lens front. The volume of the red blood-corpuscles will be seen as a red column, while the white occupy a shorter column above, being almost invisible, except in cases of leukocythemia. Each degree of the scale represents the percentage by volume, and is supposed to contain 100,000 red blood-corpuscles. Thus, if the red column reaches the mark 50, the volume is 50 percent, while the number of red cells is 5,000,000. In this way a rapid though rough and only approximately accurate blood-count may be obtained.

Estimation of Hemoglobin.—The simplest method is Tallqvist's. Comparison is made between the blood taken up by absorbent paper and a series of lithographed color bands. It is, however, quite inaccurate. The same objection applies to a similar color test, that of Wetherill. Until recently the instruments most generally used were those of Fleischl and Gowers. In Gowers' instrument a red



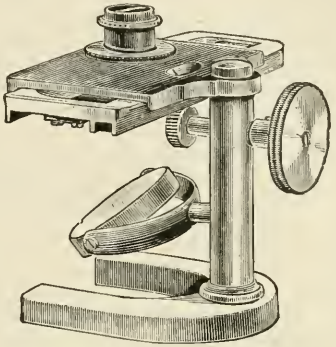
Gowers' Hemoglobinometer.

A. Pipet-bottle for distilled water. *B*. Capillary pipet. *C*. Graduated tube. *D*. Closed tube containing standard dilution. *F*. Lancet for pricking the finger.

solution (carmin-glycerin), corresponding in intensity to a 1 percent solution of normal blood, hermetically sealed in a small glass tube, is the standard used. To 20 cu. mm. of blood is added water until the color is exactly that of the standard.

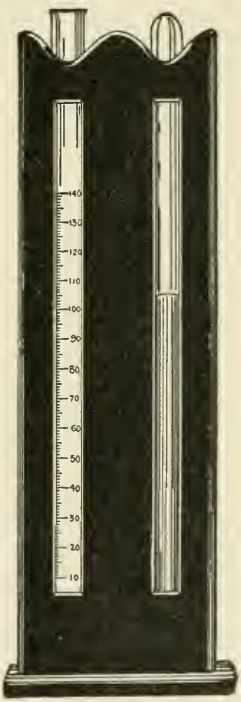
In making the comparison the tubes should be held in front of a white surface and the percentage will be shown on an accompanying scale. There is an error of about 5 percent.

Unfortunately, very accurate estimation is not always possible by either the Fleischl or Gowers instruments. In the former, approximately correct findings may be obtained by delimiting the field of observation and comparison.



Fleischl's Hemoglobinometer.

Sahli's hemometer is constructed on the same principle as Gowers' instrument, but differs from it in several important respects. The chief defect of Gowers' hemoglobinometer is the difficulty of determining when the proper dilution has been reached because the standard solution is of an entirely different color from that of blood and water. In order to appreciate slight differences in *shade* the solutions to be compared must contain the same coloring matter. Sahli, finding that solutions of hemoglobin were not permanent, devised the method of diluting the blood with 10 times its volume of 1/10 normal solution of hydrochloric acid. This forms a dark brown mixture containing in suspension minute particles of hematin hydrochlorid, to which the color is due. Such a mixture, sealed in a glass tube, is used as the standard solution in Sahli's instrument. A similar graduated tube, each division corresponding to 20 cu. mm., is filled to the mark 10 with 1/10 normal HCl solution, saturated with chloroform, which is supplied in a small stoppered vial protected by a hard-rubber capsule. With a capillary pipet 20 cu. mm. of blood are drawn up and introduced into the tube, and shaken up with the N/10 HCl until the color becomes a clear dark



Sahli's Hemometer.

brown, after which water is added until the shade of the mixture exactly corresponds to that of the standard solution, when the hemoglobin percentage may be read off, as in Gowers' instrument.

The standard solution is practically permanent. If the tube, however, remains in disuse for a long time, the suspended particles of hematin, which are not in solution, may adhere to the glass and the mixture may appear lighter in color. This is easily corrected by gently shaking and repeatedly inverting the tube to restore uniform distribution of the pigment particles.

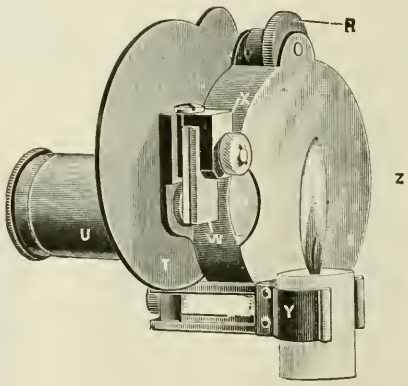
The **Hammerschlag specific gravity method** has been used also. As modified by Cabot, this method is as follows: Mix in a urinometer glass such quantities of benzol and chloroform that the specific gravity of the mixture taken by an ordinary urinometer is about 1059 (the normal specific gravity of the blood). Puncture the ear, draw a drop of blood into the tube of a Thoma-Zeiss pipet, a small medicine dropper, or any other capillary tube, and expel it again into the benzol-chloroform mixture. The blood does not mix with these liquids, but floats like a red bead. If it sinks to the bottom, add chloroform; if it rises to the top, add benzol, until finally the drop remains stationary in the body of the liquid, showing that its specific gravity is the same as the fluid in which it has been placed. Then take the specific gravity of the liquid in the same manner as that of urine. The result will also give the specific gravity of the drop of blood floating in the mixture. The chloroform-benzol mixture may be filtered and used over and over again indefinitely.

Table of specific gravity and hemoglobin (Hammerschlag):

Specific Gravity.		Hemoglobin.
1033–1035	=	25–30 percent.
1035–1038	=	30–35 percent.
1038–1040	=	35–40 percent.
1040–1045	=	40–45 percent.
1045–1048	=	45–55 percent.
1048–1050	=	55–65 percent.
1050–1053	=	65–70 percent.
1053–1055	=	70–75 percent.
1055–1057	=	75–85 percent.
1057–1060	=	85–95 percent.

Cabot adds the following precautions: (1) The inside of the urinometer glass should be perfectly dry and clean, otherwise the drop of blood may cling to it and flatten out against it. (2) It is usually well to have more than one drop of blood in the glass, in case any mishap occurs with the first. (3) Add the chloroform and benzol, a few drops at a time, and after each addition stir the whole mixture thoroughly with a glass rod. (4) If there is reason to believe that the blood will be lighter than normal—*i. e.*, the hemoglobin deficient—it saves time to start with a lighter mixture of chloroform and benzol. (5) Avoid admitting air within the blood-drop. This can be seen either in the capillary tube or after the drop is in the mixture. It is safer to take the *middle portion* of the blood drawn into the capillary tube, as both the first and the last portions of the column are more likely to have air in them. (6) The whole process should be done as quickly as possible, else the chloroform or benzol may work into the blood-drop and affect its weight. (7) It is better to have a urinometer with a scale running as high as 1070, but this is not essential, for the clinically important specific gravities are low, not high.

The above methods have largely been superseded by **Dare's** hemoglobinometer which affords a rapid, convenient, accurate and easy estimation. This instrument has the additional advantages of using undiluted blood and of an accurately standardized comparison scale. The film of fresh blood drawn by capillary attraction between two white glass plates, one transparent the other opaque, is compared with a circular disc of tinted glass representing the various color shades possessed by normal blood according to its hemoglobin concentration. The blood and color scale are illuminated by transmitted candle light. The observation is made through a camera tube, the instrument being pointed toward a dark object. The reading is indicated on the left side of the instrument by the beveled edge of the rectangular opening, the percentage beneath this edge representing the percentage of hemoglobin in the blood examined.



Dare's Hemoglobinometer.

U. Observation tube. *T.* Shield. *W.* Removable plate with capillary opening for holding blood. *X.* Thumb screw for holding same. *Y.* Candle holder and candle. *R.* Milled wheel for revolving color disc. *V.* Aperture for illumination and color comparison. *S.* Case inclosing color disc.

Variations in Hemoglobin.—Hemoglobin is diminished in chlorosis and in all forms of anemia, and may fall as low as 15 percent of the normal. This condition is called **oligochromemia.** It is usually proportionate to the reduction in the red cells except in chlorosis in which the hemoglobin equivalent of each cell is greatly reduced and pernicious anemia in which it is relatively in excess. The *color index* indicates the relation between the number of cells and the amount of hemoglobin. In other words, it is the quotient of the percentage of hemoglobin divided by the percentage of red cells.

Hemoglobin is increased in connection with pulmonary stenosis.

Further Microscopic Study.—A good microscope, a few cover-slips and slides, a bottle of good stain, on the one hand, a general knowledge of the morphology of the normal blood-corpuscles, and a memorized appreciation of the changes they present in different diseases, on the other hand, constitute the working material.

Under ordinary aseptic precautions the ear-lobule or finger-tip of the patient is pricked with a sterile needle; the droplet of blood that oozes out (no pressure should be exerted) is spread in a thin layer between two cover-slips and allowed to dry in the air.

"Ehrlich's triple stain" is prepared as follows: Concentrated watery solutions of orange G., acid fuchsin, and methyl-green are made; 40 c.c. of the orange G, 45 c.c. of the acid fuchsin, and 55 c.c. of methyl-green solutions are mixed with 50 c.c. of distilled water, 50 c.c. of alcohol, and 15 c.c. of glycerin, and the mixture allowed to stand a week in a cool, dark place.

The dried smear must first be "fixed" in one of the following ways: By heat, *i. e.*, by passing the cover-slip through a flame 30 to 40 times; by boiling one minute in absolute alcohol; by placing it in a 1 percent alcoholic solution of formalin; by formalin vapor.

A few drops of Ehrlich's triple stain are then placed upon the cover-slip and allowed to remain for about two minutes; then washed off with water, the slips dried between filter-paper, and mounted on a slide with a drop of Canada balsam. The slide is now ready for examination.

Examination of the Stained Specimen.—According to the selective affinity of the several constituents of the blood-cells for certain anilin dyes modern stains are acid, basic or neutral. *The basic dyes*, such as methyl-violet, methylene-blue or hematoxylin (chromatin stains), act chiefly upon nuclei. *Acid dyes*, such as eosin, orange G, or acid fuchsin, are protoplasm stains, while *neutral dyes* (resulting from the mixture of acid and basic colors in solution) color the "neutrophile" granules of the leukocytes. By using combinations one may in a single step attain differentiation.

Staining Solutions.—Ehrlich's triacid or triple stain has now been displaced by Wright's modification of Jenner's stain, an alkaline eosinate of methylene-blue, which, by at once *fixing* and *staining* the specimen, eliminates the laborious and delicate heating process of the older method.

Wright's Modifications of Louis Jenner's Stain.—The student or practitioner had best purchase a solution ready made; keep it tightly corked.

Technic of Staining.—(1) The dried but unfixed smear, completely covered with the stain for one minute. (2) Then distilled water is added drop by drop *until a greenish metallic scum appears and the margins show a reddish tint.* (3) After *three minutes* the stain is removed, *without washing*, and the film gently dried between filter-paper, and (4) mounted in balsam.

Results.—*Erythrocytes* appear orange or pink throughout. *Erythroblasts* show deep blue nuclei, *blood-plaques* purple, *mast cell granules* deep purple, *polymorphonuclear leukocytes* show lilac or blue nuclei, *neutrophile granules* lilac, *eosinophile granules* pink, fine *basophile granules* deep blue, *bacteria* and such organisms as malarial parasites blue.

For routine work the best stains are the Wright's, the eosin-methylene-blue and the eosin-hematoxylin, the last giving especially clearly defined pictures of the nuclear elements of the cells.

Eosin-methylene-blue Stain. Technic.—The smear is fixed in pure methyl-alcohol 3 minutes. Then it is stained 3 to 5 minutes in 1/2 percent alcoholic (70 percent) solution of Grübler's eosin. Then it is washed and dried. Next the slide is placed in a carefully made solution of 20 drops of 1/4 percent aqueous solution of methylene-blue, and 10 drops of the above eosin solution for 1/2 to 1 minute. Then it is washed, dried, and mounted if desired.

Eosin-hematoxylin Stain. Technic.—The specimen is stained with the eosin solution 1/2 minute. After washing it is placed in hematoxylin solution 1 to 3 minutes. Then it is washed, dried, mounted.

The red blood-corpuscles present themselves as round, discoid elements, with a central depression. They are arranged in rolls, have no nucleus, are uniform in size and shape, and their hemoglobin (with Ehrlich stain) is colored reddish-yellow, and forms a concentric ring around the central depression. Pathologically, five abnormalities must be observed: (1) They may be reduced in number; (2) they may have a nucleus (erythroblasts); (3) they may present differences in size; (4) they may present differences in shape; (5) the hemoglobin of the individual cell may be reduced; (6) the cells may be studded with bluish dots, so-called *basophilic* or *granular degeneration.* All these abnormalities may be determined by a glance at the blood-slide: reduction in number, by the fact that the blood-corpuscles are not, or only in part, arranged in rolls, and appear as individuals; the presence of a nucleus, by the appearance of a blue, circumscribed body within the cell; changes in size and shape are apparent, and the reduction of the hemoglobin may be determined with sufficient accuracy for diagnostic purposes by a narrowing of the concentric red ring previously described.

Basophilic degeneration is seen particularly in lead poisoning, but also in other severe forms of anemia, as in Hodgkin's disease, chlorosis, leukemia, pernicious anemia, splenic anemia, the secondary anemia of carcinoma and a number of diseases, among them pulmonary tuberculosis.

Diagnosis of the So-called Primary Anemias (Chlorosis and Primary Pernicious Anemia).—Clinically, they are very similar in their severer forms, and for prognostic purposes chiefly it becomes imperative to examine the blood carefully in these cases. The differentiation even here is not easy, and hinges practically on the following point: In both diseases, speaking of the severer form of chlorosis—we have marked decrease in the number, and pronounced changes in the size and shape, of the red blood-corpuscles, and, as a rule, in primary pernicious anemia, and sometimes in chlo-

rosis, red blood-corpuscles with nuclei. The changes in the leukocytes are varying and diagnostically insignificant. The differential diagnosis lies exclusively in the differences to be observed relative to the hemoglobin. In both diseases the hemoglobin is reduced considerably, but while in primary pernicious anemia the hemoglobin of the individual red blood-corpuscles appears normal, or, if anything, increased, under the microscope, in chlorosis the hemoglobin is greatly reduced in the individual corpuscle, sometimes presenting an appearance to the eye of a very fine ring around the periphery of the cell only. Herein lies an absolute differential diagnosis between the two diseases of great simplicity, the easy execution of which makes it most valuable.

The Leukocytes.—The characteristic features of the *normal white cell,* or leukocyte, are that it is larger than the red blood-corpuscle, has one or several nuclei, and a protoplasmic content that may be homogeneous or have fine or coarse granulations.

With the Ehrlich stain the nuclei are stained blue, the homogeneous protoplasm pink, the fine granulations violet, and the coarse ones bright red. A leukocyte with bright red, coarse granulations is called an eosinophile cell. The abnormalities observed are chiefly numeric—an increase of all or only some of the different kinds of leukocytes: that is, leukocytosis, lymphocytosis, or polynuclear leukocytosis. Normally, one leukocyte should be found, on an average, in every fifth field. When we find two or three in every five fields, we speak of slight leukocytosis, while one leukocyte to every field, or more, constitutes a severe leukocytosis. Especial attention should be paid to the absence, presence, or increase of eosinophiles.

Prince suggests the following mixture as giving the best results in staining the nuclei of the leukocytes clearly, and at the same time the granules of the neutrophilic, eosinophilic, and basophilic cells: Saturated solution of toluidin blue (Grübler), 1 part, 2 percent solution of eosin (Grübler), 2 parts. He mixes the solution in distilled water in the order given, agitates thoroughly for a few minutes, as the toluidin blue is precipitated by acid anilin dyes. He then employs the supernatant fluid only. Immediately after agitation the mixture is ready for use, and from 30 to 60 seconds is sufficient time for staining, although at the end of 10 or 12 weeks it requires 5 to 7 minutes to get a good result. He fixes in dry air at a temperature of 120° F. for nearly 20 minutes, although 128° F. will not bring disastrous results, and the time of fixation may be extended to several hours with a highly beneficial effect. Fixation with alcohol, or with a mixture of alcohol and ether, gives less satisfactory results, the granules not being satisfactorily separated out from their surroundings. After fixation the film on the cover-glass is covered with the stain, the solution being allowed to remain from 1 to 3 minutes, when the slip is washed thoroughly and rapidly in running water, and dried quickly in the air. After drying it is passed two or three times through a Bunsen flame and then mounted in balsam, when it is ready to be studied with a 1/12 of an inch immersion lens, with a flat mirror and open diaphragm. The nuclei of the small lymphocytes are stained a rather diffuse dark blue, with darker narrow bands of wavy outline interwoven throughout each nucleus, while the protoplasm is stained palè blue. The nuclei of the large lymphocytes stain deeply, with the same characteristics, the protoplasm staining faintly. Granules stained intensely blue are occasionally noted in the protoplasm and the nuclei of the large lymphocytes. In the polymorphonuclear cells the nuclei stain sharply and clearly and of a dark blue. The neutrophilic granules stain pink and are isolated from the protoplasm, which remains clear. Degenerative changes in the cells are distinguished by the faintness of the reaction in such cells. In the eosinophiles the nuclei stain greenish-blue and the granules a deep maroon. The erythrocytes react faintly or stain darkly a brownish-red stain, according as the spreads are stained for a shorter or a longer time. Nuclei in normoblasts stain deeply, exhibiting the karyokinetic tendency, when present. This stain shows the characteristics of leukemic blood very well, with better differentiations in the myelocytes, and the plasmodium malariæ stains turquoise-blue, and is therefore sharply differentiated from the cell in which it is inclosed.

Diagnosis of Leukemia.—The clinical symptoms of a case of leukemia are insufficient for a diagnosis, and a positive diagnosis of leukemia cannot be made without a differential count of the leukocytes. From a hematologic point of view we may conveniently describe two forms: *viz.,* mixed leukemia and lymphatic leukemia.

The former is a chronic disease, and gives a much better prognosis as to longevity than the latter, which runs a much more acute course, and is probably of an infectious nature, with an absolutely fatal prognosis. In mixed leukemia there is a "mixed" blood-picture, and the polymorphous character of the blood-slide is characteristic and diagnostic. All forms of polynuclear and mononuclear leukocytes in great number are found in each field—eosinophile cells, red blood-corpuscles that are decreased in number, changed in size and shape, with greatly reduced hemoglobin, and containing nuclei. A special pathologic leukocyte is noted, the myelocyte; it is a leukocyte with one nucleus, with fine or coarse granulations, and about three times as large as a normal leukocyte. For practical purposes and rapid diagnosis a single glance will make the diagnosis, if we will simply think of the polymorphous blood-picture and the myelocytes.

Lymphatic leukemia, on the other hand, shows a very uniform field; namely, a colossal increase in the small mononuclear leukocytes—lymphocytes. Sometimes there are more of these mononuclear leukocytes than red blood-corpuscles; nucleated red blood-corpuscles are sometimes found, but they have no diagnostic significance. Counting red blood-corpuscles and leukocytes or determining the hemoglobin in this disease is not necessary.

The following table (from Coplin) will aid in diagnosing the various anemias and leukemias.

TABULATION OF BLOOD CHANGES IN ANEMIAS AND LEUKEMIAS

	DISEASES.	Gross Appearance and Sp. Gr.	Hemoglobin and Color Index.	Number of Erythrocytes.	Size of, and Form Changes in Red Cells. Nucleated Cells.	Number of Leukocytes.	Large and Small Lymphocytes.	Polymorphonuclear Leukocytes.	Myelocytes.
PRIMARY ANEMIAS.	Chlorosis.	Blood flows readily Pale red, watery. Extravascular coagulation slow; intravascular, frequent. Sp. gr. of total blood decreased. Sp. gr. of plasma slightly increased.	Hemoglobin greatly reduced. Color index constantly low.	Normal or slightly reduced.	Decreased in size. Poikilocytosis only in severe cases and rarely marked. Nucleated cells rarely found. Normoblasts are present in severe cases.	Generally normal.	Occasionally relatively increased.	Normal or relatively diminished.	Rarely found.
	Pernicious Anemia.	Blood flows scantily, often difficult to obtain. Watery, pale red (often coffee color). Coagulation slow. Sp. gr. decreased.	Marked reduction in the amount of hemoglobin. Color index usually high.	Pronounced oligocythemia. Rouleaux-formation scanty or absent.	Marked variation in size. Macrocytes predominate. Poikilocytosis more marked than in any other anemia. Microblasts, normoblasts, and megaloblasts present. The latter most numerous.	A moderate leukopenia may be present.	Usually relatively increased.	Commonly decreased, relatively.	Small number nearly always found.
	Simple Primary Anemia.	Paler red than normal. Coagulation slightly more rapid. Sp. gr. decreased.	Hemoglobin moderately reduced. Color index normal or nearly so.	Moderately diminished.	Normal or slightly decreased in size. Nucleated cells only in severe cases.	Generally normal.	Sometimes increased relatively.	Sometimes decreased relatively.	Absent or rare.
Leukemia	Myelogenous Leukemia.	Light red or milky. Less fluid, coagulation slow. Sp. gr. decreased. Alkalinity usually diminished.	Hemoglobin slightly reduced. Color index below normal.	Usually only a slight reduction.	A slight reduction; poikilocytosis slight. Nucleated cells more frequent than in any other form of anemia. Normoblasts predominate.	Enormous increase. In no other anemia are leukocytes so abundant.	Increased, but relatively diminished.	Increased, but relatively diminished.	Myelocytes for a large percentage of the leukocytes, from 10 to 60 percent or more. (Basophilic cells included.)
	Lymphatic Leukemia.	Resembles myelogenous type, except that changes are not so pronounced. Alkalinity usually diminished.	Hemoglobin reduction more marked than in Splenomedullary type. Color index low.	Reduced. Always more pronounced than in myelogenous type.	Reduction in size and distortion more striking than in myelogenous type. Nucleated cells rarely present.	Greatly increased, but not to the extent found in the myelogenous type.	Greatly increased (as high as 90 percent or more). Sometimes small and other times large are increased.	Relatively decreased.	Absent or rare.
	Pseudoleukemia or Hodgkin's Disease.	Paler red than normal, depending on severity. Coagulation more rapid. Sp. gr. normal or slightly decreased.	Hemoglobin reduced, depending on severity and stage. Color index normal or low.	Diminished, depending on severity and stage.	May be undersized. Poikilocytosis in severe cases. Nucleated cells usually absent. May be present when disease is marked.	Normal or slightly increased.	Generally normal.	Generally normal.	Rarely found.

TABULATION OF BLOOD CHANGES IN ANEMIAS AND LEUKEMIAS—*Continued*

	DISEASES.	Gross Appearance and Sp. Gr.	Hemoglobin and Color Index.	Number of Erythrocytes.	Size of, and Form Changes in Red Cells. Nucleated Cells.	Number of Leukocytes.	Large and Small Lymphocytes.	Polymorphonuclear Leukocytes.	Myelocytes.
PRIMARY ANEMIAS.	Splenic* Anemia.	Pale red, more watery. Coagulation more rapid. Sp. gr. decreased.	Hemoglobin reduced. Color index normal or low.	Reduced sometimes to one-fourth of normal.	Normal; usually slightly reduced. Poikilocytosis seldom excessive. Nucleated cells rarely present.	Normal or slightly increased.	Generally normal. Usually increased if fever is present.	Generally normal.	Rarely found.
	SECONDARY ANEMIAS.	Pale red, depending on severity; watery. Coagulation usually rapid. Sp. gr. decreased.	Reduction varies, depending on severity. Color index usually below normal.	Diminution varies with condition.	Usually decreased. Poikilocytosis in a number of severe conditions. Nucleated cells rarely met with in mild anemias, but not uncommon in pronounced cases.	Generally increased. Seldom normal or decreased.	Usually diminished	Usually increased.	May be found in some cases.

* By some authors not recognized as a primary anemia.

The observations of the blood of diagnostic or prognostic importance in the cachexias, infectious fevers, various inflammations, etc., are treated of in the special articles on these various diseases.

Eosinophilia is the term applied to any increase in the cells containing eosinophilic granules. It is observed in filariasis, trichinasis, hydatid cysts, ankylostomiasis, osteomalacia, asthma, and certain skin diseases.

Poikilocytosis is a condition characterized by irregularities in the shape of the red blood-cells. It is seen in pernicious anemia and leukocythemia.

Microcythemia or microcytosis is the term applied to the condition in which the red blood-cells are markedly reduced in size. It accompanies the severe anemias and toxemias.

Macrocythemia or macrocytosis is the opposite condition, the size of the red blood-cells being greater than normal. It is associated with the severe forms of anemia, especially pernicious anemia.

Nucleated red blood-cells are abnormal constituents of the blood and are present in the grave forms of anemia.

Hydremia is an excess of the watery constituents of the blood, with a corresponding decrease of the cellular elements. It is present in anemia, in anasarca, and after the ingestion of fluids in large quantities.

Anhydremia is a condition in which the fluid portion of the blood is greatly diminished. It occurs after excessive drains on the system from any cause as in hemorrhage and cholera.

Melanemia is a rare condition characterized by the presence of black, brown, or yellow granules in the blood. It is observed in malaria, relapsing fever, melanosarcoma, and Addison's disease.

Lipemia is applied to the presence of fat in the blood. It may be detected by the microscope as minute fat globules or by its black coloration when stained with a 1 percent solution of osmic acid. Lipemia occurs in chronic alcoholism, chronic nephritis, diabetes, pulmonary tuberculosis, and after injuries to the bone-marrow.

Parasites are encountered in the blood in certain diseases. The principal animal parasites are filaria sanguinis hominis, plasmodium of malaria, spirocheta pallida, and distoma hematobium. The most important vegetable parasites are tubercle bacillus, streptococcus, staphylococcus, gonococcus, meningococcus, spirillum of relapsing fever, anthrax bacillus, typhoid bacillus, bacillus of glanders, colon bacillus, and the bacillus of tetanus, diphtheria, influenza, leprosy, glanders, bubonic plague, malignant edema. See Parasites.

BLOOD-LETTING.—See Bleeding, Cupping, Leeching, Venesection.

BLOOD-POISONING.—See Sepsis.

BLOOD-PRESSURE.—The clinical estimation of blood-pressure began more than two decades ago; but, until recently, was of little practical value, and failed to claim more than passing interest. This was because of the crudity of the apparatus and the impossibility of obtaining uniform and reliable records. Not until the adoption of the circular arm compression, suggested simultaneously by Riva Rocci and Hill, did sphygmomanometry obtain the recognition which it deserved.

Following the lead of Riva Rocci Hill, John W. Fisher and Clifford Allbutt, many investigators, in rapid succession, added numerous improvements and modifications to the earlier instruments, so that there are now several excellent models from which to choose—any of which may be relied upon for uniformly accurate figures. Among the modern instruments may be mentioned those of Cook, Janeway, Stanton, Faught, Rogers, Nicholson, Baum, Taylor and Erlanger.

The principle of modern sphygmomanometry is based upon: A means of circular compression (arm-band), applied to a superficial vessel (the brachial); means to produce pneumatic pressure (bellows or pump) within the encircling arm-band; and means to accurately measure the amount of this pressure (the mercury manometer), together with suitable tubes and connections to unite them.

Instruments.—Blood-pressure instruments have gone through various processes of evolution, and two general types are now employed; the mercury type and the aneroid. Many mercury instruments still have imperfections. The fundamental portion of the instrument is very simple; either a U-tube or a straight tube with a mercury reservoir, but the tube must be made of the proper quality of glass, accurately calibrated and the scale should be sufficiently large to be easily read. The small portable, mercury instruments are not practical and are seldom accurate. The early types of instruments have a redundance of stop-cocks and complicated attachments. The ideal mercurial instrument is one that is non-leakable, free from stop-cocks, the release of air being controlled by the valves in the pump.

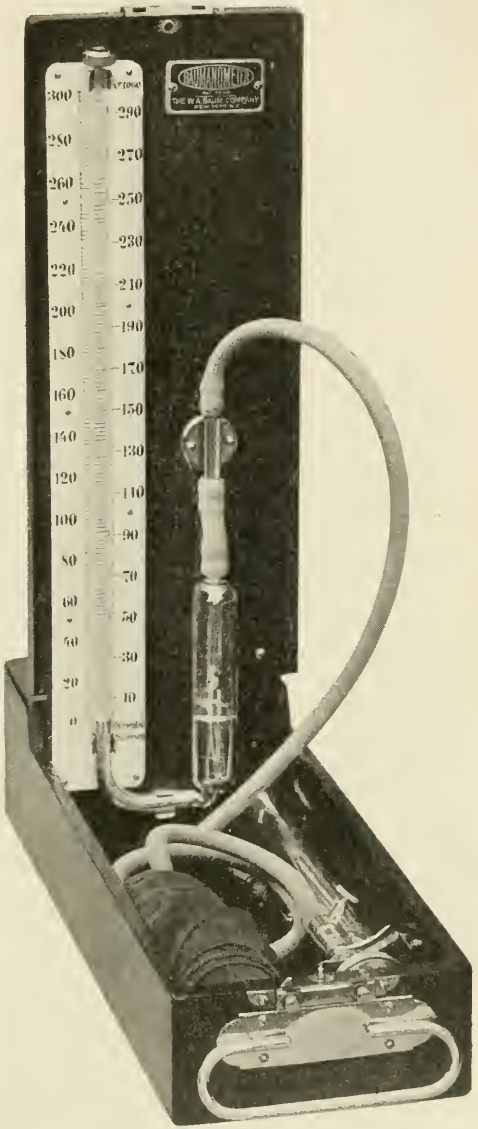
The following is an excellent type of such an instrument, evolved after experiencing many difficulties in securing accurate blood-pressure readings from a large staff of examiners.

The aneroid instruments are portable and elegant in appearance, but are not entirely dependable. They require frequent checking with the mercury manometer. They are useful for bedside work but the mercury instruments are more scientific and dependable for office work or for scientific work. Janeway says "no metal manometer can remain accurate."

The variations in blood-pressure, occurring with change in posture, constitute an important study in the examination of the heart affections, of the muscular variety particularly. In a normal individual, it should be found that, as the posture is changed from standing to reclining, the blood-pressure should increase, and the pulse rate decrease. For example: Standing, blood-pressure, 120 mm.; pulse, 72. Sitting, blood-pressure, 125 mm.; pulse, 70. Reclining, blood-pressure, 135 mm.; pulse, 64. Any change in this relation, tending toward an inversion of the ratio, is indicative of myocardial weakness or defective innervation or both.

(3) Temporary causes of variation, such as fatigue, mental excitement, or fear of the test itself, recent taking of alcohol, etc., should be eliminated, as much as possible, and for these and other reasons, *no single observation should be accepted, when it is possible to make several.* This is particularly so in cases under high nervous tension, where it is often noted that the mere change of the patient's current of thought will immediately be indicated by a change in the pressure level. The examiner will often find himself taxed to the utmost in his effort to control such variations, that he may arrive at proper deductions.

(4) Age and sex variation may be largely eliminated by the following simple rules: In children, 8 to 14 years, consider the maximum systolic pressure to be 90 mm. Hg., and in youth, up to 21 years, from 100 to 120 mm. Hg. (Brunton). Consider the average systolic pressure to be 120 mm. Hg., at the age of 20, then, for each year of life



BAUMANOMETER.

add 1/2 mm. Hg. to 120. Thus, at the age of 60, the average normal systolic pressure would be 140 mm. Hg. The figures obtained agree closely with those of Woley, Janeway and others. Women have a slightly lower blood-pressure than men, averaging about 10 mm. less for the same age.

There are several other minor factors that are believed to influence blood-pressure, namely:

Digestion, time of day, menstruation, etc.; but their effect is so slight that they need not be considered from the clinical standpoint.

In the estimation of blood-pressure, it is the usual practice to determine the systolic, the diastolic, the pulse pressure and the mean pressure.

Method of Taking Blood-pressure.—There is only one method that an up-to-date physician should follow and this is the auscultatory method. The method of palpation and the method of noting the diastolic pressure by the oscillation of the needle of an aneroid instrument or of the mercury column in mercurial types of instruments are crude and inaccurate. Any physician who has a blood-pressure instrument will surely have a stethoscope. The following method is adopted by the Life Extension Institute for reading and interpreting blood-pressure:

The systolic and diastolic blood-pressure should be taken preferably with a mercurial instrument and by the auscultatory method. In employing this method, the following points should be carefully borne in mind. The cuff should be applied preferably to the left arm, on a level with the heart, the subject sitting and the arm supinated and resting on a table. Place the stethoscope over the brachial artery just below the sphygmomanometer cuff, avoiding undue pressure (avoid indenting the skin). Inflate the sphygmomanometer bag until the heart sounds disappear Slowly release the air until the sounds reappear. The sounds elicited over the artery may then be distinguished as follows. *First*, a sound sharp and snappy in character. This is designated the *first phase* and = the **systolic pressure.** *Second*, succeeding the snappy sound one may usually distinguish a soft blowing murmur. This is termed the *second phase* and is not recorded in the reading. *Third*, succeeding the murmur is a return of the snappy sound, termed the *third phase;* also disregarded in the reading. *Fourth*, the snappy character continues for a varying number of beats and then becomes abruptly muffled. This point of muffling is the *fourth phase* and = the **diastolic pressure.** *Fifth*, the muffled sound finally disappears, constituting the *fifth phase*, formerly suggested as the diastolic pressure, but not so regarded by this Institute. CAUTION: If a leather cuff is used, the buckle should be watched for slipping, as this will greatly increase the reading. The normal pulse pressure (difference between the systolic and diastolic pressure) ranges between 30 and 55 mm.; a lower pulse pressure in an apparently active, healthy subject raises a question as to the accuracy of the reading or of the standard employed. The leather cuff is preferable to the cuff of silk or any other material.

The Pulse Pressure.—This is the variation in pressure occurring within the vessel during a cardiac cycle, and is obtained by subtracting the diastolic from the systolic pressure. A normal pulse pressure should be between 30 and 45 mm. Hg. by the auscultatory method. The pulse pressure is increased in generalized arteriosclerosis, aortic regurgitation; and is decreased in prolonged infections, valvular disease with loss of compensation, and in pure myocardial disease.

The *mean pressure* is determined by dividing the sum of the systolic and diastolic pressure by two, and is an index of the mean pressure of the circulation within the vessel at the time of observation.

The importance of the blood-pressure changes are often overestimated. The proper status of the blood-pressure test is that of a clinical sign, which attains its greatest value when taken in consideration with the clinical picture as a whole. The mistake is frequently made of placing too much stress upon the evidence of high blood-pressure, and of treating this symptom as the whole disease. This is dangerous! The fact must never be lost sight of that high blood-pressure is frequently a conservative act of nature to maintain a normal blood distribution in the face of increased peripheral resistance, in which case it would be the height of folly to blindly set about an energetic blood-pressure lowering campaign, without first carefully considering its cause and relation to the clinical picture.

Low Blood-pressure (Hypotension).—As yet, very little importance is attached to slightly lowered blood-pressure; though it has been noted with considerable constancy in tuberculosis, infectious fevers (particularly typhoid), in uncomplicated diabetes mellitus, etc. Most important is the marked fall of pressure occurring during prolonged anesthesia, when its detection should immediately suggest the employment of active stimulation, if not the speedy termination of the operation.

High Blood-pressure (Hypertension).—Several well-known pathologic conditions are associated with constant and marked elevation in blood-pressure, and in which regular observations with the sphygmomanometer are an important adjunct to treatment, and are worthy of more general adoption.

Chronic Interstitial Nephritis.—This condition, usually accompanied by general arteriosclerosis, is productive of some of the highest pressures seen. Faught has recently reported two cases where the pressure remained for many days above 300 mm. Hg. Both in chronic interstitial nephritis and in arteriosclerosis, the sphygmomanometer is valuable in following the effect of measures of relief. In *cerebral hemorrhage*, and in *apoplectic coma*, the sphygmomanometer will serve to distinguish them from embolism, when the pressure is low. *Uremia* is always preceded by a gradual but persistent rise in pressure. Here, systematic observations may, by giving timely warning, forestall the attack.

Eclampsia shows a very high blood-pressure, as illustrated by Hirst, who reports a pressure of 320 mm. Hg. The sphygmomanometer, used at regular intervals during pregnancy, may, at times, be even more valuable than urinalysis.

Blood-pressure and Arteriosclerosis.—There is much misapprehension even among the medical profession and especially among the laity as to the relationship of arterial tension and arterial thick-

ening. In fact they are spoken of at times in medical works as synonymous. The conditions are, of course, entirely different. An artery of gossamer thinness may show very high tension. There is no necessary relationship between high blood-pressure and arterial thickening. Thickening often follows high tension but advanced arterial sclerosis can exist and does exist in a large number of instances with lowered blood-pressure. The two conditions should be independently sought. Many physicians have reported to the Institute that arterial thickening cannot exist in either case because the blood-pressure is normal. Such comments display a fundamental ignorance of the pathological conditions referred to. As long as the splanchnic area is not extensively involved, very extensive thickening in other regions may have no effect on blood-pressure. The blood-pressure and the condition of the arteries should be separately determined in all physical examinations regardless of the age of the subject. This matter has been well covered by Dr. Clifford Allbutt in his classical work on Angina-Pectoris in which complete references to this subject will be found.

Finally it should be borne in mind that high blood-pressure or low blood-pressure is a symptom and not a disease. It may be a temporary manifestation of nervous failure or nervous excitement and repeated observations are necessary to determine the significance of any variations found.

The importance of the blood-pressure test to therapeutics of the circulation is a most important subject, as, by it, we are able to follow more intelligently our therapeutic endeavors, and to note their beneficial effects, or total failure. Much evidence is at hand to show that too great confidence has, in the past, been placed in the so-called blood-pressure reducers, chiefly comprising the nitrites; and, on the other hand, that more dependence should be placed on physical methods, such as massage, exercise, baths, etc., one of the most striking facts shown being the extremely feeble and evanescent effect of some of the old remedies, and the prolonged and marked benefit derived from purely physical measures. In the light of present knowledge, it is useless to continue the use of a remedy, when the sphygmomanometer fails to show the expected improvement. Neither is it a good practice to push a drug further when the sphygmomanometer shows that the effect has been obtained.

Life Insurance.—While British Life Insurance Companies have given little attention to blood-pressure, most American companies now require at least the systolic pressure as a routine measure in all examinations; and some companies are requiring also the diastolic pressure. The papers of Dr. John W. Fisher of the Northwestern Life Insurance Company, should be consulted for statistics giving the mortality experience of many thousands of cases. This experience has also been confirmed by investigations of the Prudential Life Insurance Company. From such experiences the following table has been derived showing the average blood-pressure among healthy males at each age period:

	Average Systolic Pressure, Mm.
Ages 15 to 20	120
Ages 21 to 25	123
Ages 26 to 30	124
Ages 31 to 35	124
Ages 36 to 40	127
Ages 41 to 45	129
Ages 46 to 50	131
Ages 51 to 55	132
Ages 56 to 60	135

Women 10 to 15 mm. less.

From a life insurance standpoint the principle has also been evolved that a persistent blood-pressure ranging of 15 mm. above the average for the age is attended by an increased mortality and warrants postponement or close study of the case.

BLOOD, TRANSFUSION.—See Transfusion.

BLUE MASS.—See Mercury.

BLUE OINTMENT.—See Mercury.

BLUE PILL.—See Mercury.

BLUE VITRIOL.—See Copper (sulphate).

B N A.—See Anatomic Nomenclature.

BOIL (Furuncle).—A boil is an acute circumscribed inflammation of a sebaceous or hair follicle, ending in suppuration and the extrusion of a central necrotic mass. It begins as a painful, deep-seated induration that gradually approaches the surface, showing itself as a rounded or acuminate reddish prominence. In the course of a few days softening takes place, with the formation of a central slough, or "core." The resulting depression heals up by granulation, with the production of a slight scar. When no suppuration or necrosis takes place, the lesion is termed a "blind boil."

Numerous satellites are likely to form around one furuncle as a focus. This may be due to external autoinoculation or to lymphatic transmission.

Furunculosis is a condition in which there are intermittent outbreaks of boils, extending over a period of weeks or months. This condition is not infrequently seen in diabetes and Bright's disease. Boils are due to the introduction of specific microbes into the hair or sebaceous follicles. Impoverished health renders the soil favorable, but it does not produce furuncles *per se*. Uncleanliness, itching dermatoses (promoting scratching), and certain occupations (tar and petroleum workers), all favor the development of boils.

The pathologic process consists of a dense leukocytic infiltration around a sebaceous or hair follicle, with thrombotic obstruction of the capillary blood-vessels and a central necrosis. The exciting organism is a pyogenic microbe, usually the staphylococcus pyogenes aureus.

The prognosis in single furuncles is good. Furunculosis may long remain refractory to treatment.

Treatment.—Single lesions should be incised as soon as the first evidences of suppuration occur.

Abortive applications—such as carbolic acid, nitrate of silver, tincture of iodin—fail, as rule, to abort, although they may do good as counterirritants. A 25 percent ichthyol plaster protects the boil and tends to prevent autoinoculation. An excellent method is to apply hot boric-acid com-

presses covered with oiled silk. The use of this lotion upon the surrounding skin lessens the liability to further follicular infection.

The following method for preventing the formation of boils is recommended by Robin: The patient should be given tar-water as a drink, and should take 3 capsules every day, each containing the following:

℞. Sublimed sulphur, gr. jss
Pulverized camphor, gr. 3/10.

Wherever there is any redness, or there are threatening indications of the formation of a boil, the spot should be painted with tincture of iodin, and in this way it may be arrested. When the boil has formed, the contents should be evacuated as completely as possible. When the core has been taken out, the following ointment is introduced into the wound by means of a brush:

℞. Sublimed sulphur, } each 150 grains.
Pulverized camphor, }
Glycerin, q. s.

The boil is then covered with a piece of linen on which this ointment has been spread. Afterward the entire region of the eruption should be sprayed with a solution of equal parts of carbolic acid and water four times a day, after the boil has been carefully washed with boric-acid water; then a dressing of the ointment is again applied.

Predisposing causes being removed, invigorating life, change of air, outdoor exercise, and bathing are to be employed. The urine should be carefully examined to determine whether or not diabetes or Bright's disease exists. The diet is to be attended to. A saline purge occasionally is beneficial. Quinin and iron chlorid, the former in 5-grain doses every 6 hours, then gradually lowered to 3 or 4 grains a day, may be given. If diabetes or nephritis exists, appropriate treatment should be given. Dilute sulphuric acid, 5 to 10 drops, with 1/2 of a dram of magnesium sulphate, will open the bowels. Sulphid of calcium, in 1/6 of a grain doses every hour or two, has been recommended. Tablespoonful doses of yeast, given 3 times a day, half an hour before meals, improve some cases. Benefit has resulted from 20 to 30 minim doses of dilute sulphuric acid in two ounces of water, every four hours.

Recently suction cupping has been used with success. See Bier's Hyperemic Treatment, Inflammation.

Furunculosis has been treated with excellent results by vaccine injections—preferably of autogenous material rather than stock. See Vaccine Therapy (Staphylococcus).

BONE, DISEASES.—Akromegaly is a strange progressive disease that is attended with symmetric enlargement of the bones as well as of the soft parts of the body. The bones commonly enlarged are those of the head and face; the lower jaw often projects beyond the upper; the hands and feet are often enormously enlarged, but the central viscera are, as a rule, unchanged. No treatment has yet been found to check this disease, which invariably ends in death. See Akromegaly.

Virchow's disease, or leontiasis ossea, somewhat resembles akromegaly. In this the enlargement begins in the upper jaw, and soon interferes with mastication, extends to the other cranial and facial bones, and produces severe headaches. It is distinguished by the appearance of a tumor of the jaw, while in akromegaly the enlargement is uniform in all parts of the bone. It has caused blindness by pressure upon the optic nerve. No satisfactory treatment is known, although Horsley claims that he has relieved the symptoms by removing portions of the bone to take away the effects of pressure.

Actinomycosis.—In microscopic structure this disease bears a close resemblance to round-celled sarcoma, with which it was until recent years confounded. It is now known to be due to a specific germ—the actinomyces, or ray fungus. When it attacks bone, the lower jaw is the most frequently affected. The progress of the disease resembles that of tuberculosis, or, perhaps more closely, periosteal sarcoma. See Actinomycosis.

Atrophy of bone may occur in old age in the natural process of wasting. The medullary cavity gradually enlarges, while the compact tissue becomes thinner and thinner. The same thing occurs from disuse: as, for example, in old dislocations; hence, it is necessary in the aged, and in reducing dislocations of long standing, to manipulate the bones with care, lest a fracture should complicate the existing condition. Atrophy is also an accompaniment of chronic osteitis. The only treatment that offers any prospect of success is the production of hyperemia by the frequent use for a limited time of an Esmarch bandage.

Hypertrophy of bone may be the result of: (1) Increased blood supply, as when the epiphysis is the seat of chronic inflammation, and the whole shaft of the bone grows much larger than its fellow; (2) increased functional activity, as seen in the increased size of the fibula when there is congenital absence of the tibia.

Inflammation of Bone.—The study of inflammatory affections of bone is greatly simplified by keeping two points strictly in view:

1. Bone is a tissue in which inflammation follows the same course as it does in any other tissue, the only difference being that the deposit of lime salts in bone gives such density and firmness that swelling cannot take place; hence there is intense pain, and also a more ready cutting off of blood supply, resulting in death of tissue (necrosis).

2. No matter what the infection may be—whether the tubercle bacillus, the staphylococcus, the streptococcus, the pneumococcus, the colon bacillus, the bacillus of typhoid, or the germs of la grippe—the mechanism of the infection and the lesions resulting therefrom are practically identical with those occurring in the other tissues.

Of the three structures that enter into the formation of bone—viz., periosteum, compact and cancellous substance, and medulla—any or all may be the seat of inflammation. Thus, there may be *periostitis*, the periosteum alone being affected; *ostitis*, when the bony structure is inflamed; or *myelitis*, when the medullary cavity of

the long bones is the seat of inflammation. As a rule, however, two combinations are seen—osteoperiostitis and osteomyelitis.

Osteoperiostitis.—The periosteum may be the seat of inflammation (periostitis), but, as a rule, the superficial layer of bone is also involved (osteoperiostitis). The disease may be the result of injury, or of infection by the tubercle bacillus, the staphylococcus, the streptococcus, the pneumococcus, the colon bacillus, the bacillus of typhoid, or the germs of la grippe.

Symptoms.—The bones that are the most superficial are those most likely to suffer: *e. g.*, the tibia. The constitutional symptoms are not prominent except in suppurative cases. Pain is always present; it is worse at night, and it is increased by pressure or percussion. On passing the finger over the inflamed area, swelling can be detected, giving to the bone a spindle shape. As the disease progresses, the soft parts overlying the inflamed periosteum become red and edematous. Suppuration is attended with fever, chills, and severe constitutional disturbance.

Treatment.—Rest and immobilization of the parts are of the first importance. Relief may sometimes be obtained by making numerous punctures with the needle or, better, by dividing the periosteum with a tenotome. Lead and laudanum lotion, leeches, cold and hot applications—as the patient finds one or the other the more comfortable—are favorite remedies. Keep the bowels open by salines, give morphin to relieve pain, and support the parts by a bandage. In suppurative cases make a free incision through the soft parts and periosteum, and, if necessary, into the bone; then drain.

Syphilitic osteoperiostitis is slow in its onset, comparatively free from pain, and attacks the long bones and those of the skull and face. At first it has the character of periostitis, but later flat, smooth elevations can be felt; they are tender on pressure, and measure 1 or 2 cm. in diameter. They should be treated with iodid of potassium and mercurials. Operative treatment is not required unless necrosis results.

Results of Inflammation of Bone.—1. **Abscess** occurs, as a rule, in the cancellous structure of the ends of long bones, as the head of the tibia, the malleoli, the femur, and the humerus. The symptoms are the same as those of osteoperiostitis, but more localized and persistent. The pain is deep and constant, and there is tenderness, confined to one spot, increased on motion or on assuming the dependent position. The neighboring joints suffer from repeated attacks of synovitis.

Treatment.—Trephine the point of greatest tenderness, and if pus is not found, explore the walls of the bone by the aid of a stout drill. When the abscess is reached, gouge out its cavity, disinfect, and pack with iodoform gauze.

2. **Caries,** or molecular death of bone.

3. **Necrosis,** or death of bone *en masse.* Unless promptly arrested by treatment, osteoperiostitis results in the periosteum being stripped from the bone, thus cutting off the blood supply to the osseous tissue. Hyperemia and the pressure of inflammatory products in the Haversian canals or in the medulla may also cut off the circulation to a considerable area of bone. This portion dies, and the process is termed necrosis. The necrosed portion is called a sequestrum which simply means that it is separated from the sound portion. Nature throws out new bone, which sometimes encircles the sequestrum, and this envelope is called an involucrum. In the involucrum openings are sometimes found leading down to the sequestrum, and to such an opening the name cloaca is applied.

Symptoms of Necrosis.—Following inflammation in bone an abscess forms, and either bursts of itself or is opened by the surgeon. The opening becomes a *sinus,* from which there is a constant discharge of pus. Through the sinus a probe may be passed, and as it strikes the sequestrum, a clear sharp note is produced. Carious bone is gritty and the probe can be passed into it.

Sequestrotomy, or the operation for the removal of dead bone, is thus performed: When the bone of one of the extremities is affected, elevate the limb for 4 or 5 minutes, and apply an Esmarch's bandage upon the proximal side. Look for a cloaca, and if the sequestrum present at the opening, it may be possible to remove it with forceps. If held by the involucrum, the latter must be chiseled away and the sequestrum removed in a mass or in pieces. Next scrape the cavity, disinfect by carbolic acid or corrosive sublimate solution, and pack with iodoform gauze or with Mosetig-Moerhoff bone wax.

Treatment.—Remove the child from its unhealthful surroundings and give it fresh air, sunshine, baths, and wholesome and easily assimilated food. Fresh milk or cream, meat-juice, hypophosphites of lime and soda, codliver oil, syrup of the iodid of iron, and tonic treatment are invaluable. Deformity must be prevented or corrected by the recumbent position or by proper splints.

Excisions of the special bones are described under the title Excision of Joints (*q. v.*).

Acute Diffuse Osteomyelitis is an infectious disease, and may be produced by any of the germs mentioned under the head of osteoperiostitis. It is a common result of injury, such as a compound fracture, a gunshot wound, or an amputation. The inflammation spreads rapidly along the medullary canal, the cancellous tissue, and the Haversian canals. Swelling cannot take place owing to the density and hardness of the bone; hence pain is intense and destruction of bone tissue (necrosis or caries) comes on rapidly.

Symptoms.—Pain is very severe, of a boring, gnawing, or aching character, and very much increased by pressure or by percussion. The temperature is high and of a septic character. The soft parts over the bone are greatly swollen. If the disease is the result of a wound, an offensive purulent discharge takes place containing fragments of bone and necrotic tissue. If the parts are exposed to view, the periosteum appears red and thickened, and from the medullary canal protrudes a fungous mass. Many cases run into pyemia, as shown by rigors, cold sweats, and the formation of multiple abscesses.

Treatment.—Prompt action is demanded. Expose the bone freely, trephine or chisel out a trough in it sufficient to remove all the purulent material, scrape out the medullary cavity, disinfect it with corrosive sublimate solution (1:1000) or strong carbolic acid, pack with iodoform gauze, and renew the packing twice a week, or more often if necessary. Necrosis is common; the sequestrum must be removed when separated. In severe cases amputation may be necessary.

Diagnosis of Inflammation of Bone.—Acute osteoperiostitis or acute osteomyelitis must be distinguished from—(1) *Rheumatism:* Acute rheumatism attacks the joints and not the shafts of long bones, and is seldom confined to a single joint. (2) *Typhoid fever:* The morning remission and evening rise of temperature characteristic of typhoid, the serum test, and the abdominal complications should be sufficient to settle the question. (3) *Erysipelas:* The redness of the skin and inflammation of the overlying soft parts come on after the bone inflammation has lasted several hours or days. There are always pain and tenderness over the bone before the skin becomes inflamed.

Tubercular Ostitis.—The bones most liable to tubercular infection are those adjacent to the hip-, knee-, and elbow-joints, and also the wrist and ankle. See HIP-JOINT, SPINE, etc. Children are especially liable to this form of infection, and the progress of the disease is slow. In some cases pain is very slight, and is often spoken of as "starting" in character. The earliest indications of tuberculosis of bone may be seen in the muscles. The parts above and below the seat of the disease become atrophied to such a degree that simple disuse is not sufficient to account for the wasting. Spasm of muscles is observed when the patient is dropping off to sleep. Rigidity of muscles is noticeable in the earliest stages of spinal caries and of hip-joint disease. Flexion of joints is common as the disease advances, the flexors overcoming the extensors until the joints become seriously deformed.

Treatment.—Rest and immobilization of the affected part greatly retard the growth of the bacteria. Plaster casts, splints, injections of iodoform, of chlorid of zinc, or of acid phosphate of lime have given good results. The constitutional treatment proper for tuberculosis should be carefully carried out. If these methods are not applicable or have failed, the diseased areas should be removed by operation. Scraping and removal of the infected tissues must be very thoroughly done. The walls of every sinus, the medulla of infected bones, and every suspected deposit of tubercle in the soft parts, such as the tendon sheaths, the synovial cavities, or the skin should be carefully curetted.

When tubercular ostitis extends into a joint, resection or amputation must be considered. See EXCISION OF JOINTS.

Tumors of Bone.—Chondromata, enchondromata or cartilaginous tumors grow from cartilage; at least it would seem best to limit the term chondroma to the tumors which grow from cartilage. Other tumors which contain a cartilage-like material are now recognized to be degenerating sarcomas, or to belong to the class of tumors of variable composite structure described under *Endothelioma.* A chondroma consists of hyalin cartilage, having a hard, nodular outline, is encapsuled, and shows a translucent bluish-gray section. Chondromata ossify and become exostoses (see below), or may undergo myxomatous degeneration.

A **pure chondroma** not ossifying is of rare occurrence. It is met with on the hands, affecting the phalanges and metacarpal bones, more rarely in the feet and other bones. The hands become deformed by a number of tumors which grow from within the shaft of the phalanges and metacarpals, or from the surface, presumably from remnants of cartilage, from the ossification of the shaft in cartilage or at the epiphysis. The result is an increasing deformity of the hand, with pain, paralysis, and ulceration of the skin from involvement of nerves.

Treatment.—As the tumors are generally multiple, they are usually left alone, unless one presses on a nerve, when it may be removed. Amputation of a finger, of part or the whole of the hand, may be indicated for persistent pain and threatened ascending neuritis, for ulceration of the skin and degeneration of the tumors. A single growth may readily be shelled out from the interior of the phalanx in which it is situated.

Callus tumor is a slow growth of an irregular cartilaginous mass developing in the position of a fracture, usually in a rickety child, for which amputation may be necessary.

Osteomata or osseous tumors grow from bone, being formed in cartilage or in membrane. Bony masses occur in tumors of the soft parts by calcification and ossification in degenerating tissues.

Exostoses are tumors growing from the surface of bone, being either pedunculated or sessile and circumscribed. Others termed *enostoses* grow from within bone, and are more diffuse.

1. **Exostosis Developing from Cartilage.**—This is the most common type, and develops from a remnant of epiphyseal cartilage attached to the diaphysis. The origin of the tumor is therefore in the neighborhood of the epiphyseal line, although if the diaphysis grows in length, the exostosis is found attached to the shaft some distance away. In this position as it grows the tumor becomes pedunculated, consists of cancellous bone covered by a thin layer of compact bone, and at the growing surface by a cap of hyalin cartilage. A narrow pedicle may undergo quiet necrosis or be actually fractured, and a tumor so detached has been discharged through an ulcerated aperture; or a bursal cavity may form over the exostosis containing fibrinous masses and serum, and be a cause of much pain.

(a) **The single pedunculated exostosis** occurs most often to the inner side of the lower end of the femur, either near or some distance above the epiphyseal line, according to the subsequent growth of the bone; it is rarer behind the femur, where it may involve the popliteal artery, and in other bones, the upper end of the tibia, or humerus, etc.

Treatment.—The exostosis is easily removed,

being cut off by a chisel level with the shaft, while taking care to remove all the cartilage, and in operating near the knee to flex the joint so as to draw down the synovial membrane lest it be injured.

A small exostosis, generally covered with periosteum, grows from the ungual phalanx nearly always of the great toe, it is presumed from a remnant of cartilage. See SUBUNGUAL EXOSTOSIS.

(b) **Multiple exostoses** grow from the epiphyseal ends of bone like the above, but tend to be more sessile, are generally symmetrical, affecting many bones, and cause deformities resembling rickets. Some have considered them to be a rickety complication; against this is the fact that they are sometimes hereditary. Multiple sarcomata have supervened. They are generally left alone unless any one tumor is especially painful. Care must be taken that the skin-wound heals, or a troublesome necrosis may result.

2. **Exostosis Arising in Tendon.**—An exostosis in some cases arises by ossification of a tendon, as if by an extension of the ridge into which the tendon is inserted, the insertion of the abductor magnus into the tubercle just above the inner condyle of the femur, the insertion of the pectoralis major into the external bicipital ridge of the humerus, the insertion of the deltoid. This may follow injury or strain.

3. **Exostosis in Membrane.**—(a) **The single exostosis** growing from the *surface of the skull* is usually seen on the frontal bone. These tumors are generally sessile and lenticular in shape, of densely-compact bone, usually without Haversian systems. They are firmly attached to the skull, and the scalp moves freely over them; they grow slowly, and sometimes extend inward as well as outward and irritate the dura mater; otherwise there is an absence of pain and no history of injury.

Treatment.—Removal if growing or any signs of pressing on the dura. Rapidly revolving drills and saws are required; the skull has been fractured in attempts to remove them by hammering a chisel.

(b) **An exostosis** grows from the *orbital plate* of the frontal bone or in the *frontal sinus*, and displaces the eye forward and outward. As it grows the exostosis becomes more and more lobulated. By retaining discharges a frontal sinus empyema and necrosis may occur; by pressure on the eye, corneal ulceration and panophthalmitis or optic atrophy may be produced.

Treatment.—Exploration and removal as early as possible.

(c) **Diffuse exostosis and enostosis** connected with *bones of the face.* They are composed of finely cancellated bone, more compact than the cancellous exostoses, less compact than the ivory ones. Some are more vascular than bone, others less so. A symmetrical mass growing on either side of the nasal bones is common in West African negroes, and is called *Henpuye.* A mass may grow in the antrum and occlude the nose on one or both sides, or push up the orbit and displace the eye, or form nodular masses deforming the upper or lower jaw. (See LEONTIASIS OSSEA.) These masses are distinguished from sarcoma by their slow growth, by their hard, nodular surface, and by not involving the soft parts. Pain may be caused, however, by pressure on the fifth nerve ends.

Treatment.—The superior maxillary bone may be removed in part or wholly.

Fibromata or fibrous tumors grow from the outer layer of the periosteum, but are very rare, except as an epulis from the periosteum of the jaw underneath the gum, or as a nasopharyngeal polypus. Fibrous masses grow in joints from the synovial membrane.

Lipomata or fatty tumors grow from the outer layer of the periosteum, but are very rare. *Lipoma arborescens* is a lobulated fibro-fatty mass growing from the ends of the bone in cases of arthritis deformans.

Malignant Disease of Bone.—Malignant disease of bone may occur either primarily, or secondarily by metastasis or by invasion. Primary growths are usually single, but exceptionally multiple from the beginning; secondary growths are generally multiple, but exceptionally a single metastatic growth may be observed. The primary growths are always sarcomatous; the secondary growths may be either sarcomatous or carcinomatous. Besides actual tumors, malignant disease promotes changes in the osseous system of a widespread nature, having resemblances to osteomalacia and osteitis deformans.

Primary Sarcoma of Bone.—This may be periosteal or endosteal in origin. The periosteal sarcoma is usually a round-, spindle- or mixed-celled sarcoma, the endosteal, especially a myeloid sarcoma, less often a round- or spindle-celled. Rarer endosteal tumors are the small-celled myeloma or lympho-sarcoma of bone, and endothelioma. See also TUMORS.

(*a*) **Periosteal sarcomata** spring from the deeper layers of the periosteum; a rare growth from the outer layers has been termed a *parosteal* sarcoma. They rapidly invade the bone beneath and the soft parts around, spread out into muscles and along intermuscular planes, enter the veins and grow along their lumen, invade the lymphatic glands corresponding to the part, and by means of both the venous and lymphatic stream reach the blood. Then metastases appear, especially small, scattered nodules on the surface of the lungs, with a blood-stained exudation into the pleura. Meanwhile, if superficial, the primary growth may fungate, or some calcification and ossification takes place, spicules forming at right angles to the axis of the bone; spontaneous fracture occurs. They may develop anywhere, the lower third of the femur being the commonest seat.

Symptoms.—In a typical case of periosteal sarcoma, a rapidly-growing tumor is observed connected with the bone, not usually painful nor attended with signs of local inflammation or general fever. The swelling is soft, semifluctuating, or doughy in consistence, or hard in some parts and soft in others. Over the surface may appear tortuous veins, and the lymphatic glands connected

with the part may be enlarged. The patient is commonly a young adult, often gives a history of an injury to the part, and may lose weight and strength before definite signs of cachexia set in. The history is not of long duration, not more than three months.

Diagnosis.—A periosteal sarcoma has to be distinguished from gummatous periostitis, but even when the history is negative and syphilitic remedies fail, yet an exploration may reveal a gumma, either to the naked eye or on microscopic examination. It must also be distinguished from inflammatory periostitis set up by an injury. This is difficult when the sarcoma grows rapidly or is attended by local inflammation and a rise of temperature. Indeed, suppuration with necrosis may occur in connection with sarcoma.

Prognosis.—This is the worst possible in all true cases of periosteal sarcoma. No case ever appears to be cured.

Treatment.—Amputation as far as possible above the growth with excision of lymphatic glands, for periosteal sarcoma of the lower end of the femur an amputation through the upper third or hip-joint with excision of the glands in the groins, may possibly prolong life to a year or a year and a half, after which the first sign of metastases may be a blood-stained pleural effusion. It follows that as an amputation does not cure nor materially prolong life, amputation may be delayed in any case where gumma or chronic periostitis is still a possible diagnosis. Indeed, if the growth is found to be a spindle-celled sarcoma, more or less encapsuled, a local excision including the superficial layer of the bone, should be tried.

(*b*) **Endosteal sarcomata** are of much slower growth, and a very much more favorable kind for treatment.

(i) **Myeloid sarcoma,** or giant-celled myeloma, is the most frequent endosteal tumor. Its growth is slow, and it may be a year or more before it extends beyond the limits of the bone. A boring pain may be caused, then a more or less uniform swelling, generally of the articular end of a long bone, the swelling at first having the resistance of bone, later yielding and softening occur in places, and the thinned-out shell of bone occasionally gives rise to a peculiar sensation when the tumor is palpated, called egg-shell crackling, a sign much more often talked of than met with. Having perforated the shell of bone, the tumor increases rapidly, softens, and often pulsates.

Myeloid sarcoma occurs most frequently in the lower end of the femur and in the upper end of the tibia, but also in the cancellous ends of other long bones. It is also met with in the lower and upper jaws, clavicle, pelvis, and in other short bones.

The **diagnosis** has chiefly to be made from chronic central osteomyelitis in the early stages, and from aneurysm when the tumor pulsates. From central osteomyelitis it must be distinguished by exploration when the characteristic appearance of myeloid sarcoma is met with. It is likely to be confused with aneurysm when growing in the line of the iliac and femoral arteries from the pelvis, and from the upper or lower end of the femur. In the upper end of the tibia extending out into the calf, vascular tumors have been met with, called aneurysms of bone, but on examination some tumor substance has usually been found.

The **prognosis** is very good if the growth be removed completely. Metastasis is much delayed, taking place only after two years or more.

Treatment.—The tumor must be scooped out, the wall thoroughly scraped, or the cautery applied; then the shell is crushed inward, and the remainder of the cavity filled with gauze. When the growth has extended and destroyed the shell of bone a suitable excision is performed, according to the position of the growth. When the disease has spread beyond the bone to the soft parts or threatens to fungate, then an amputation is necessary through the limb just above the growth. The result is very favorable, no recurrence taking place if the primary growth is freely removed.

(ii) **Chondro-, osteo- and cystic sarcomata,** not myeloid, are usually endosteal, round- and spindle-celled sarcomata. They are more malignant than myeloids, but more favorable for operation than true periosteal growths.

(iii) **Small Round-celled Sarcoma, or Myeloma.**—Lymphosarcoma of bone is an endosteal growth which has appeared in one of two forms:

(*a*) A single local tumor grows in the marrow and enlarges the bone slowly until a spontaneous fracture occurs. On exploration, a grayish-white tumor, solid or with cysts, is found, having under the microscope the structure of a small round-celled sarcoma.

(*b*) A multiple or diffuse tumor formation occurs in the skeleton, with new growths in the spleen and in lymphatic glands not specially connected with the tumor, while the urine is milky from the albumose of Bence Jones. According to Dr. Bradshaw, the bones most affected are those of the thorax, vertebræ, sternum, and ribs. As compared with osteomalacia, the disease is commonest in men; the skeleton is brittle, but does not bend; the composition of the bones is not altered by absorption of calcareous matter, but fractures occur simply on account of the absorption by the tumors, the bone becoming so thin that it can be cut through with a knife. The tumors consist of small round-celled masses, which may become cystic, but there is not a formation of fibrous tissue as in osteomalacia. The new growth fills the medullary canal and absorbs bone, and the same growth is found in the spleen and lymphatic glands. The patient gradually becomes exhausted with dyspnea and marked vomiting. The milky urine, containing albumose, is of diagnostic importance at an early stage. The disease has lasted as long as six years after the first albumosuria.

(iv) **Endothelioma** has been suggested as an explanation of some rare endosteal tumors of bone, which have been called from their arrangement alveolar sarcoma; or from their large epitheloid cells, primary carcinoma of bone; or from containing hyalin material, chondromata; or from becoming cystic, cysts of bone. When such tumors are vascular and pulsating, a possible explanation is afforded of the so-called aneurysms of bone in

which myeloid sarcoma material has not been found in the walls; also of thyroid gland-like tumors. The tumors thus referred to have occurred in the bones above and below the knee.

Secondary Malignant Disease of Bone.—Both carcinoma and sarcoma cause metastatic growths in bone. Carcinoma is never a primary growth, but is always secondary. *Squamous-celled carcinoma* may spread by extension in the case of an epitheliomatous ulcer of the leg, or to the jaw from the lip. It is rarely a cause of metastatic growths which may then be single. One on the scapula was secondary to epithelioma of the esophagus. It is mostly *spheroidal-celled carcinoma* which infects bone by metastatic growths, especially from the breast, less often from the thyroid gland, and rarer still from the prostate. The bones especially affected by metastases from cancer of the breast, are the vertebræ, femur, humerus, ribs, pelvis, sternum. The skull is especially affected by thyroid metastases. *Columnar-celled carcinoma* of the rectum or intestine may occasionally give rise to a metastatic growth in a bone. Sarcoma appears also secondarily, whether primary in the soft parts or in bone itself. *Melanotic sarcoma* starting in the skin or orbit may develop metastases in the skull, spine or pelvis. *Hypernephroma*, or tumor of the kidney having a structure resembling the suprarenal or adrenal body, is also liable to cause bone metastases, even although the primary tumor is too small to be perceptible. At first the cancer cells may tend to new periosteal bone formation, probably by setting up some venous obstruction, but the later result is softening of bone or *cancerous osteomalacia*, bending, and fractures. A short bone like the sternum may show no external tumor, yet be soft and easily cut with a knife. Then its interior will, on microscopic examination, show the structure of the primary growth, *e. g.*, of the breast.

Treatment.—When epithelioma has spread to bone a wide removal is necessary, seeing that on reaching the medullary cavity the growth quickly extends along it. This may call for removal of all the bone, amputation of the leg, excision of the lower jaw. If only the surface is involved a free gouging away until healthy bone is reached may suffice. Rarely in other cases is any surgical measure indicated, the patient being treated medically in bed. Fractures are treated as if they were traumatic, and partial or even firm bony union sometimes occurs, although nonunion is the rule. Metastases in the liver or lungs being absent, the removal of a single metastasis in a bone may prolong life; indeed, this has been done before the primary tumor was discovered.

Cysts in Bone.—Some of those described as such would be now recognized as due to quiet central osteomyelitis. The blood cysts are probably in all cases degenerating sarcomata. Dermoid cysts are occasionally found in the line of sutures of the skull.

Hydatid cysts affect the diaphyses of the long bones, converting the shaft into a spindle-shaped thin-walled tube, which undergoes spontaneous fracture. The periosteum is not involved. The fractures do not unite. The epiphyseal ends are excavated, and the hydatids may burst into joints, but do not seem to grow primarily there. The hydatid cysts have no adventitious sac, but occur in grape-like masses of daughter cysts without a mother cyst. Suppuration may complicate the disease, by which the hydatids are killed and then discharged from the abscess, but the patient suffers from septic absorption and may die from pyemia.

The skull, vertebræ, pelvis, humerus, femur and bones of the leg and forearm are most commonly affected. It is difficult to understand how, but hydatids have many times developed after injury to a bone, after an ordinary traumatic fracture which united well, after a well-marked blow on the bone, and in one case after a charge of shot had entered the arm.

Treatment.—An early free incision is made, the cavity cleared out and stuffed with gauze. Amputation should be reserved for extensive suppuration (Spencer and Gask).

Osteomalacia (Mollities Ossium; Malacosteon).—This is a progressive softening of the skeleton with resulting deformity. It is a disease of adult life, being rare in children and old people. Pregnant women or those who have borne many children are most commonly the subjects of this grave disease.

The causes of osteomalacia are not well understood. The pregnant condition possibly predisposes to it by depriving the mother's bones of the mineral matter necessary for the growth of the fetus; starvation is supposed to produce it, and it has been observed in women who have nursed their children for long periods.

The pathologic changes consist in the disappearance of the calcium salts, which are absorbed by the fluid surrounding the bone elements. These salts are found in abnormal proportions in the blood and excretions. The bone becomes soft, and deformity may result from muscular contraction or from pressure. The pelvic bones are liable to suffer, resulting in deformity and narrowing, which necessitates operative delivery or cesarean section. As if to compensate for the softening of the bone, the periosteum becomes thickened and hyperemic. The medulla is congested, and may be the seat of hemorrhage.

Symptoms.—The earliest symptoms are nervous, painful points, supposed to be due to rheumatism. The urine is loaded with calcium salts. The bones sooner or later become twisted or bent. Fractures occur from slight causes, and, refusing to unite, false joints may result.

Treatment.—Pregnancy and lactation must be avoided. Lime salts, cod-liver oil, iron, phosphorus, and bone-marrow are the medicines to be employed. Fresh air and good hygiene are requisite. Splints or braces should be applied to bones that show special weakness. Ovariotomy has checked the process in some cases.

Rickets, or rachitis, is a constitutional disease, principally manifested by changes in the bones. It is a disease of infancy, appearing during the first three years of life, in the ill-fed, unwashed, and badly cared for children of crowded and un-

healthy localities. Its pathologic character is chiefly the formation of an embryonic tissue that, instead of being converted into bone as in healthy conditions, stops short of ossification.

Symptoms.—A rachitic child is sickly and ill-nourished, small for its age, or dwarfed. Teething is delayed and the fontanels are late in closing. Diarrhea is common, the appetite is capricious, and the abdomen is enlarged. The child is subject to night-sweats, and often screams in its sleep. Changes in the bones become marked: Those of the skull are thickened; the forehead is prominent; the sternum is projected and gives the angular or "pigeon-breast" shape to the chest; the lower limbs are curved laterally, producing bow-legs, or they may bend anteroposteriorly; the long bones are increased in size throughout, but the enlargement is most marked at their extremities; the sternal ends of the ribs are enlarged, forming "rachitic beads;" the spine is curved, but it is a long, sweeping curve, not the sharp angularity of Pott's disease. See RICKETS.

BONE-MARROW.—Extract of bone-marrow is derived from the red bone-marrow—one of the sources of the red blood-corpuscles. It has been used successfully in cases of pernicious anemia. Glycerin extracts have been used in hemophilia, chlorosis, profuse hematemesis, pernicious anemia, and other anemic affections. The raw marrow, free from spicules of bone, may be given in amounts of about 3 ounces daily, in divided doses, or made into a paste with wine, glycerin, and gelatin. Tablets of from 1 1/2 to 5 grains each of the dried marrow are on the market.

BONES, TABLE OF

NAME.	PRINCIPAL FEATURES.	ARTICULATIONS AND VARIETY.	MUSCULAR AND LIGAMENTOUS ATTACHMENTS.
Astragalus...	Irregularly cubical; forms the keystone of arch of foot; head, neck, six articular surfaces.	Tibia, Fibula, } *ginglymus.* Os calcis, Scaphoid, } *arthrodia.*	Internal and external lateral ligaments.
Atlas.....	First cervical vertebra; ring-like; anterior and posterior arches and tubercles; articular surfaces.	Occipital bone—*double arthrodia.* Axis, four joints—*diarthrodia rotatoria and double arthrodia.*	Longus colli (*tubercle*), rectus capitis posticus minor (*spinous process*).
Axis.....	Second cervical vertebra; body, odontoid process, pedicles, laminæ, spinous process, transverse processes, articular surfaces.	First cervical vertebra—*diarthrodia rotatoria and double arthrodia* Third cervical vertebra—*double arthrodia.*	Longus coli, check ligaments.
Calcaneum...	The heel bone; irregularly cuboidal; lesser process [sustentaculum tali], greater process, peroneal ridge or spine, superior groove, articular surfaces.	Astragalus, Cuboid, Scaphoid, } *arthrodia.*	Tibialis posticus, tendo Achillis, plantaris, abductor pollicis, abductor minimi digiti, flexor brevis digitorum, flexor accessorius, extensor brevis digitorum.
Carpal.....	Consists of scaphoid, semilunar, cuneiform, pisiform, trapezium, trapezoid, os magnum, unciform. See *Individual Bones.*		
Clavicle.....	Collar bone, resembles the italic "*f*:" conoid tubercle, deltoid tubercle, oblique line.	Sternum Scapula, Cartilage of first rib, } *arthrodia.*	Sternocleidomastoid, trapezius, pectoralis major, deltoid, subclavius, sternohyoid, platysma.
Coccyx.....	The last bone of the vertebral column; resembles a cuckoo's beak; usually composed of four small segments; base, apex, cornua.	Sacrum—*amphiarthrodia.*	Coccygeus, gluteus maximus, extensor coccygis, sphincter ani, levator ani.
Cranial.....	Occipital, parietal (two), frontal, temporal (two), sphenoid, ethmoid. See *Individual Bones.*		
Cuboid.....	Somewhat pyramidal; tuberosity.	Os calcis, External cuneiform, 4th and 5th metatarsal bones. } *arthrodia.*	Flexor brevis pollicis.
Cuneiform (of carpus).	Pyramidal.....	Semilunar, Pisiform, Unciform, Interarticular fibrocartilage. } *arthrodia.*	
Cuneiform (of tarsus).			
Internal.....	Irregularly wedge-shaped; the largest of the three.	Scaphoid, Middle cuneiform, First and second metatarsal bones. } *arthrodia.*	Tibialis anticus and posticus.
Middle.....	Wedge-shaped; smallest of the three.	Scaphoid, Internal cuneiform, External cuneiform, Second metatarsal, } *arthrodia.*	Tibialis posticus.
External.....	Wedge-shaped.....	Scaphoid, Middle cuneiform, Cuboid, Second, third, and fourth metatarsal bones. } *arthrodia.*	Tibialis posticus, flexor brevis pollicis.

BONES, TABLE OF

Name.	Principal Features.	Articulations and Variety.	Muscular and Ligamentous Attachments.
Ethmoid.....	Irregularly cubical situated at anterior part of base of skull; horizontal or cribriform plate, perpendicular plate, two lateral masses, crista galli.	Sphenoid, Two sphenoidal turbinated, Frontal, Two nasal, Two superior maxillary, Two lacrimal, Two palate, Two inferior turbinated, Vomer. } *synarthrodia.*	None.
Femur.....	Cylindrical; longest, largest, and strongest bone in the body; shaft and two extremities, head, neck, greater and lesser trochanters, linea aspera, condyles; a long bone.	Os innominatum—*enarthrodia.* Tibia—*ginglymus.* Patella—*arthrodia.*	Gluteus medius, gluteus minimus, pyriformis, obturator internus, obturator externus, gemellus superior, gemellus inferior, quadra tusfemoris, psoas magnus, iliacus, vastus externus, gluteus maximus, short head of the biceps, vastus internus, adductor magnus, pectineus, adductor brevis, adductor longus, crureus, subcrureus, gastrocnemius, plantaris, popliteus.
Fibula.....	Long bone; shaft, upper extremity or head, lower extremity or external malleolus.	Tibia—*arthrodia.* Astragalus, with the tibia and fibula—*ginglymus.*	Biceps, soleus, peroneus longus, extensor longus digitorum, peroneus tertius, extensor proprius pollicis tibialis posticus, flexor longus pollicis, peroneus brevis.
Foot.....	Composed of tarsus, metatarsus and phalanges, *q. v.*		
Frontal.....	The forehead bone; a flat bone; a frontal portion and an orbito-nasal portion; frontal eminences, superciliary ridges, supraorbital arches, supraorbital notches or foramina, internal and external angular processes, temporal ridges, nasal notch, nasal spine, nasal eminence or glabella.	Two parietal Sphenoid, Ethmoid, Two nasal, Two superior maxillary, Two lacrimal, Two malar, } *synarthrodia.*	Corrugator supercilii, orbicularis palpebrarum, and temporal on each side.
Hand.....	Composed of carpus, metacarpus and phalanges. *q. v.*		
Humerus....	Largest bone of upper extremity; long bone; a shaft and two extremities. Upper extremity presents a head, neck and greater and lesser tuberosities. Lower extremity, trochlea, olecranon fossa, coronoid fossa, external and internal condyles, supratrochlear foramen, supracondyloid ridges.	Scapula (glenoid cavity)—*enarthrodia.* Ulna, Radius, } *ginglymus.*	Supraspinatus, infraspinatus, teres minor, subscapularis, pectoralis major, latissimus dorsi, deltoid, coracobrachialis, brachialis anticus, triceps, subanconeus, pronator radii teres, flexor carpi radialis, palmaris longus, flexor digitorum sublimis, flexor carpi ulnaris, supinator longus, extensor carpi radialis longior, extensor carpi radialis brevior, extensor communis digitorum, extensor minimi digiti, extensor carpi ulnaris, supinator brevis and anconeus.
Hyoid.....	A bony arch; irregular bone; a body, two greater and two lesser cornua.	None.	Sternohyoid, thyrohyoid, omohyoid, digastric, stylohyoid, mylohyoid, geniohyoid, geniohyoglossus, hyoglossus, middle constrictor of the pharynx.
Ilium.....	See *Innominate.*		
Incus.....	Resembles a bicuspid tooth with two roots, body, and two processes.	Malleus—*arthrodia* (*trigger-joint*). Stapes—*arthrodia.*	None.
Inferior maxillary.	Body and two rami; contains the teeth of the lower jaw; symphysis, mental process, mental foramen, coronoid and condyloid process, head, neck, sigmoid notch, irregular bone.	The two temporal bones—*bilateral condyloid—diarthrodia.*	Levator menti, depressor labii inferioris, depressor anguli oris, platysma myoides, buccinator, masseter, orbicularis oris, geniohyoglossus, geniohyoid, mylohyoid digastric, superior constrictor, temporal, internal pterygoid, externa pterygoid.
Inferior turbinated.	Situated on the outer wall of the nasal fossa: irregular bone.	Ethmoid, Superior maxillary, Lacrimal, Palate, } *synarthrodia.*	None.

BONES, TABLE OF

Name	Principal Features.	Articulations and Variety.	Muscular and Ligamentous Attachments.
Innominate..	Large, 3 parts; flat bone; with its fellow and sacrum and coccyx forms pelvis. *Ilium*—superior broad expanded portion, crest, superior, middle and inferior curved lines, iliopectineal line, venter, auricular surface, anterior and posterior, superior and inferior spinous processes, 2/5 (about) of acetabulum. *Ischium*—lower and back portion, body, tuberosity and ramus, spine, greater and lesser sacrosciatic notches, external and internal lips of tuberosity, lower boundary of obturator foramen, 2/5 (about) of acetabulum. *Pubis*—body, horizontal ramus, descending ramus, spine, iliopectineal line, angle, symphysis, obturator foramen (upper boundary), 1/5 of acetabulum.	With its fellow of opposite side, Sacrum, } *synarthrodia.* Femur—*enarthrodia.*	*Ilium*—tensor vaginæ femoris, external oblique, latissimus dorsi, iliacus, transversalis, quadratus lumborum, erector spinæ, internal oblique, gluteus maximus, medius and minimus, rectus, pyriformis, multifidus spinæ, sartorius. *Ischium*—obturator externus and internus, gracilis, levator ani, gemellus superior and inferior, coccygeus biceps, semitendinosus, semimembranosus, quadratus femoris, adductor magnus, transversus perinei erector penis. *Pubis*—internal and external oblique, transversalis, rectus, pyramidalis, psoas parvus, pectineus, adductor magnus, longus and brevis, gracilis, external and internal obturator, levator ani, compressor urethræ, accelerator urinæ.
Ischium.	See *Innominate.*		
Lacrimal.....	Small; situated at front part of inner wall of orbit; resembles finger-nail; crest, lacrimal groove; flat bone.	Frontal, Ethmoid, Superior maxillary), Inferior turbinated, } *synarthrodia.*	Tensor tarsi.
Magnum (os).	Largest bone of carpus; occupies center of wrist; head, neck, body; short bone.	Scaphoid, Semilunar, } *anarthrodia.* Second, Third, Fourth, } Metacarpal—*arthrodia.* Trapezoid, Unciform, } *arthrodia.*	Flexor brevis pollicis (part).
Malar.....	Small; quadrangular; at upper and outer part of face; forms prominence of cheek, part of outer wall and floor of orbit, part of temporal and zygomatic fossæ; frontal, orbital, maxillary and zygomatic processes, malar foramen, four borders; irregular bone.	Frontal Sphenoid, Temporal, Superior maxillary, } *synarthrodia.*	Levator labii superioris proprius, zygomaticus major and minor, masseter, temporal.
Malleus.....	Resembles a hammer; head, neck, handle or manubrium, processus gracilis, processus brevis; irregular.	Incus—*arthrodia (trigger-joint).....*	Tensor tympani.
Maxillary, inferior.	See *Inferior maxillary.*		
Maxillary superior.	See *Superior maxillary.*		
Metacarpal..	Five in number; shaft, base, and head; long bones.	Second row of carpus—*arthrodia.* Phalanges—*condyloid.*	To the *thumb*—flexor and extensor ossis metacarpi pollicis, first dorsal interosseous. *Second metacarpal bone*—flexor carpi radialis, extensor carpi radialis longior, first and second dorsal interosseous, first palmar interosseous, flexor brevis pollicis (frequenlty). *Third metacarpal*—extensor carpi radialis brevior, flexor brevis pollicis, adductor pollicis, second and third dorsal interosseous.

BONES, TABLE OF

Name.	Principal Features.	Articulations and Variety.	Muscular and Ligamentous Attachments.
Metacarpal. *Continued.*			*Fourth metacarpal*—third and fourth dorsal and second palmar interosseous. *Fifth metacarpal*—extensor carpi ulnaris, flexor carpi ulnaris, flexor ossis metacarpi minimi digiti, fourth dorsal, and third palmar interosseous.
Metatarsal...	Five in number; shaft, base, and head; long bones.	Tarsus—*arthrodia.* Phalanges—*condyloid.*	*First*—tibialis anticus (part), peroneus longus, first dorsal interosseous. *Second*—adductor pollicis, first and second dorsal interosseous, tibialis posticus (part). *Third*—adductor pollicis, second and third dorsal, and first plantar interosseous, tibialis posticus (part). *Fourth*—adductor pollicis, third and fourth dorsal and second plantar interosseous, tibialis posticus (part). *Fifth*—peroneus brevis, peroneus tertius, flexor brevis minimi digiti, transversus pedis, fourth dorsal and third plantar interosseous.
Nasal.....	Oblong; forms with its fellow the bridge of the nose; nasal foramen, spine, crest; flat bone.	Frontal, Ethmoid, Nasal (opposite), Superior maxillary, } *synarthrodia.*	
Occipital....	Back part and base of cranium; trapezoid in shape; outer and inner tables; external protuberance, external occipital crest, superior and inferior curved lines, foramen magnum, condyles, jugular process, anterior and posterior condyloid foramina, basilar process, pharyngeal spine, 4 fossæ on internal surface, internal occipital protuberance and crest, grooves for the cerebral sinuses, torcular Herophili, jugular foramen; flat bone.	Parietal (two), Temporal (two), Sphenoid, } *synarthrodia.* Atlas—*doubte arthrodia.*	Twelve pairs—occipitofrontalis, trapezius, strenocleidomastoid, complexus, biventer cervicis, splenius capitis superior oblique, rectus capitis posticus major and minor, rectus lateralis, rectus capitis anticus, major and minor, superior constrictor of the pharynx.
Palate.....	Back part of nasal fossa; helps to form floor and outer wall of nose, the roof of mouth and floor of orbit, also spheno-maxillary and pterygoid fossæ and the spheno-maxillary fissure; L-shaped: inferior or horizontal plate, superior or vertical plate, posterior palatine canal, posterior nasal spine, inferior and superior turbinated crests, maxillary process, pterygoid process, accessory descending palatine canals, orbital process, sphenoidal process, sphenopalatine foramen.	Sphenoid, Ethmoid, Superior maxillary, Inferior turbinated, Vomer, } *synarthrodia.* Opposite palate.	Tensor palati, azygos uvulæ, internal and external pterygoid, superior constrictor of pharynx.
Parietal.....	Form sides and roof of skull; irregular, quadrilateral; two surfaces, four borders, four angles, parietal eminence, temporal ridge, parietal foramen, furrows for cerebral sinuses, depressions for Pacchionian bodies; flat bone.	Opposite parietal, Occipital, Frontal, Temporal, Sphenoid, } *synarthrodia.*	Temporal.
Patella.....	Flat; triangular; sesamoid; anterior part of knee-joint; two surfaces, three borders, apex; flat bone.	Condyles of femur—*partly arthrodial.*	Rectus, crureus, vastus internus, vastus externus.

BONES, TABLE OF

NAME.	PRINCIPAL FEATURES.	ARTICULATIONS AND VARIETY.	MUSCULAR AND LIGAMENTOUS ATTACHMENTS.
Pelvis.....	Composed of two ossa innominata, sacrum and coccyx, *q. v.*		
Phalanges of foot.	14 in number, two of great toe, three of each of the others; shaft, base, head; long bones.	First row with metatarsal and second phalanges—*condyloid.* Second of great toe with first phalanx; of other toes, with first and third phalanges, } *ginglymus.* Third row with second row,	*First—great toe*—inner tendon extensor brevis digitorum, abductor pollicis, adductor pollicis, flexor brevis pollicis, transversus pedis. *Second toe*—first and second dorsal interosseous, first lumbrical. *Third toe*—third dorsal and first plantar interosseous, second lumbrical. *Fourth toe*—fourth dorsal and second plantar interosseous, third lumbrical. *Fifth toe*—flexor brevis minimi digiti, abductor minimi digiti, third plantar interosseous, fourth lumbrical. *Second—great toe*—extensor longus pollicis, flexor longus pollicis. *Other toes*—flexor brevis digitorum, one slip of common tendon of extensor longus and brevis digitorum, *Third*—two slips from the common tendon of the extensor longus and extensor brevis digitorum, and flexor longus digitorum.
Phalanges of hand.	14 in number, three for each finger and two for thumb; shaft head, base; long bones.	First row with metacarpal bones and second row of phalanges—*condyloid.* Second row with first and third rows, } *ginglymus.* Third row with second row,	*Thumb*—extensor primi internodii pollicis, flexor brevis pollicis, abductor pollicis, adductor pollicis, flexor longus pollicis, extensor secundi internodii. *First—index finger*—first dorsal and first palmar interosseous. *Middle finger*—second and third dorsal interosseous. *Ring finger*—fourth dorsal and second palmar interosseous. *Little finger*—third palmar interosseous, flexor brevis minimi digiti, abductor minimi digiti. *Second—to all*—flexor sublimis digitorum and extensor communis digitorum: in addition. *To index finger*—extensor indicis. *To little finger*—extensor minimi digiti. *Third*—flexor profundus digitorum, extensor communis digitorum.
Pisiform.....	Anterior and inner side of carpus: small; spherical; one articular facet; short bone.	Cuneiform—*arthrodia*.....	Flexor carpi ulnaris, abductor minimi digiti, anterior annular ligament.
Pubis.....	See *Innominate.*		
Radius.....	Outer side of forearm; shaft, head, neck, tuberosity, lower extremity, oblique line, sigmoid cavity, styloid process.	Humerus—*ginglymus.* Ulna,... { superior—*diarthrodia rotatoria.* / middle—*membranous.* / Inferior—*diarthrodia rotatoria.* Semilunar—*condyloid.*	Biceps, supinator brevis, flexor sublimis digitorum, flexor longus pollicis, pronator quadratus, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, pronator radii teres, supinator longus.
Ribs.....	Twelve in number on each side; shaft, head, neck, tuberosity, angle (anterior and posterior), anterior or sternal extremity: first, second, tenth, eleventh and twelfth are peculiar; flat bones.	Vertebræ—*arthrodia.* Sternum { First rib—*synarthrodia.* / Others—*arthrodia.*	Internal and external intercostals, scalenus, anticus, medius, and posticus, pectoralis minor, serratus magnus, obliquus externus, transversalis, quadratus lumborum, diaphragm, latissimus dorsi, serratus posticus superior and inferior, sacrolumbalis, musculus accessorius ad sacrolumbalem, longissimus dorsi, cervicalis ascendens, levatores costarum, infracostales.

BONES, TABLE OF

Name.	Principal Features.	Articulations and Variety.	Muscular and Ligamentous Attachments.
Sacrum.....	Large triangular bone at lower part of vertebral column, and upper and back part of pelvic cavity; composed of five vertebræ; base, promontory, four surfaces, apex, central canal, anterior and posterior sacral foraminæ, lateral masses, laminæ, articular processes, sacral cornua, transverse processes, sacral groove, ala; irregular bone.	Last lumbar vertebra, Coccyx, Ossa innominata (two), } *amphiarthrodia.*	Pyriformis, coccygeus, iliacus, gluteus maximus, latissimus dorsi, multifidus spinæ, erector spinæ, extensor coccygis.
Scaphoid, of carpus.	Largest bone of first row; boat-shaped; upper and outer part of carpus, four surfaces; tubercle; short bone.	Radius—*condyloid.* Trapezium, Trapezoid, Os magnum, Semilunar } *arthrodia.*	External lateral ligament of wrist.
Scaphoid, of tarsus.	Or navicular bone; boat-shaped; inner side of tarsus, four surfaces, tuberosity: short bone.	Astragalus, Cuneiform (three), Cuboid (occasionally), } *arthrodia.*	Tibialis posticus (part).
Scapula.....	Back part of shoulder; triangular; posterior aspect and side of thorax, two surfaces, three borders, three angles, subscapular fossa, subscapular angle, dorsum, spine, supraspinous and infraspinous fossæ, acromion process, glenoid cavity, neck, head, coracoid process; flat bone.	Humerus—*enarthrodia.* Clavicle—*arthrodia.*	Subscapularis, supraspinatus, infraspinatus, trapezius, deltoid, omohyoid, serratus magnus, levator anguli scapulæ, rhomboideus major and minor, triceps, teres major and minor, biceps, coracobrachialis, pectoralis minor, platysma, latissimus dorsi.
Semilunar...	Upper rows of carpus; four surfaces, crescentic outline.	Radius—*condyloid.* Os magnum, Unciform, Cuneiform, Scaphoid, } *arthrodia.*	
Sesamoid....	Small, rounded masses, cartilaginous in early life, osseous in the adult; developed in tendons; inconstant, except patellæ.		
Sphenoid....	Anterior part of base of skull; bat-shaped, with wings extended; body, two greater and two lesser wings, two peterygoid processes, ethmoidal spine, optic groove, optic foramen, olivary process, pituitary fossa, anterior, middle and posterior clinoid processes, sella turcica, carotid or cavernous groove, lingula, ethmoidal crest, sphenoidal cells or sinuses, sphenoidal turbinated bones, rostrum, vaginal processes, pterygopalatine canal, spinous processes, round foramen, oval foramen, foramen Vesalii, foramen spinosum pterygoid ridge, external orbital foramina, vidian canal, pterygoid fossa, internal and external pterygoid plates, hamular process, scaphoid fossa.	All the bones of cranium, Molar (two), Palate (two), Vomer, } *synarthrodia.*	Temporal, external and internal pterygoid, superior constrictor, tensor palati, levator tympani, levator palpebræ, obliquus superior, superior, inferior, internal and external recti.
Sphenoidal turbinated or sphenoidal spongy bones.	Situated at anterior and inferior part of body of sphenoid; exist as separate pieces until puberty and occasionally are not joined in the adult.	Ethmoid, Palate, } *synarthrodia.*	None.

BONES, TABLE OF

Name.	Principal Features.	Articulations and Variety.	Muscular and Ligamentous Attachments.
Stapes.....	Resembles a stirrup; one of the ossicles of the tympanum; head, neck, two branches (crura), base; irregular bone.	Incus—*arthrodia.*	Stapedius.
Sternum.....	The breast bone; manubrium, gladiolus, ensiform cartilage, or first, second and third pieces, anterior and posterior surface, borders.	Clavicles (two)—*arthrodia.* Costal cartilages (seven on each side) first—*synarthrodia;* others, *arthrodia.*	Pectoralis major, sternocleidomastoid, sternohyoid, sternothyroid, triangularis sterni, aponeuroses of the obliquus externus and internus, and transversalis muscles, rectus, diaphragm.
Superior maxillary.	Forms with its fellow the whole of the upper jaw; somewhat cuboidal; body and malar, nasal, alveolar and palatine processes; hollow (the antrum of Highmore or maxillary sinus), incisive or myrtiform fossa, canine fossa, canine eminence, infraorbital foramen, posterior dental canals, maxillary tuberosity, posterior palatine canal, infraorbital groove; irregular bone.	Frontal, Ethmoid, Nasal, Malar, Lacrimal, Inferior turbinated, Palate, Vomer, Fellow of opposite side. } *synarthrodia.*	Orbicularis palpebrarum, obliquus inferior oculi, levator labii superioris alæque nasi, levator labii superioris proprius, levator anguli oris, compressor nasi, depressor alæ nasi, dilator naris posterior, masseter, buccinator, internal pterygoid, orbicularis oris.
Tarsal.....	Consist of calcaneum, or os calcis, astragalus, cuboid, scaphoid, internal, middle and external cuneiform. See *Individual bones.*		
Temporal...	Situated at side and base of skull: squamous, mastoid and petrous portions, temporal ridge, zygoma or zygomatic process, eminentia articularis, Glaserian fissure, tubercle, glenoid fossa, post-glenoid process, tympanic plate, mastoid foramen, digastric fossa, occipital groove, sigmoid fossa, mastoid cells, meatus auditorius externus, hiatus Fallopii, meatus auditorius internus, lamina cribrosa, aquæductus vestibuli, styloid process, stylomastoid foramen, auricular fissure; irregular bone.	Occipital, Parietal, Sphenoid, Inferior maxillary, Malar, } *synarthrodia.*	Temporal, masseter, occipitofrontalis, sternomastoid, splenius capitis, trachelomastoid, digastric, retrahens aurem, stylopharyngeus, stylohyoid, styloglossus, levator-palati, tensor tympani, tensor palati, stapedius.
Tibia.....	At front and inner side of leg; next to femur in length and size; prismoid in form; upper extremity or head, tuberosities, spinous process, tubercle, popliteal notch, shaft, crest (the shin), oblique line, internal malleolus; long bone.	Femur—*ginglymus.* Fibula { superior—*arthrodia.* middle—*membranous.* inferior—*arthrodia.* Astragalus with fibula—*ginglymus.*	Semimembranosus, tibialis anticus, extensor longus digitorum, biceps, sartorius, gracilis, semitendinosus, tibialis posticus, popliteus, soleus, flexor longus digitorum, ligamentum patellæ.
Trapezium...	In lower row of carpus; very irregular; six surfaces, groove; short bone.	Scaphoid, Trapezoid, First and second metacarpal, } *arthrodia.*	Adductor pollicis, flexor ossis metacarpi pollicis, flexor brevis pollicis (part).
Trapezoid...	Smallest bone in second row of carpus; wedge-shaped; six surfaces; short bone.	Scaphoid, Second metacarpal, Trapezium, Os magnum, } *arthrodia.*	Flexor brevis pollicis (part).
Turbinate, inferior.	One on each side of outer wall of nasal fossæ; curled like a scroll; two surfaces, two borders, two extremities, lacrimal process, ethmoidal process, maxillary process.	Ethmoid, Superior maxillary, Lacrimal, Palate, } *synarthrodia.*	
Turbinate, middle.	The free convoluted margin of the thin lamella, that descends from the under surface of the cribriform plate of the ethmoid bone.		

BONES, TABLE OF

Name.	Principal Features.	Articulations and Variety.	Muscular and Ligamentous Attachments.
Turbinate, superior.	The thin curved plate of the ethmoid, that bounds the superior meatus of the nose above.		
Ulna.....	Inner side of forearm, parallel with radius; prismatic; shaft and two extremities, olecranon process, coronoid process, greater and lesser sigmoid cavities, oblique ridge, perpendicular line, head or lower extremity, styloid process; long bone.	Humerus—*ginglymus.* Radius, { superior—*diarthrodia rotatoria.* middle—*membranous.* inferior—*diarthrodia rotatoria.*	Triceps, anconeus, flexor carpi ulnaris, brachialis, anticus, pronator radii teres, flexor sublimis digitorum, flexor profundus digitorum, flexor longus pollicis (occasionally), pronator quadratus, supinator brevis, extensor ossis metacarpi pollicis, extensor secundi internodii pollicis, extensor indicis, extensor carpi ulnaris.
Unciform....	Wedge-shaped; hook-like process; in lower row of carpus; short bone.	Semilunar, Fourth and fifth metacarpal, Cuneiform, Os magnum, } *arthrodia.*	Flexor brevis minimi digiti, flexor ossis metacarpi minimi digiti, anterior annular ligament.
Vertebræ....	Twenty-six; cervical seven, dorsal twelve, lumbar five, sacrum (composed of five), coccyx (composed of four), each has a body and an arch; latter has two pedicles, two laminæ and seven processes, viz.: four articular, two transverse, one spinous. Peculiar vertebræ, first, second and seventh cervical; first, ninth, tenth, eleventh, and twelfth dorsal; sacrum, coccyx; irregular bones.	Articulate with each other, and with occipital and innominate bones and ribs (*q. v.*). Intervertebral articulations, between the bodies—*amphiarthrodia.* Between articular processes—*arthrodia*	Attachment of muscles.—*To the Atlas* are attached nine pairs; the longus colli, rectus anticus minor, rectus lateralis, rectus posticus minor, obliquus superior and inferior, splenius colli, levator anguli scapulæ and first intertransverse. *To the axis* are attached eleven pairs; the longus colli, obliquus inferior, rectus posticus major, semispinalis colli, multifidus spinæ, levator anguli scapulæ, splenius colli, scalenus medius, transversalis colli, intertransversales, interspinales. *To the remaining vertebræ* generally are attached thirty-five pairs and a single muscle; anteriorly, the rectus anticus major, longus colli, scalenus anticus, medius, and posticus, psoas magnus, psoas parvus, quadratus lumborum, diaphragm, obliquus internus and transversalis: posteriorly, the trapezius, latissimus dorsi, levator anguli scapulæ-rhomboideus major and minor, serratus posticus superior and inferior, splenius, erector spinæ, sacrolumbalis, longissimus dorsi, spinalis dorsi, cervicalis ascendens, transversalis colli, trachelo-mastoid, complexus, biventer cervicis, semispinalis dorsi and colli, multifidus spinæ, rotatores spinæ, interspinales, supraspinales, intertransversales, levatores costarum.
Vomer.....	Situated vertically at back part of nasal fossæ; forms part of septum of nose; somewhat like a plow-share; two surfaces and four borders.	Sphenoid, Ethmoid, Superior maxillary (two), Palate (two), Cartilage of the septum. } *synarthrodia.*	
Wormian....	Supernumerary bones; irregular, inconstant, isolated, interposed between the cranial bones, most frequently in the lambdoid suture.		

BORAX.—$Na_2B_4O_7,10H_2O$. Sodium borate. Occurs in lacustrine deposits as white, transparent crystals, soluble in water, alcohol, and glycerin. It is used as an antiseptic wash for ulcers and indolent lesions, and is valuable also as an emmenagog, and in leukorrhea. Borax may be used as a wash in bromidrosis or fetid sweating of the feet, in the treatment of pruritus ani and vulvæ, in diphtheria, and in aphthous and gangrenous stomatitis. Dose, 5 to 30 grains.

For freckles, tan, etc.

℞.	Borax,	ʒ ss
	Buchu water,	ʒ xjss
	Spirit of rosemary,	ʒ ss.

For ringworm of the scalp:

℞.	Borax,	gr. xx
	Distilled acetic acid,	ʒ ij.

For sore nipples:

℞.	Borax,	ʒ ij
	Prepared chalk,	ʒ j
	Rose water,	ʒ iij
	Spirit of wine,	ʒ iij.

BORBORYGMUS.—The rumbling sounds produced in the abdomen by the movements of gas within the bowels or stomach. See FLATULENCE.

BORIC (Boracic) ACID.—H_3BO_3. A crystalline substance found native in the volcanic lagoons of Tuscany. It occurs in white, transparent crystals, soluble in water and alcohol. Dose, 5 to 15 grains. **Unguent. Acidi Borici** contains boric acid 10, paraffin 10, white petrolatum 80. It is used as an antiseptic and in dermatology.

Boric acid is an efficient antiseptic, disinfectant, and deodorant, arresting fermentation and putrefaction, and very destructive to all low organisms. A solution of 1:133 arrests the activity of bacteria. It is feebly acid and but slightly irritant, and is used in the form of a dusting-powder as a surgical dressing because of its antiseptic and unirritating qualities. Its lotion and ointment have been successfully employed in ulcers, eczema, and parasitic diseases of the skin. It is one of the most commonly used substances in eye-washes. It is of particular value to inflamed mucous surfaces. As an irrigating solution for the bladder, it is invaluable; it renders the urine acid when given ernally. Its dose is 5 to 15 grains.

Application to the skin of the face and hands:

℞.	Boric acid,	ʒ j
	White wax,	ʒ j
	Paraffin,	ʒ ij
	Oil of bitter orange,	ʒ ij.

Shake well and apply night and morning.

An eye lotion:

℞.	Boric acid,		gr. xl
	Camphor water, Distilled water,	each,	ʒ ij.

Bathe the eyes freely several times a day.

BOROGLYCERID.—See BOROGLYCERIN.

BOROGLYCERIN.—A mixture of boric acid, 62 parts, with glycerin, 92 parts; it is called also *boroglycerid* and *glyceryl borate*. It is an active antiseptic in a solution of 1:40. It is readily soluble without precipitation in glycerin or water, and hence affords a convenient means of presenting any desired proportion of boric acid. A 50 percent solution of boroglycerin in glycerin is of syrupy consistence. In this form it is kept on hand by druggists and dispensed under the name of **"Glyceritum Boroglycerini."**

For the treatment of open wounds it is a non-irritating and powerful antiseptic. Barwell employs it in a watery solution for washing out abscess cavities. Sir Henry Thompson speaks highly of boroglycerin used in a watery solution as an injection for cystitis. It may be used in the proportion of 1 to 50 of water.

The indications for the use of boroglycerin are not distinct from those of boric acid. It is a favorite nasal application with some physicians. It appears to be especially adapted to aphthous or hemorrhagic ulcerated surfaces in the nasal chamber. It is an admirable application to the lines of incision in the after-treatment of operations on the nasal septum.

Boroglycerin (50 percent) is a useful application in all forms of conjunctivitis, and is almost indispensable in trachoma, painted on the everted lid with a camel's-hair brush or a small pledget of absorbent cotton.

For granular conjunctivitis:

℞. Boroglycerin (50 percent), ʒ ij.

In a compressible tube, one drop in the eye morning and night.

BOTHRIOCEPHALUS LATUS.—See WORMS (Tape).

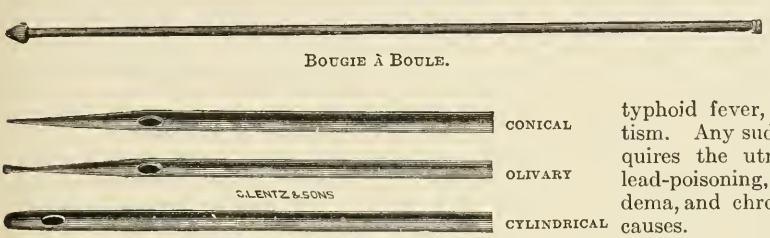
BOUGIE.—A slender, cylindric instrument, made of waxed silk, catgut, etc., for introduction into the urethra or other passage for the purpose of dilatation, exploration, etc. Sometimes bougies are covered with preparations, which are thus conveyed to the inner mucous surfaces. An *armed bougie* has a piece of nitrate of silver or other caustic attached to its extremity. A *filiform bougie* is a whalebone or other bougie of very small size. Bougies for the esophagus are about 2 feet long, those for the rectum 8 or 9 inches, and those for the urethra 13 inches.

The French scale of thickness or size of urethral bougies, generally adopted in America, has each size 1 mm. larger in circumference than the preceding one. The range is from 1 to 50 mm. in circumference. The English or gum-elastic bougie is a seamless tube of woven silk, of tawny brown color, overlaid with copal varnish, and smoothly polished. The French bougie is also of woven silk, but more flexible than the English one. Whalebone is troublesome, from its rigidity, which can be lessened by steeping in boiling water. Catgut becomes too supple after soaking in the mucus of the urethra, and is likely to get rough. Silkworm gut is strong, not affected by urine, mucus, or water. Celluloid bougies are nonabsorbent, smooth, pliant when warmed, but resume their rigidity too quickly, and sometimes, when cold,

are too brittle. They are best fitted for catheters for tying in the urethra, because they are unirritating, and, at the body temperature, yield to the curves of the passages wherein they lie.

The most commonly used bougies are the English gum-elastic and the French bougies. The former are cylindric and of the same thickness throughout. The French bougies are tapering in their lower one-third, and are better adapted to pass along the urethra.

A French bougie is called "olivary" when the tip is rounded or bulbous. The "swell" of an olivary bougie is such as to remove all sharpness, and the tapering end is so supple that it bends easily and passes an obstruction, which the gum-elastic bougie does not readily do; but they are not so durable as the English catheter. The imported French bougies are not so well varnished nor are they so smooth or so tough as those of the English manufacture. The flexibility of the tapering bougie has been modified by the introduction of leaden stilets which penetrate to the tip of the bougie. Fine shot may be used instead of the wire stilet.



Bougie à Boule.

A table based upon measurements of the circumference of the flaccid penis at the middle of the spongy portion, and showing the direct relation to the normal size of the urethra, and corresponding size of bougie, is as follows:

Circumference of Penis.	Size of Bougie.
3 inches,	26 to 28 French scale.
3 1/4 inches,	28 to 30 French scale.
3 1/2 inches,	30 to 32 French scale.
3 3/4 inches,	32 to 34 French scale.
4 inches,	34 to 36 French scale.

This table must not be regarded strictly.

Medicated bougies will be found of service in the treatment of certain inflammatory conditions of the mucous membranes, especially those of the genitourinary tract and of the rectum. They will often succeed when other methods fail. The object of the use of bougies is to keep the mucous surfaces apart, and at the same time to apply the selected medicament to advantage. As a base, gelatin is preferable to cacao-butter, for it does not become rancid, and, owing to its animal nature, is more readily absorbed. Urethral bougies are manufactured for use in the treatment of gonorrhea, gleet, etc., in two sizes, 6 1/2 inches and 3 inches.

BOUILLON.—An alimentary broth, made by boiling meat—usually beef—in water. Also a liquid nutritive medium, made by boiling meat, for the culture of microorganisms. Peptonized bouillons and solutions of powdered meats have also been used. See Bacteriology.

BOW-LEGS.—See Genu Varum.

BRADYCARDIA (Brachycardia).—A paroxysmal or permanent slowness in the cardiac action. It is often associated with organic nervous diseases. It is a symptom of such cardiac diseases as fibroid and fatty heart, atheroma of the coronary arteries, and the Stokes-Adams syndrome, "heart-block" (*q. v.*). It frequently occurs during convalescence from infectious diseases, such as diphtheria, pneumonia, typhoid fever, erysipelas, and rheumatism. Any sudden fall below normal requires the utmost vigilance. Uremia, lead-poisoning, anemia, jaundice, myxedema, and chronic alcoholism are often causes.

The pulse is quite variable, and is weak, small, and slow. As results of the slow cardiac action are vertigo, noises in the ears, syncopal attacks, and, rarely, convulsions. The onset may be either sudden or follow "warnings."

The first sound is soft and feeble, and often the second sound is not heard. As a rule, with reduction in the number of contractions there is an increase in their force; as this is not so in bradycardia, its central origin is shown. Sudden death is a very frequent termination. The cause controls the prognosis.

Treatment.—Rest in the recumbent position, heat to the precordia, and the use of such remedies as atropin, caffein, and strychnin is indicated. Often the emergency is so great as to call for the hypodermic use of the selected drug. Digitalis is contraindicated. Between the paroxysms such remedies as improve the general health and prevent the progress of the central or exciting cause should be given. See Heart-disease (Functional), Pulse.

BRAIN, ABSCESS.—See Brain (Inflammation).

BRAIN, ANEMIA.—An abnormal decrease in the amount of blood in the cerebral vessels: *general*, when the diminished supply includes all the vessels; *partial*, when the diminished supply is limited in area; characterized by pallor, headache, vertigo, some loss of power, and, rarely, convulsions.

Etiology.—Partial cerebral anemia results from obstruction of a vessel— from embolism or thrombosis. General cerebral anemia results from hemorrhages, wasting diseases, during convalescence from severe attacks of fevers, sudden shock, feeble cardiac action, and general anemia.

Symptoms.—In general anemia there is headache, relieved by the recumbent position; vertigo, aggravated by exertion; general pallor, with attacks of fainting. When the general cerebral anemia is sudden and decided, convulsions occur.

Partial anemia is manifested by sudden loss of power, of limited muscular area, generally returning to the normal condition.

Prognosis is favorable in all cases save those that are the result of severe and repeated hemorrhages.

Treatment consists in regulated nourishment, with stimulants. A certain number of hours daily in the recumbent position is of advantage. When a tendency to attacks of fainting exists, stimulants, or even the cautious inhalation of amyl nitrite, are indicated. To improve the quantity or quality of the blood give:

℞. Tincture of iron chlorid, ℥ ss
Dilute phosphoric acid, ℥ j
Solution of potassium arsenite, ℥ ss
Syrup of ginger, q. s. ad ℥ iij.

A teaspoonful, well diluted, every 6 hours.

Or—

℞. Strychnin sulphate, gr. j
Quinin sulphate, ℥ j
Dilute hydrochloric acid, ℥ ij
Compound tincture of gentian, q. s. ad ℥ vj.

Teaspoonful in water after meals.

BRAIN, COMPRESSION.—See BRAIN (Injuries.)

BRAIN, CONCUSSION.—See BRAIN (Injuries).

BRAIN, DECOMPRESSION.—See CRANIECTOMY.

BRAIN EXTRACT (Cerebrinin).—Obtained from the gray matter of the sheep's brain by digestion in 5 times its weight of pure glycerin and then adding an equal quantity of a 12 percent solution of common salt. Its effects are almost identical with those of orchitic extract, the most noticeable being increased strength and a feeling of well-being, regulation of the organic functions, and increase of the cardiac force. It has been employed with alleged benefit in locomotor ataxia, neurasthenia and allied affections, nymphomania, perverted sexual habits of cerebral origin, hysteria, melancholia, insomnia, the general debility of malaria, chlorosis, and even more profound anemias; also in cases of defective development of the spinal apparatus, as Friedreich's ataxia. The dose is 16 minims (1 c.c.), once daily or every other day, administered subcutaneously.

Cerebrin is an extract of the entire brain of the ox. The dose is 5 minims, diluted with an equal quantity of distilled water at the time of administration, by hypodermic injection.

BRAIN, FUNGUS.—See BRAIN (Hernia).

BRAIN, HEMORRHAGE (Apoplexy).—Apoplexy is a term usually applied to coma coming on rapidly as a result of cerebral hemorrhage. The word, by its etymology, means a striking off.

Seat.—The location of predilection is in the internal capsule, caused by rupture of the lenticulostriate artery. If the hemorrhage is into the meninges, it is called meningeal hemorrhage.

Etiology.—Apoplexy is the result of hemorrhage. Uricacidemia, gout, rheumatism, syphilis, alcoholism, and all other causes leading to excessive arterial tension and sclerosis are predisposing causes. Apoplexy is more common in the old than in the young, owing to a degenerative and atheromatous condition of the blood-vessels set up by predisposing causes of long standing.

Pathology.—In adults the most common seat is in the internal capsule, but in children it is cortical. The hemorrhage is usually found in the gray matter of the brain—internal capsule, lenticular nucleus—and is generally circumscribed. Its size varies—often being a miliary particle—but it may be so extensive as to burst into the lateral ventricle, or, if cerebellar, into the fourth ventricle. Osler records 2 deaths from hemorrhage into the cerebellum. The clot at first is soft and dark, and the cut edges of the area may show only punctate spots. At times the cerebral tissues may be lacerated. Should the case terminate favorably, the clot gradually loses its color, becomes cystic, and is finally absorbed, leaving only a small cicatrix, the cells and tissues being tinged brownish from the blood-pigment hematoidin.

Symptoms and Course.—As a rule, the onset is sudden; but prodromal symptoms, such as headache, vertigo, mumbness, or tingling pains in the limbs, may precede the attack.

The symptoms may be divided into (1) primary and (2) secondary.

Primary Symptoms.—If the ruptured blood-vessel is in the central ganglia, the patient may fall unconscious, and in convulsions. Hemiplegia is usually present. The face is flushed, the temporal arteries throb violently, the eyelids are half open, the lips are blue, the pulse is full and slow. Often there is a twitching of the extremities, the head being rotated toward one side; the respirations are snoring in character, and there is often sputtering of the lips on expiration. The pupils may be either dilated or contracted.

There is generally a lowering of the body-temperature (which may be different in the two axillæ), followed by a rise—the first day, if the patient survives, to 100° or 102° F., and the second day to 101° F. If there is a very rapid rise in the temperature, the prognosis is more grave. Hemorrhage into the pons or medulla causes an initial rise of temperature.

The affected parts are rigid, and if raised and allowed to drop, fall heavily. The urine and feces may be passed involuntarily.

The chief causal element in the production of the symptoms of apoplexy is probably intracranial pressure.

Secondary Symptoms.—If the hemorrhage is not of sufficient size to produce grave pressure-symptoms, consciousness is gradually restored, and the paralysis is only partial, involving one extremity, one side of face or tongue. The tongue, if protruded, deviates toward the affected side. In most cases of apoplexy there is paralysis of motion only, the sensation remaining good, except occasional paresthesia. The paralysis produces in the affected parts much rigidity, and they move as a whole, with a swinging or rotatory movement given by the trunk. The muscles of the face and those of the thorax usually escape. Should the clot not be absorbed, there may be great damage to the higher brain-functions, with consequent loss of memory, and the different forms of aphasia.

Diagnosis.—In **cardiac syncope** the heart is weak, the face is pale, the respirations are sighing, and the reflexes are not abolished.

In **uremia** the onset of coma is slow; the urine is scanty and contains albumin, especially if the patient is young. Paralysis may occur. If there is an odor it is urinous. There may be a history of general convulsions or convulsive movements preceding the attack. Edema of ankles is generally present, and control of the sphincters is not lost. The pulse at first strong becomes weak and rapid; tension is strong. The heart is hypertrophied, the second aortic sound is accentuated; there is arteriosclerosis. Breathing is stertorous, often of the Cheyne-Stokes type.

In **opium-poisoning** the patient can be aroused by loud calls; the pupils are contracted; the respirations are very slow and stertorous. There is no paralysis, and no loss of control of sphincters.

Alcoholism.—There is an odor of alcohol on the breath; the temperature is normal; the pupils are normal; the coma is less profound; and there is no paralysis nor involuntary action of bowels or bladder. The urine is usually negative but the possibility of concurrent Bright's disease should be kept in mind. The pulse is feeble and frequent.

Embolism is generally the result of valvular disease of the heart, and usually occurs earlier in life. The unconsciousness, as a rule, comes on later, and is not so complete. The left common carotid comes direct from the aorta, and the embolus has a more direct course to the cerebrum; hence the paralysis is more often on the right side.

Thrombosis comes on more gradually, on account of the thrombus usually affecting a vein.

Abscess.—There is generally a history of injury, and the symptoms often appear gradually.

Hysteric hemiplegia usually occurs in women. There is commonly a history of hysteric outbreak. Hemianesthesia is often present with paralysis of motion. Should the patient fall at the time of the attack, it will generally be where she would not be likely to suffer from bodily injury, probably on the bed or couch. This differentiates it also from an epileptic seizure, in which the patient loses consciousness completely, and may suffer severe injury by the fall.

For further diagnosis see Coma.

Prognosis depends upon the site of the lesion. A cortical hemorrhage, if in a young person, may subside without leaving serious sequels behind. The hemiplegia that develops from rupture of the lenticulostriate artery into the internal capsule is usually permanent, and gives rise to subsequent contracture and aphasia. If there is a persistent rise of temperature—103° F. or 104° F.—and persistent coma after the second day, the prognosis becomes more grave. If there is no improvement in the paralyzed member before the first month, contracture is almost sure to arise.

Treatment of the Attack.—The proper treatment of an attack of apoplexy is to put the patient immediately to bed, with head elevated. If away from home, he should not be moved, as the disturbance may lead to further damage of the brain-structure. The head should be slightly turned to one side to prevent the tongue from falling back into the throat and closing the glottis. An ice-bag to the head may prevent further hemorrhage. If the person is a full-blooded individual and the pulse is full and bounding, from 4 to 6 ounces of blood may be taken from the veins of the forearm. Venesection is indicated only when the diagnosis of hemorrhage is positive; in thrombosis it may do harm by slowing the blood current in the veins and favoring the clotting. A weak pulse contraindicates venesection. No attempts should be made to arouse the patient by loud shouting or shaking, but absolute quiet and rest are to be enjoined. If ability to swallow is present, 1 drop of croton oil with 4 or 5 grains of calomel, mixed with glycerin, should be placed upon the tongue, and a small amount of water afterwards given. Stimulants are to be avoided. Should the person not be able to swallow, no food of any kind should be placed in the mouth for a number of hours. As soon as the power of deglutition returns, a small amount of milk, beef-broth, or light soups may be given every 3 or 4 hours. Rectal alimentation may have to be resorted to. Peptonized milk is probably the most nutritious, and 6 or 8 ounces may be injected high up the bowel 2 or 3 times daily. Bed-sores are to be avoided by sponging the bony prominences with diluted alcohol once daily. They may often be prevented by keeping the body free from urine. The amount of urine passed should always be ascertained, and catheterization may be necessary after the first few days. To prevent congestion of the lungs the patient may be turned gently first on one side and then on the other every few hours after the second day. Nitroglycerin or nitrites may be given to soften the pulse and decrease blood-pressure. Restlessness may be combated with bromids.

Subsequent Treatment.—At the end of 6 weeks or 2 months, or after signs of irritation have disappeared, the contracture may be improved by applying the galvanic current over the muscles for 15 or 20 minutes every 2 days. Massage and passive motion also aid in the improvement of the parts. Never use a current so strong as to be painful to the patient. Should syphilis be suspected as the cause of sclerosis of arteries, potassium iodid should be given in 10-grain doses, and gradually increased to 40 or 50 grains, after each meal. Strychnin is valuable after the second month, to give proper tone to the muscles; 1/30 of a grain may be given after meals for periods of 10 days or 2 weeks.

BRAIN, HERNIA.—This is a protrusion of the brain tissue beneath the scalp, through a traumatic defect in the skull, as the result of increased intracranial pressure, *e. g.*, after an operation for an irremovable tumor. When there is a defect in the scalp the condition is called *prolapse of the brain.*

Symptoms.—It pulsates, has an impulse on coughing, and may be partly reducible, causing symptoms of compression of the brain. According to the cause of increased intracranial pressure, it increases or decreases in size. If uncovered by scalp, septic meningitis is likely to occur; and if of large size, gangrene frequently results. *Prolapse*

of the brain should not be confused with *fungus cerebri*, which is simply exuberant and edematous granulations from the neuroglia, as the result of wounds of the brain. Since the latter occurs only when there is an opening leading down to the brain, care should be taken after operation to suture the dura whenever possible; when a portion of the dura has been destroyed, the defect may be closed with a flap of pericranium, sutured in place with the osteogenetic surface outwards, or with a piece of the fascia lata, fatty side in.

Treatment of Hernia Cerebri.—If possible, the cause of the increased intracranial pressure must be removed. The protruding brain should be protected; and, if uncovered, dressed with sterile gauze to prevent septic contamination. Pressure may be dangerous, and amputation should be employed only when sloughing has occurred. The **prognosis** is unfavorable.

Fungus cerebri is treated by slicing off the granulations, or by cauterizing them with silver nitrate. The condition is not serious (Stewart).

BRAIN, HYPEREMIA.—Abnormal fulness of the small vessels of the brain; active, when arterial, passive, when venous. It is characterized by headache, vertigo, disorders of the special senses, and, if the hyperemia is decided, by convulsions.

Causes, Active.—Increased cardiac action, the result of hypertrophy of the left ventricle; general plethora; excesses in eating and drinking; acute alcoholism; sunstroke; prolonged mental labor; diminished amount of arterial blood in other parts, the result of the compression of the abdominal aorta; ligation of a large artery; and the suppression of a habitual bleeding hemorrhoid are active causes.

Passive.—Dilatation of the right heart; pressure upon the veins returning the cerebral blood.

Symptoms.—Fulness in the head may be gradual or sudden in its onset, the symptoms aggravated by the recumbent position. Headache, with paroxysmal neuralgic darts, disorders of vision and hearing, buzzing in the ears and sparks before the eyes, contracted pupils, vertigo, blunted intellect, inability to concentrate the mind, irritable temper, and curious hallucinations are all occasional symptoms. The face is red, the eyes congested, and the carotids pulsating. Sleep is disturbed by dreams, and there is twitching of the limbs. If the attack is sudden, unconsciousness with muscular relaxation occurs.

Cerebral hyperemia, in children often presents alarming symptoms, such as great restlessness, insomnia, night-terrors, gnashing of the teeth during sleep, vomiting, and contraction of pupils followed by general convulsions. Any or all of these symptoms may continue more or less marked from an hour or two to a day, the child enjoying its usual health after a sound sleep, save some fatigue.

Prognosis.—Mild cases terminate favorably in a few hours or a day or two, but may recur. Severe cases (apoplectiform) may recover, but usually indicate subsequent cerebral hemorrhage. The passive form is controlled through the lesions giving rise to it.

Treatment. Active Form.—Remove the cause, if possible. Elevate the head and apply cold—either cold cloths or the ice-cap; at the same time, warmth to the feet. Leeches to the mastoid or cups to the neck, or, in the apoplectiform variety, venesection, to diminish the intracranial blood-pressure; compression of the carotids or ligatures about the thighs have been recommended.

An active purgation is indicated, either by croton oil or magnesium sulphate, by the mouth. Mercury in a full initial dose (5 grains of blue mass), followed by 1/4 to 1/2 grain of calomel three times a day, is recommended. Continued purging is controlled by the addition of opium. The following enema is often valuable:

℞.	Magnesium suphate,	℥ j
	Glycerin,	℥ j
	Warm water,	℥ iv.

In mild cases the application of an ice-cap to the head, a blister to the back of the neck, and 30 to 40 grains of potassium bromid, repeated, and the foregoing enema, control the symptoms.

In severe cases, with forcible, overacting heart, to the measures mentioned must be added tincture of veratrum viride, tincture of aconite, nitroglycerin, or the nitrites.

In the **passive form** the treatment is directed to the cause. See Brain (Hemorrhage).

BRAIN, INFLAMMATION (Encephalitis; Cerebritis; Abscess of the Brain). Definition.—By encephalitis is meant inflammation of the brain substance as contrasted with that of its membranes. What is popularly known as inflammation of the brain is really inflammation of the membranes of the brain, or meningitis. When, on the one hand, inflammation of the surface of the brain accompanying meningitis is eliminated, and, on the other, softening of the brain (formerly thought to be the result in inflammation, but now known to be due to the arrest of blood supply), it leaves a very small number of cases of possible encephalitis without abscess; this both Gowers and Strümpell admit as possible.

Etiology.—The causes of cerebritis are: (1) Traumatism; (2) extension from an adjacent focus of inflammation; and (3) pyemia.

Under traumatic causes are included falls or blows upon the head, more commonly attended by fracture or punctured wound, although no visible injury, not even a scratch upon the skin, may be present.

Under adjacent disease, whence extension of inflammation is especially frequent, is to be included caries of the petrous portion of the temporal bone, due to disease of the middle ear or labyrinth, the most common of all causes of abscess of the brain. Disease of the orbit is another similar cause. The route of such a communication may be either through the sinuses of the brain or the lymph channels.

Pyemic abscess of the brain is rare. Causal foci are malignant endocarditis, gangrene of the lung, chronic bronchitis with bronchiectasis, bone-disease, suppuration of the liver, and the specific fevers, among which may be included influenza.

Encephalitis occurs most frequently between the ages of 10 and 40, and about three times as often in men as in women.

Symptoms.—In acute cases the symptoms develop rapidly, and may run their course in a few days; while in the forms known as chronic, the symptoms are scarcely less rapid after they once set in, which may be weeks, months, or even longer, after the primary causal lesion. These symptoms are the result of pressure—direct or indirect—of destruction of the brain substance, or of poisoning due to absorption of putrid matter. They are much the same as those of meningitis, with which, indeed, abscess is often associated, especially if there is injury. The most striking are headache, often severe and persistent; vomiting; vertigo; mental dulness, succeeded sometimes by delirium and sometimes by coma. Convulsions are often present, and are epileptoid in character. Optic neuritis is also one of the symptoms. There is usually fever, as shown by elevation of temperature. At times the temperature is normal or subnormal. The pulse is usually slow—60 to 70. The symptoms may set in with a chill after the latent period. The toxic symptoms are those usual to toxic states: viz., chill, irregular fever, prostration, emaciation, exhaustion. Paralysis, in the form of hemiplegia, sometimes occurs. The paralysis, however, is not always hemiplegic, and may be limited to the arm and face, especially in abscess of the temporosphenoidal lobe, which may compress the lower motor centers. If on the left side, there may be aphasia. Other cranial nerves besides the optic are sometimes involved.

When the abscess is in the parietooccipital region, there may be hemianopsia. It is especially in abscess of the cerebellum that vomiting occurs, and staggering, if the middle lobe is affected.

Phlebitis of the superior petrosal and lateral sinues is common, especially when the abscess is caused by disease of the ear, for the former receives a vein from the internal ear, and the latter the mastoid veins. Edema about the ear and neçk and hardness of the jugular veins should suggest phlebitis, while rigidity of the neck and cranial nerve paralysis even more unerringly point to meningitis.

Acute cases last from 8 to 14 days, rarely 30 days; the delayed cases may not show their first symptoms for months.

Diagnosis.—This is readily determined in acute cases, being substantiated by the history of injury, rigor, and fever, followed by the brain-symptoms described. Almost as certain is the diagnosis when such symptoms follow chronic ear-disease or localized putrid lung-disease. It is to be remembered, however, that simple ear-disease may produce some general cerebral symptoms, in which is included optic neuritis. In such cases it is impossible to make the diagnosis until the course and termination of the disease have excluded one or the other. In like manner meningitis and abscess may be confounded, and with reason, because, in the first place, meningitis may be produced by the same causes as produce abscess; and, second, meningitis may be caused by abscess. Meningitis, however, affects the cranial nerves more than abscess, unless the abscess is seated in the pons, and usually meningitis follows more promptly upon its cause. It is to be remembered that tumor of the brain may produce symptoms identical with those described. The chief distinctive symptom is the presence of fever in abscess.

Prognosis.—Unless we admit a curable form, described by Strümpell, it is always ultimately fatal, unless we have the rare good fortune to reach the abscess with the trephine.

Treatment.—A certain prophylaxis may be exercised in the proper treatment of disease of the ear, for it is often neglect of this that leads to the abscess. Such prophylaxis includes measures that secure free discharge and antisepsis. Beyond this, the only treatment for abscess that promises anything toward a favorable result is the operation of trephining.

Aconite and opium are useful in the stage of excitement, and bromid of potassium or sodium may restrain convulsions. The wound must be made aseptic. The bowels should be loosened, the head shaved, and the patient placed in a cool, quiet room. The catheter should be used if unconsciousness exists, and not forgotten later. Cold to the head by Leiter's tubes or rubber ice-caps is beneficial. Among the useful hypnotics are hydrobromid of hyoscin, chloral, and paraldehyd. Mustard plasters to the neck and forehead for short periods may be employed, especially if pressure-symptoms are observed. If depression is great, aromatic spirit of ammonia or wine (sherry or champagne) should be used. A milk diet is best. If coma develops and constipation exists, croton oil and glycerin should be administered.

BRAIN, INJURIES.—In general terms brain injuries may be classified as injuries causing intracranial lesions with or without concomitant fracture of the skull. These may act directly or indirectly, and may be caused by falls, by blows, or by wounds with blunt, pointed, or sharp-edged weapons or missiles, and by all varieties of firearms. As a result of these injuries, traumatisms of the skull that give rise to endocranial manifestations may be classified as simple contusions, direct or indirect (*e. g.*, the latter from falls on the buttocks, knees, or feet, or from blows on the chin), without fracture; and into fractures proper, which may be simple or compound, comminuted or complicated, complete or incomplete, direct or indirect—these terms being applied in the sense in which they are understood when dealing with fractures in other parts of the body. Secondarily and topographically, they are again subdivided into (*a*) fractures of the vault, and (*b*) fractures of the base; and in accordance with the nature of the injuring force, into (*a*) linear or fissured, (*b*) punctured, or (*c*) depressed. See Skull (Fractures).

The endocranial lesions that may result from the preceding direct or indirect injuries, as they are transmitted from the cranial case to its contents, may be classified, irrespective of cause, into the following categories: viz., (1) *primary* lesions, contusions, lacerations, hemorrhages, thromboses of sinuses, and, more rarely, effusions of air and cere-

brospinal fluid; (2) *secondary* lesions; these are the sequels of infectious meningitis in all its anatomic varieties, and of parenchymatous inflammations, which are usually, if not invariably, of a septic character, leading to various types of intracranial suppuration, abscess, and meningoencephalitis; finally, as (3) *tertiary* or remote lesions, we would mention the degenerative results of trauma and of those lesions that coincide with cicatrization. These sometimes occasion serious permanent disorders, such as obstinate cephalalgia, epilepsy, insanity, etc.

In addition to all these, as the almost constant attendant of cranial traumatism, is surgical shock, which is perhaps more manifest in injuries of the head than in other parts of the body, and is so important that it is usually referred to by a specific term—"concussion."

At the very threshold of the study of endocranial traumatisms a difficult question arises that relates to the definition and differentiation of certain general conditions that up to the present have perplexed the practitioner as well as the pathologist. The first of these refers to the meaning and limitations of the word "concussion." The ancients applied this term "concussion" (commotio cerebri) to every symptom and manifestation of brain injury, and it was not until 1677 that the modern concept of this term was reached, when Borel limited the application of the word "concussion" to the brain symptoms that follow injuries of the head when these are not associated with appreciable anatomic or structural lesions of its contents. The observations of Littré (1705) and J. L. Pettit (1761), followed by those of Serres, Gama, Desault, Dupuytren, Malgaigne, and others, separated two other conditions—contusion and compression—from concussion, and thus established a clinical triology, which has since remained inseparably linked with the study of cerebral traumatism. With increasing knowledge and accumulating anatomic and experimental data, this simple clinical classification of brain injuries was soon complicated by the recognition of new pathologic conditions, and it became evident that the words "concussion" and "compression" stood only for complex symptom-groups of a generic character, which embraced a variety of anatomic lesions.

The old classification was very simple and easy of comprehension. If the intracranial space was diminished by the intrusion of a fractured bone, serum, or extravasated blood or pus, it was *compression;* otherwise all symptoms were referred to a hypothetic vibration of the brain within the skull—a merely functional disorder produced by violence. But this distinction was too finely drawn, and between simple concussion and real compression there are several intermediary states or clinical conditions that result from a variety of lesions that are often very disastrous in their consequences, and that frequently may be distinguished from one another. It is in view of the almost constant presence of structural alterations in the brain-substance in the traumatic conditions that were formerly classed as pure concussion that clinicians are growing more and more reluctant to accept the existence of a purely functional disorder, such as concussion was supposed to be in former years, and are inclined to adopt a much more restricted and better defined application of this term. Hence what was formerly broadly described as "concussion," now embraces a variety of conditions, in which *contusion, laceration,* and *hemorrhage* are recognized as the dominant lesions.

As the sharp lines that at one time were artificially drawn between concussion and compression have been gradually obliterated in accordance with a better knowledge of the pathologic facts, so have the intermediary conditions of contusion, laceration, and hemorrhage assumed their true clinical value and importance.

Cerebral Shock or Concussion.—In accordance with present knowledge and with the views that prevail among the best authorities on the subject, the application of the word "concussion" is restricted to conditions of pure traumatic shock following head injuries in which the brain symptoms are of a purely dynamic character, indicative solely of vascular disturbances in the endocranial circulation, and so transitory in duration that they preclude the possibility of permanent organic lesions. As the mechanism of its production is probably different from that of ordinary surgical shock, as this is brought about by traumatisms in other parts of the body, it must be recognized as a clinical entity that has the right to separate existence by the side of the graver states known as general contusion, laceration, and hemorrhage. It must be recognized, however, that while concussion may exist as a form of shock, its presence is so intimately linked with grave organic lesions that it is practically impossible to separate it from such conditions when they coexist in complicated cases. It is, therefore, only by the careful observation of individual cases, and often only after a sufficient length of time has elapsed after the injury, that one can eliminate shock or concussion ("stunning," as it is called by the laity) and establish the existence of the graver states that are recognized as contusion or "bruising" of the brain.

It is especially those frequent cases of head injury in which there is no recognizable fracture of the skull, or when this occurs without depression, and in which partial or complete unconsciousness exists without definite localizing symptoms, that are likely to trouble the practitioner for an exact diagnosis or a satisfactory interpretation of the underlying conditions. Take, for instance, the following case: A man is struck a blow on the head, or he falls; he is temporarily stunned—that is to say, the brain is so shaken up that its functions have been temporarily arrested; at least, something has happened to it of sufficient importance to suspend the intelligence. With this temporary unconsciousness there is pallor; the pulse quickens and flickers for a few moments; phenomena like syncope ensue; the respirations are rapid, shallow, irregular; in a few minutes more he arouses; is dizzy; he gets up; slowly regains possession of himself; has a certain amount of nausea, and then for the rest of the day, or for a short time afterwards has headache, and the disturbance is over. This

is the simplest form of brain shock or concussion. It is followed by no appreciable consequences or evidences of permanent lesion.

Contusion.—The differences between concussion or shock and contusion are, as previously indicated, due to differences in the degree of violence with which the injury is inflicted. The mechanism of their production is the same; at least, when the generalized forms of contusion are considered. In contusions there are positive anatomic lesions, which may be limited to a circumscribed area, or, more frequently, disseminated throughout the brain and its membranes. The meninges, cortex, subcortical brain-substance, and the ventricles may be separately involved, but more often all these are affected simultaneously by the same process. The contusion may be so violent that a part of the brain and its membranes will be transformed into a thick magma of mushy consistency, in which the various anatomic elements are indistinguishable. This is frequently the case in compound comminuted fractures, gunshot injuries, and crushing blows with blunt instruments; in other cases the evidences of contusion are scarcely appreciable, and only the experienced pathologist will be able to recognize the minute lesions that characterize it. This is particularly true of those fatal cases in which, apart from general hyperemia and edema, only a few punctiform hemorrhages are observed in the floor of the fourth ventricle or in the substance of the medulla. The essential lesions in the general forms of contusion are:

1. General hyperemia of variable intensity.

2. General parenchymatous edema of the brain-substance. This edema is variable in amount, sometimes appreciable only after some delay and after close inspection upon section, and at other times so profuse that the fluid can be squeezed from the brain by the hand, as from a sponge. In marked cases of contusion considerable exudation follows soon after the accident, causing the ecchymosed and thrombosed brain-substance to swell and become edematous; this may speedily subside in the less severe cases, but in the more serious contusions spreading edema often follows in the wake of the capillary and venous stasis induced by vasomotor pareses, multiple thromboses, and disseminated extravasations. The pressure caused by this primary swelling of the tissues also interferes with the circulation in the superficial veins of the pia mater; this, in turn, intensifies the tendency to serous transudation and edema, and in this way a general interstitial compression of the brain elements results, which is expressed clinically in the signs of compression and coma. This spreading edema is a very important lesion; it establishes a distinct link between severe contusion and compression from extensive traumatism, and explains the mechanism by which cases of brain injury in which signs of contusion or laceration alone exist pass rapidly into a state of profound coma, with the typical sign of compression from extrinsic causes. It should be remembered that degenerative changes will follow in the brain-substance from a prolonged interference with its circulation and nutrition; yellow softening occurs, which is indicated by the presence of a pulpy, yellowish mass containing fat-granules and disintegrated nerve-elements, soft enough to be washed away by a stream of water.

3. Punctiform or miliary hemorrhages, never exceeding the size of a buckshot (anything larger than this is due to laceration and not to contusion).

4. Capillary thrombi, which are disseminated throughout the cortex or cerebral substance.

Laceration.—Intimately associated with the lesions of contusion are lacerations of the brain-substance, which vary exceedingly in extent and importance. These lacerations may be cortical or subcortical, single or multiple, trivial or important. Lacerations may be so extensive that not only an entire lobe, but a greater part of a whole hemisphere may be involved. In other cases they are scarcely larger or more important than the most inconsiderable limited contusions, from which they are distinguishable only by the great amount of hemorrhage involved. Between these extremes they present every gradation of destructive injury. Lacerations, like limited contusions and indirect fractures, almost invariably occur at points directly opposite those at which force has been applied. They occur usually at the base of the brain, and by far the largest proportion is observed in the inferior surface of the frontal or temporal lobes. When lacerations are extensive, death ensues, in the majority of cases, long before sufficient time has elapsed for cicatrization. The process of repair is very slow. After the lapse of several months lacerations have been found to be still distinctly limited, uncontracted, softened, rusty in color, and without regenerative changes. The fatalities that immediately follow intracranial injury with laceration are probably to be ascribed to concomitant hemorrhage or to general contusion; those in which the laceration is the essential cause of death occur during a period which may extend from the end of the first 48 hours to 6 weeks (Phelps).

Symptomatology.—At the bedside it is practically impossible to distinguish between the effects of pure shock, general contusion, multiple minute lacerations, or capillary hemorrhages; at least in the beginning or immediately after the infliction of the injury. It is only when the stupor is very profound from the beginning, and irritative (convulsive) signs or paralytic manifestations that point to injury done to special areas of the cortex; or, again, when the visible external injury of the skull is such (depressed comminuted fracture) that it must unavoidably implicate the brain, that a positive knowledge is had that contusion exists. General contusion of the brain, it must be remembered, is one of the most frequent of brain traumatisms; few injuries of the head sufficiently severe to produce unconsciousness are free from it, either as a dominant condition or as a complication. On the other hand, an injury that is serious enough to cause contusion or laceration of the brain must have sufficed to produce shock or concussion. The essential signs are partial or complete unconsciousness; a rapid, feeble pulse; quick, shallow respiration; pallor of skin; copious perspiration; muscle

incoordination, with frequent lack of sphincter control; occasional vomiting; and variable pupils, which usually react to light. This state, when uncomplicated, usually passes away with reasonable promptness, especially when aided by proper treatment. "When stupor or unconsciousness persists for several hours, and new symptoms are superadded to those of shock, there is every reason to believe that the intracranial condition is one of contusion, and not of shock. When, for instance, mental agitation changes into delirium, when the rapid, feeble pulse becomes stronger and slower, the respirations deeper, the limbs move in incoordinate ways, the speech is disturbed from muscle incoordination, the patient selects wrong words; or when the mental condition becomes more serious, and stupor or coma takes the place of delirium, while external irritants have gradually diminishing effects, and when the pupils gradually enlarge, while failing to respond to light, it may be said that the condition of contusion is making itself apparent. If along with muscle uncertainty there is also much spasm and rigidity in particular peripheral groups, the evidence to this effect is certain" (Park).

From the preceding statements it is evident that the clinical picture of contusion, with its frequently associated lacerations and small hemorrhages, is extremely variable, and presents no absolutely fixed or unchangeable traits. The symptomatic manifestations of this condition must, in fact, vary with the extent, the character, and the intensity of the anatomic lesions upon which it is dependent. Just as with the lesions themselves, there is no distinct line of demarcation that separates pure concussion on the one hand, from the graver lesions that constitute general compression; they imperceptibly blend or merge into one another, and it is only when the extremes are contrasted that the distinctions can be readily made.

The course, duration, and termination of contusion must, for the same reasons, be as variable as the individual cases themselves. In the most favorable and simple cases vascular equilibrium is promptly restored; the hyperemia and edema due to vasomotor paresis disappear, and capillary hemorrhages and ecchymoses are absorbed; a complete psychic and physical restoration takes place in a few hours or days. In other less favorable cases the patient remains in a doubtful condition for days, weeks and months; the primary total unconsciousness is changed to stupor, lethargy, or somnolence, from which the patient gradually recovers. In others the stupor of shock changes into mental agitation and delirium, with great irritability, in which violent paroxysms or explosions of irritation (anger, violent language) alternate with long intervals of sleep, during which urine and feces may be voided involuntarily; the patient usually lies curled upon his side, and can only be moved by loud yelling into his ears or by other means of stimulation. This latter is the condition especially described by British authors as "cerebral irritation." It is usually associated with laceration and other injuries of the frontal lobes. From this state the patient may recover completely or partially; some of the physical or psychic functions may remain impaired; focal epilepsy or insanity may also remain as relics of the damage done to the brain. In still other cases the state of contusion slowly or rapidly passes into that of acute leptomeningitis or cerebritis (meningoencephalitis); localized abscess of the brain may form; or, more often, if the meningeal infection dominates, delirium, photophobia, rising temperature, rapid pulse, and other inflammatory signs, soon followed by coma, produced by seropurulent effusions and exudates, closes the picture, indicating that septic infection has fatally invaded the bruised area of the brain. In a last group of cases the effects of contusion are immediately fatal. These were the fulminating or "foudroyant" cases of concussion of the older clinicians; they are now recognized as fatal cases of contusion in which the initial violence has involved the medulla or the floor of the fourth ventricle, when localized lacerations or extravasations mark its occurrence.

Diagnosis.—In summing up the diagnostic features of general contusions the following considerations are important:

1. **The time that has elapsed since the injury** is of diagnostic value (unconsciousness that lasts for hours means more than shock; it means structural lesions).

2. The first conclusion is accentuated and made positive by the occurrence of new **physical and focal** (sensory or paretic) **disturbances** after reaction has set in.

3. There is **abnormal rise in the temperature** after reaction has set in; the temperature is subnormal in shock. It may rise from 100° to 105° F. or more in general contusion, but any temperature of 103° F. or more that persists after reaction means that, in addition to contusion, marked lacerations coexist. The diagnostic value of the primary and persistent rise of temperature in head injuries as an almost constant accompaniment of brain laceration has been brought to light by Phelps' researches, and should be remembered—it is almost pathognomonic in its significance. The use of the thermometer is also of great prognostic value. In over 500 case of head injuries carefully studied by Phelps none recovered in which the temperature rose to 105° F. and persisted at this figure. This rise is not due, necessarily, to injury of hypothetic thermogenetic centers but is an indication of a generalized nutritive disturbance; it is significant of the extent rather than of the localization of the injury. It is interesting to observe that in the cases of general contusion in which the highest temperatures were obtained—105° to 109°—the fornix, the optic thalami, and the corpora striata were coincidently involved. This primary rise of temperature must be carefully distinguished from the secondary elevations occurring sometimes days or weeks after reaction has taken place, and which usually indicate, if persistent and progressive, that pyogenic infection has penetrated the cranium.

In localized contusion and laceration bilateral variation in the axillary temperature has been observed. "It may be said, with some reserve, that when a difference exists, the temperature is

rather more frequently 0.2° higher upon the side opposite than upon that which corresponds to the seat of cerebral injury" (Phelps).

4. **Pulse and Respiration.**—After the effect of the initial shock is over the pulse becomes slower and fuller. The respirations, on the contrary, when disturbed, are usually hastened, even though the pulse may be retarded. The want of symmetry in the radial pulse is not rare in head injuries. It is most frequently a primary aberration. The variations in the radial pulse affect its strength and fulness, not its frequency, and it is in all other respects symmetric. The pulse is sometimes stronger and fuller upon the side opposite the site of injury, but this is not constant. If localized hemorrhages sufficiently extensive to produce general compression occur coincidently with contusion, especially if the medulla is involved, respiration may be immediately and fatally retarded. Cheyne-Stokes breathing is associated most often with fatal general contusion and laceration and edema, when these implicate the medulla; it is usually the forerunner of dissolution and death.

5. **Special Peripheral Signs.**—Limited paralyses or convulsive movements, rigidity of the extremities, disturbances in sight, hearing, smell, and tactile sense, indicate that special centers in the cortex or in other well-differentiated areas have been involved in the general contusion and laceration, and their topographic significance in the brain is to be considered in the light of the knowledge furnished by experimental physiology.

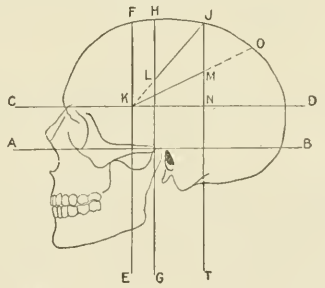
6. **Loss of bladder or rectal control** may occur in all forms of general contusion, and even in simple shock, from the loss of cortical inhibitory impulses. Any lesions of the cerebral parenchyma may give rise to these symptoms, though it is possible that in future it may be recognized as a disturbance of a special cerebral center.

7. **The condition of the pupils** is so variable in general contusion that no special importance can be attached to their appearance, except that marked permanent asymmetry is valuable as a sign of compression from epidural hemorrhage, and that fixed, immovable, dilated pupils usually indicate localized compression of the hemisphere or motor oculi nerve (Hutchinson's sign) on the side corresponding to the pupillary dilatation; and that bilateral dilatation, with fixation of the pupils, indicates general compression of the brain, and is of grave prognosis.

Cerebral Localization.—"If a patient receives a blow upon the head, and it is found that localized paralysis is present, we conclude that there exists in the cortical center a laceration of some severity corresponding to the muscles implicated. If almost immediately after the injury there is a distinct spasm affecting a localized group of muscles—a monospasm— it may be concluded that hemorrhage is going on from the lacerated brain-substance, or that there is a breaking down of the tissue of the center corresponding to the affected muscles. If the monospasm extends, first affecting one side of the body and finally both sides, so that the attacks assume the form of true epileptic fits, it is probable that the extravasated blood is extending over the surface of the brain and irritating more or less widely the whole motor area" (Erichsen). Should there be motor aphasia, a lesion of the posterior extremity of the third left frontal convolution is indicated. Should there be facial spasm or paralysis, a lesion of the lower third of the ascending frontal and of the contiguous part of the posterior end of the second frontal convolutions is probably present. Should there be paralysis of the arm—a brachial monoplegia—the middle portion of the ascending frontal lobe is probably affected. Should there be paralysis of the lower limb, the lesion probably involves the upper end of the ascending parietal, and the superior parietal lobule lying behind it, as far as the margin of the longitudinal fissure.

Briefly, therefore, a cortical lesion may be distinguished from a central lesion as follows: In the *cortical lesion* the paralysis, although it may occur immediately after the accident, often does not appear for some time. It is incomplete and localized, and probably affects only one limb or a single group of muscles. In the *central lesion*, on the other hand, the paralysis occurs immediately after the injury; it is more complete and extensive, and the whole of one side, at least, will probably be paralyzed (Walsham).

Kronlein's method of craniocerebral topography is as follows: A horizontal line, A B, is drawn through the lower margin of the orbit and upper margin of the external auditory meatus. Above and parallel with this is a second line, C D, on a level with the upper margin of the orbit. Three vertical lines are now drawn, the first passing through the middle of the zygoma, E F, the second, G H, through condyle of the lower jaw, and the



Kronlein's Method of Craniocerebral Topography.

third, T J, through the posterior margin of the mastoid process. A line drawn from K to J corresponds between L and J to the fissure of Rolando. The line K M, which bisects the angle J K N, corresponds to the horizontal limb of the fissure of Sylvius. If this line is continued backward to the middle line of the head it indicates approximately the location of the parietooccipital fissure. K and N are the points to trephine for the anterior and posterior branches of the middle meningeal artery.

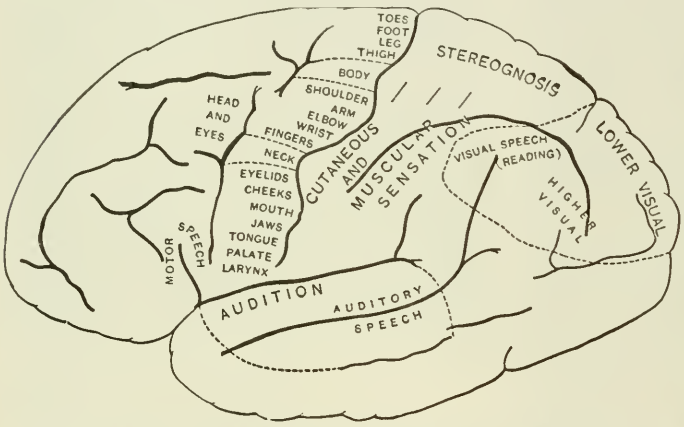
Treatment.—"No injury to the head is too slight to be despised or too severe to be despaired of" is an aphorism in surgery that must always be borne in mind when dealing with these cases. This assertion is particularly true of those cranial

injuries in which the external skull lesions are of very slight extent. All such cases should be regarded as serious and dangerous until distinctly proved to be the contrary. Inasmuch as time is the main element by which to ascertain this fact, all such patients should, if not actually put to bed, at least be kept quiet and under observation for no less than 24 hours. The usual primary indications are to combat shock, to arrest hemorrhage, to secure asepsis, and to meet any localized lesions by such surgical measures as may be indicated. When reaction has set in, the work of the surgeon is limited to counteracting excessive endocranial hyperemia and secondary inflammations, and, lastly, to promoting the absorption of effusions and exudates. If the patient is seen in the primary collapse of shock, when he is algid, pale, and in a syncopal condition, begin by putting him in the recumbent position with the head low. Apply ammonia by inhalation to the nostrils. Cover the patient with blankets and warm the feet, legs, trunk, and precordia with hot-water bags and fomentations. Dashing hot water over the head repeatedly, as recommended by Horsley, is a valuable restorative. If the pulse is weak and deglutition difficult, counterirritants (mustard plasters) to the extremities, and an enema of warm black coffee or of hot saline solution containing a teaspoonful of beef-juice, to be repeated every 3 or 4 hours, are indicated. Aromatic spirit of ammonia, Hoffmann's anodyne by mouth, and hypodermic injections of strychnin (1/40 to 1/15 of a grain), atropin (1/150 to 1/175 of a grain), digitalin (1/100 of a grain), nitroglycerin (1/100 of a grain), will materially aid in stimulating the circulatory, respiratory, and vasomotor centers.

If the degree of collapse is very great, alcoholic stimulants may be cautiously administered by mouth (champagne, brandy, whisky, etc.), hypodermically, or in the coffee enema. The objections to alcohol in cerebral shock and contusion are (1) that the blood pressure is raised and ruptured vessels may commence to bleed, and (2) that it tends to cause hyperemia of the brain and to favor the occurrence of spreading edema.

As a last resource, intravenous saline infusion may be resorted to. The infusion must be as hot as the hand can comfortably bear it, and should be of the decinormal strength sodium chlorid, 0.7 per cent.; or, approximately, 40 grains to 1 pint of water). This is the most powerful circulatory restorative at our command, but it should be used cautiously, not to its maximum effect, for the same reasons given against the too liberal use of alcohol. If saline infusion fails to improve the circulation, the prognosis is very gloomy indeed, and there is scarcely any prospect of recovery.

If respiratory failure is marked, as in some cases of bulbar contusions, artificial respiration may be resorted to with the greatest advantage, and for an indefinite period of time, by means of the Fell-O'Dwyer apparatus; in this way respiration may be kept up, as in opium narcosis, until the nutritive equilibrium of the brain is restored. With the advent of reaction and the reestablishment of a comparatively normal pulse and temperature, the earliest possible attention should be given to the cranial and intracranial lesions.



Localization of Function on the Cerebral Cortex; External Surface.—(*Starr.*)—(*From Woolsey's Surgical Anatomy.*)

The head should be shaved, shampooed, and brushed with green-soap lather, and prepared with as much care as if a primary intracranial operation were contemplated. The ears, nose, and pharynx should be carefully examined for blood, cerebro-spinal fluid, or brain matter, and cleansed with the greatest thoroughness in order to diminish the risk of infection. The auditory canal demands especial attention, as it is one of the most frequent avenues of secondary encephalic infection. The auditory canal should be plugged, after cleansing, with an antiseptic (sublimate) absorbent cotton tampon or with iodoform gauze. Unfortunately, asepsis of the nose and mouth and pharynx is always imperfect, and, therefore, of comparatively little value.

If fracture of the skull exists, the indications will vary in accordance with their simple or compound character. In compound fractures the indications are clear and positive; the external wound should be thoroughly disinfected by antiseptic irrigation with a mild germicide (lysol, 2 percent; formol, 5 percent; carbolic acid, 2 percent; acid sublimate, 1:4000) and should be enlarged as freely as may be necessary in order to remove any visible foreign bodies or loose fragments of bone. If there are any depressed fragments, they should be elevated and replaced if still adherent to the pericranium, or removed entirely if completely detached. In simple or closed fracture the attitude of the surgeon should be most guarded and conservative, as it is easy to convert a simple condition into a grave and fatal state

by hasty interference, which may be followed by infection. The rules that govern the surgeon in dealing with the various kinds of fractures are separately detailed elsewhere, and will not be repeated here. It is very important, however, that no operation be undertaken so long as profound shock exists. This rule is as imperative here as in operation for injury elsewhere in the body. The only exception is in a case of localized hemorrhage, when the lesion itself is the chief cause of the systemic depression. All such operations should be performed, whenever practicable, under the influence of cocain or eucain anesthesia, with weak (Schleich's) solutions; hemostasis and anesthesia being maintained during the operation by a tight rubber tube or band encircling the head on a level with the glabella in front and with the external occipital protuberance behind.

After disinfecting, draining, and dressing any wounds that may exist in the scalp or skull a complete antiseptic head-dressing should be applied to permanently protect the wounded area from infection. After all these preliminaries have been attended to, the patient should be kept under constant observation, with special reference to the secondary development of new symptoms that might indicate the distinct localization of lesions, with a view to further operative procedures. If pressure-symptoms, monoplegias, hemiplegias, a symmetrically dilated pupil, and mental condition should point to localized intracranial (especially epidural) hemorrhage, operative interference is immediately indicated to expose and ligate the injured vessel and remove the clot.

If the symptoms simply continue to point to a general contusion or laceration, the operative indications cease, and the rôle of the practitioner is limited to combating secondary intracranial hyperemia and edema, with its attendant symptoms—fever, headache, delirium, convulsions, scattered and irregular compression symptoms (from exudates and effusions), and, lastly, the comatose state itself. The treatment then resembles that used for a subacute form of meningocerebritis; thus, in the hyperemic state with delirium or simple cerebral irritation, an ice-helmet, Leiter's coils, or ice-bags should be applied to the head; leeches to the mastoid or temples; wet cups to the back of head, to the extent of drawing 10 to 12 ounces of blood, especially if the pulse is growing slower, more tense, and fuller.

It is also important to secure intestinal asepsis and to diminish the dangers of autointoxication. For this purpose give calomel, followed by salines, until the intestinal contents are thoroughly evacuated; give water in abundance, to favor renal elimination and to dilute toxins in the blood. Give only milk and moderate quantities of predigested food and fruit-juices, with the same object in view. If there is hyperthermia, with evidences of headache, insomnia, and great retinal and auditory sensitiveness, the bromids, with or without chloral hydrate, will be indicated, given alone or combined with the usual analgesic antipyretics, phenacetin, antipyrin, lactophenin, and such hypnotics as trional, sulphonal, etc. After the acute congestive symptoms are over, but the patient lingers for days and weeks in a doubtful state of torpor, somnolence, or lethargy, with persistent evidences of localized exudations, potassium iodid may be given, with the hope of favoring absorption.

In long, lasting cases special care should be observed in maintaining the best hygeinic surroundings about the patient. Bed-sores are easily developed, and cystitis frequently follows the careless use of unclean catheters. Consequently the patient should be bathed frequently, and if catheters are required to evacuate the bladder, they should be subjected to the most scrupulous sterilization. See Skull (Fractures, Surgery), Brain (Inflammation).

Compression.—Like concussion, this is a generic term applied to a distinct group of symptoms that may be produced by a variety of causes, all of which lead to the same effect: viz., to a notable increase in the intracranial tension and abnormal pressure upon the brain as a whole. "The brain, blood, lymph, and cerebrospinal fluid completely fill the cranial cavity, and there is normally no room for anything in the shape of a foreign body without seriously affecting the equilibrium between the brain and the contents of the spinal canal. When, however, a foreign substance exerts pressure upon the brain, the results are invariably the same—be this substance what it may—and compression signs will follow no matter what the compressing cause" (Park).

It is only the *sudden* increase of pressure that causes the characteristic symptoms of compression, and not the chronic, very gradually developing diminution of space, due, for example, to intracranial tumors, increase in the amount of cerebrospinal fluid (hydrocephalus), enlargement of the brain and diminution in size or form of the skull. In all such chronic conditions there is some compensation made by absorption of cerebrospinal fluid, by atrophy of the skull, by yielding of the cranial walls, etc. In sudden encroachments into the cranial capacity by depressed fractures, clots, foreign bodies, etc., there is a certain amount of compensation and accommodation by the passage of some of the cerebrospinal fluid from the skull into the vertebral canal; the latter, owing to the ligamentous connections between the different vertebræ, being capable of some expansion; whereas the other, on account of its rigid, unyielding, bony case, cannot expand. If, however, the intracranial pressure oversteps a certain limit, the tension of the cerebrospinal fluid becomes so great that the circulation in the brain and its membranes becomes impeded.

In dealing with this subject a clear distinction must be made between *pressure* and *compression* of the brain. A certain area of the brain may be pressed upon by a depressed bone, a clot, an abscess, a small tumor, or a foreign body, and yet not give rise to the symptoms of compression. The multiple and small hemorrhages and ecchymoses of contusion and laceration do not, in themselves, give rise to compression; but the associated edema and capillary stasis from vasomotor paresis

give rise to anemia and a vitiated (toxic) circulation, which simulate the phenomena of compression if the lesions are extensive enough. Compression means a general mechanic encroachment upon the endocranial capacity, and not localized pressure over a definite, limited area; when such pressure exists, the mere mechanic displacement caused by it is easily compensated by the dislodgement of the cerebrospinal fluid and by vascular adaptation.

Symptomatology.—The clinical picture of compression will vary in its incipiency according to the nature, seat, and extent of the compressing cause. In the fully developed state the signs and symptoms are identical, no matter what the cause may be. The signs of compression may come on gradually and very slowly, as in abscesses and tumors of the brain; they may be instantaneous, as in depressed fractures with violent contusion, laceration, and hemorrhage. There are, therefore, acute and chronic forms of compression.

When compression is general and fully developed, the symptoms are those of coma, and as such they are unmistakable. A man is struck a blow on the head; his skull is crushed in; one or more fragments of broken bone are driven in; the brain and its membranes are torn, bruised, and lacerated; the brain is not only bruised, but compressed. Under such circumstances the patient is felled to the ground senseless. No amount of shouting or shaking will arouse him. Such a patient has dilated pupils, which are wide open and will not respond to light. He snores in respiration, and his cheeks puff just as a patient does under the profound anesthesia of ether. He sweats profusely. His pulse is extremely full and labored, sometimes sinking as low as 50, 40, or even 30 beats a minute. It is regular, full and bounding, but extremely slow. He is practically dead to consciousness. As Bergmann has aptly said, "in the night of the senses" produced by pressure upon the cortex, only the medulla and spinal ganglia are awake. Everything is dead above the bulb, and even the vigilance of this sleepless sentinel is partially lessened (in the more extensive injuries) by the impairment of some of its most important functions, as shown by the diminution of the glossopharyngeal reflex and by difficult deglutition. Not only is there a general and absolute relaxation, but the muscular system of the patient is paralyzed, and he lies an inert, motionless mass. In this purely automatic condition, in which life is maintained solely by the persistence of the respiratory and circulatory functions, the immediate borderline that separates life from death is reached, and unless prompt relief is obtained, dissolution is inevitable. The final extinction of the bulbar centers need not take place immediately, but this state may continue for hours or a few days, when the patient gradually sinks, and dies as a result of the cessation, first, of the respiration, and, lastly, of the circulation. But between this comatose state, in which the patient is practically lifeless, and the condition of the patient temporarily stunned—who is quickly roused, with flickering pulse, irregular pupils, nausea, etc.—the contrast is marked and unmistakable.

Cases of simple shock and of the milder degrees of contusion and laceration, with their localized peripheral manifestations in the organs of special sense and in individual groups of muscles, are usually easily distinguished from those of pure compression; but in the more general and violent forms of contusion, laceration, and hemorrhage, the symptoms begin to run together, and culminate in a comatose condition in which it is impossible to establish any difference between them and those of compression as produced by more direct mechanic agencies. When the comatose state is fully established, it is only by a knowledge of the antecedent history, of the nature of the injury itself, and of the earlier symptoms that it is possible to differentiate between the various primary conditions that have led to the compression.

Compression is simply a *result*—a condition that, in itself, is not significant or indicative of any particular cause. It is, therefore, far more profitable to study the clinical phenomena of compression etiologically and analytically than synthetically —that is, they should be studied from the point of view of the individual causes that give rise to them. Nevertheless, the phenomena that merely indicate a general encroachment upon the cranial capacity, regardless of cause, are worthy of separate consideration.

The phenomena of compression, as studied experimentally and clinically, are the same, and may be conveniently divided into 3 stages:

1. *The stage of cortical and bulbar irritation:* irritability, erethism, restlessness, visceral disturbances (nausea, vomiting, etc.), cephalgia, delirium, congestion of the face, narrow pupils, convulsive movements; pulse begins to be hard and slow, indicating increased arterial tension; irritation of vasomotor and pneumogastric centers.

2. *The paralytic stage,* indicating general cephalic compression: the irritability and excitement of the previous stage change to torpor, lethargy, somnolence, from which the patient never rouses, or is awakened with great difficulty. Ophthalmoscopic examination of the fundus oculi clearly reveals the condition of the endocranial circulation. There is marked venous turgescence of the central retinal veins, followed by edema of the retina and optic disc, with concomitant arterial anemia of the retina. "Choked disc" is then typical. The pupils are symmetrically dilated, though bilateral dilatation is preceded by asymmetry and mydriasis on the side corresponding to the primary lesion. Monoplegias and hemiplegias occur, according as the pressure is made upon a limited area or upon an entire hemisphere. As the compression increases and becomes general throughout the encephalon, the limited or localized paralyses and convulsive movements disappear, as the focal symptoms are lost in the comatose state that follows. Then, as the vasomotor centers and pneumogastric centers are stimulated to overcome the increasing endocranial resistance, the pulse becomes progressively slower and harder; the arterial tension is greatly increased; the carotids pulsate visibly; the respirations are deep and

slow; there is stertor (snoring) from paralysis of the palatine and pharyngeal muscles, which usually flap with the air-current; there is retention of urine, involuntary discharge of feces, and the entire voluntary muscular apparatus becomes paralyzed through compression of both Rolandic areas. Temperature rises above normal, the rise varying according to the nature of the compressing cause.

3. *Stage of Dissolution.*—This coincides with the final exhaustion and surrender of the basal and bulbar centers; the hard and slow pulse of the previous stage becomes soft, rapid, irregular, and compressible; the respiration is superficial, and the Cheyne-Stokes type of breathing is established. The face is livid and cyanotic from defective respiration; the pupils are widely dilated, fixed, and immovable; deglutition is impossible and total anesthesia and paralyses are followed by failure of the respiration and death.

General Causes of Compression.—The reduction in size of the cranial cavity that is required to produce compression may be obtained, according to Park (1) by lessening of its cavity as a result of alterations in the configuration of its surroundings, whether this is diffused or local; (2) by increase in the quantity of the cerebrospinal fluid or in the size of the brain itself, which latter condition may be produced by edema, by exudation of serum, or by hypertrophy of the brain; (3) by foreign bodies that may enter the skull from without; (4) by pathologic conditions—such as hemorrhages, collections of pus, and tumors—that may be produced either from the brain-substance, its membranes, or its vessels, or that may arise from without and produce other disturbances indirectly and in a secondary way—*i. e.*, depressed bone.

The causes of compression that arise from traumatism or injury are summed up in the following conditions: (1) Compression by extravasated blood; (2) by fractures of the skull with depression, or by foreign bodies penetrating from without; (3) by products of acute infectious inflammation due to septic infection from without.

Diagnosis.—The differential diagnosis of compression, as regards the endocranial lesions that give rise to it, and of other nontraumatic conditions of which the comatose stage is a final and dominant manifestation, is of the greatest practical importance. As Phelps says: "The case of an unknown man found unconscious in the street, taken to a hospital, retained in a medical ward, and first discovered in the dead-house to have been the victim of accident or violence is not exceptional."

The primary symptom that overshadows all others, in all forms of intracranial injury, and that at the same time is the most striking of various other morbid conditions, is coma or some degree of unconsciousness. It is natural that the identity should be, as it is, the most fruitful source of error in diagnosis. The number of idiopathic diseases in which coma is characteristic is large; possibly 20 or more. The vast majority of these need not claim the attention, as their differentiation is not difficult. The greatest interest centers in the differential diagnosis of apoplexy, uremia, alcoholism, and opium narcosis, in which difficulties are sometimes so great, and erroneous conclusions so often reached, as to demand special consideration.

When the practitioner is called upon to attend to some unknown person who has been accidentally discovered in an unconscious or comatose condition, he should bear in mind the medicolegal, the diagnostic, and the therapeutic relations of the case. For the sake of possible judicial proceedings, as well as for diagnostic purposes, he should take a rapid survey of the situation, of the surroundings of the patient, and note the presence or absence of blood, vomitus, excreta, etc. He should note the position and attitude of the patient, the nature of the ground, etc. He should try to rouse the patient, in order to elicit information and to determine the degree or depth of the unconsciousness. A most thorough and critical examination of the head and body should be made; the skull should be examined for contusions, lacerations, fractures, or other evidences of local violence; the tongue should be examined for bites—so often self-inflicted by epileptics; the reflexes, the muscular resistance, and the sensibility should be tested for general or partial paralyses and anesthesias; the state of the pupils, of the pulse, and of the respiration should be noted; the urine drawn and tested for albumin or sugar; if in doubt, the stomach contents should be siphoned or pumped out to determine the character of the gastric contents, and to test later on for alcohol or poisons. Lastly, if, after a thorough examination, there is still doubt, the patient should be put to bed and kept under the observation of a trained nurse or of an intelligent person who will keep account of further developments.

In investigating for traumatic conditions the possible existence of other nontraumatic states should never be lost sight of.

In *apoplexy*, which is due to a spontaneous intracerebral or intraventricular hemorrhage—from atheromatous lesions of the lenticulostriate artery—the picture of coma is complete; but the absence of external marks of violence, the age, the atheromatous condition of the arterial system, and the temperature will usually help to distinguish it. In apoplexy the temperature is at first subnormal, and scarcely rises above the normal standard, except when death ensues. In traumatic hemorrhagic lesions there is subnormal temperature while shock lasts, but an abnormal rise follows immediately with reaction, whether recovery or death impends, and is practically continuous while the result remains in abeyance (Phelps).

In *opium-poisoning* the pupils are strongly and symmetrically contracted, the respiration is markedly and progressively diminished in frequency, and there is a pause between inspiration and expiration; the patient can frequently be roused by powerful cutaneous irritation with electric brush and faradic current; and the intelligence is only torpid, not lost; there is no incoherence, and articulation is unaffected. The breath may have the odor of opium.

In *uremic coma* the face is pale, white, edematous; the breath sweetish or ammoniacal; the pupils

dilated, sluggish, and irresponsive to light; the patient can rarely be roused; the pulse is hard, but rapid and irregular; as a rule, the respirations are frequent and irregular; the urine is albuminous. If there is diabetic coma, the presence of sugar in the urine will clear the diagnosis.

In *alcoholic coma* the breath is alcoholic, the pupils normal, the face flushed, the surface cold, and the patient can usually be roused unless very deeply comatose; his speech is then incoherent, he is irritable, and the articulation is indistinct. Respirations are regular and without stertor; the pulse frequent, weak, but it becomes slow as coma increases; the temperature, when the coma is profound, is markedly subnormal, often not over 96° F., the fall in the temperature being directly proportional to the degree of intoxication (Phelps). The urine may contain alcohol. The importance of the correct diagnosis of alcoholic coma cannot be overestimated, because it is the condition which is most frequently confounded with intracranial traumatism. It is also essential in approaching the diagnosis of a case of alcoholic coma "to divest the mind of all preoccupations and to realize that an unconscious man with a scalp wound is not necessarily drunk, and that even a drunken man may be so seriously injured as to require surgical treatment." The low temperature of pure alcoholic coma is almost a pathognomonic sign, and should not be forgotten (Phelps). See Coma.

In the differential diagnosis of the several primary traumatic lesions that give rise to general compression and the comatose state, the history of the case, the character of the injury, the cause, the duration, and the manifestations presented before the total unconsciousness has occurred are of prime importance. When these data are available, the greatest interest is centered in the recognition of *hemorrhage*, and especially in its localized meningeal forms. The diagnostic importance of hemorrhage cannot be overestimated. It is the cause of the brain symptoms in 50 to 60 percent of all cases of brain injury, and in one-third of this percentage it is the direct, if not the sole, cause of a fatal termination (Phelps). Of the intracranial hemorrhages, those furnished by the middle meningeal artery are by far the most important, as they constitute no less than 85 percent of the operable cases. When intracranial hemorrhage exists, its occurrence, at least in the epidural forms, is almost invariably preceded by a period of lucidity, which may last a few minutes, hours, or days. This lucid period intervenes between the reaction from shock and the development of sufficient extravasation to excite compression. In the extradural and most frequent forms this interval of consciousness after injury is longest, because of the adhesion of the dura, which resists the spread of the blood. If, however, primary unconsciousness persists or is greatly prolonged, its continuance may be due either to the severity of the lesion or to a complicating hemorrhage; whether the one has persisted from the beginning, or has at any time been replaced by the other, or whether both exist together, can be determined, if at all, only by the study of all the symptoms presented. In those obscure cases in which the practitioner has no previous history to guide him—nothing except the knowledge that the patient who lies comatose before him has been hurt in the head—the value of the thermometer as a differential diagnostic agent, as taught us by Phelps' painstaking observations, is inestimable.*

Prognosis.—The existence of the typical, fully developed symptoms of compression is in itself, in all traumatisms of the brain, of the gravest prognostic significance. And when signs of bulbar lesions, with failure of the circulatory and respiratory centers, are apparent, the fatal issue of the case is practically certain. The prognosis becomes darker as the symptoms become general; more hopeful when they indicate localization and areas of limited pressure. The greatest fallacy lies in waiting for the general compression symptoms to develop. In traumatic cases all is centered in the probability of removing the compressing cause and relieving the intracranial tension. Under these circumstances a great deal will depend upon the judgment of the surgeon who is quick to see the opportunity for the intervention, and who will not operate too soon, while the patient is still suffering from profound shock, or wait too long, until the prolonged action of the compressing agent has led to irreparable degeneration and atrophic changes in the damaged brain. Another of the fallacies against which the inexperienced must guard themselves is the expectation of great immediate results after the apparent removal of the gross objective cause of the compression. This erroneous expectation is usually greatest in the operative treatment of markedly depressed fractures. The tyro often forgets in his enthusiasm that the fracture of the bone is not directly a source of danger, but that this resides in the lesions of the brain and membranes that are invariably associated with it. It is upon the manifestations produced by these that the practitioner must depend in formulating his prognosis. "The traditional cases in which, by the elevation of a depressed fragment of bone and the relief of compression, the patient, in the twinkling of an eye, springs from coma into consciousness and mental activity seem to be extinct." Instances will occur in which, by the opening of the cranial cavity and incidental elevation of en-

* "The primary temperature is above the normal standard in all forms of intracranial lesion, when it has not been depressed by general shock or by the effect of alcoholic excess. In cases of comparatively uncomplicated hemorrhage it will range from 98.5° to 99.5°, and will not subsequently exceed 100°, unless general cerebral contusion is well pronounced, when it may reach 101° or 101°+. If the essential lesion is cerebral contusion, the primary temperature is but slightly higher, but will rise progressively, and, in a certain proportion of cases, will be marked by remissions, which do not attend hemorrhages. If, then, after the lapse of an hour consciousness still remains in abeyance, a *stationary* temperature, but 1 or 2 degrees above normal, will indicate a hemorrhage of some profusion without serious cerebral injury; but a higher elevation, which constantly increases, with possible remissions, will point to a visceral lesion. If this increasing temperature does not exceed moderate limits, and its advance is slow, it will suggest a contusion alone, or with lacerations of small extent a still higher, early temperature (103° to 105° +), advancing rapidly and uninterruptedly, or without important remissions, is an almost pathognomonic indication of extensive and usually fatal lacerations."

croaching bone, cerebral function is presently restored; but, as a rule, the improvement that follows the removal of the primary compressing agent is gradual, and the probabilities of recovery will ultimately depend upon the extent and degree of the general and invisible lesions that have coincided with it. On the other hand, the extreme pessimism that is entertained by some ultraconservative surgeons is not always justified by the course of even the most sombre cases, in which the removal of gross objective causes of compression—bone, clot, or pus—will be followed by surprisingly favorable results.

Treatment.—In dealing with compression from primary traumatic lesions the practitioner is called upon to remedy the evil caused by the presence of four pathologic elements, which may appear singly or combined; fractured bone, extravasated blood, a foreign body, and a purulent collection. This last must be considered as a secondary complication, and should not be regarded in the light of a primary indication for which immediate action is demanded after injury. Each one of the first three primary conditions, or all together, may, and frequently do, coexist with contusion or laceration—the extent of gravity of which can be easily estimated. The treatment in each instance demands special consideration, but in its essence resolves itself into the removal of the dominant compressing cause, whenever this is practicable. The preliminary rules that have been laid down for the treatment of shock in the section on concussion and contusion, as well as those that refer to the immediate sterilization of the head, the injured areas, and all the available avenues of infection, have been sufficiently insisted upon not to require repetition.

When it is clear that the hemorrhage is from the middle meningeal artery, and it appears probable that no other serious injury of the brain has been received, the trephine should be applied, for the purpose of removing the clot and securing the bleeding vessel. The situation of the artery is about 1 1/2 inches behind the external angular process of the orbit, and over this spot a crown of bone should be removed. The dark clot that now protrudes at the opening should be turned out by some form of scoop, and if the bleeding artery is then seen, an attempt should be made to tie or twist it, or to compress it by plugging the groove in the bone in which it lies with a piece of aseptic wax or wood. If the bleeding-point cannot be reached, more bone may be cut away.

After the depressed bone or fragments have been elevated, the extradural clot removed, and the bullet or other foreign body extracted—if this is feasible—the efforts of the surgeon should be chiefly directed toward the maintenance of the asepsis and drainage already initiated in the preliminary treatment and during the operation itself. The postoperative treatment must then aim at the relief of the general contusion and laceration, which are generally improved by the diminished tension and the drainage afforded by the operation. Nature's efforts at repair must then be aided by judicious supportive treatment, and by such measures as have been previously recommended to combat the secondary inflammatory reaction and septic complications that are likely to follow. In the cases in which the operative treatment of the chief compressing lesion is impracticable, owing to the extent of the lesion or to the condition of the patient, the only course left the surgeon is to await developments, and, while waiting, to maintain the activity of the vital centers of the medulla and of the eliminating organs, with the lingering hope that the reparative process may be initiated and spontaneous recovery still take place.

See Skull (Fractures, Surgery), Brain (Inflammation), Gunshot Wounds.

BRAIN, SCLEROSIS.—See Insular Sclerosis.

BRAIN, THROMBOSIS AND EMBOLISM.—**Thrombosis,** or the formation of a clot in a vessel—an antemortem coagulation—is as a rule the result of chronic endarteritis, as seen in the aged, together with a slowing and weakening of the blood-current. Chronic alcoholism and syphilis are the usual causes when occurring in young adults.

Emboli, in the great majority of instances, result from endocarditis—cardiac emboli; small particles of the exudation being carried into the circulation and deposited in the brain. Emboli may also be derived from aortic aneurysm or from syphiloma of the great vessels.

The cerebral arteries may be obstructed by emboli or thrombi; the cerebral veins and sinuses by thrombi alone. The changes in the cerebral tissue are those of anemia of the part or parts supplied by the occluded vessels. The subsequent changes depend upon the anatomy of the vessels.

The vessel most commonly occluded is the left middle cerebral artery, which sends branches to the second and third frontal convolutions, the anterior and superior portions of the three temporal convolutions, the island of Reil, the parietal convolutions, part of the external and all of the internal capsule, the lenticular nucleus, and most of the corpus striatum—the motor centers.

Symptoms.—There are two distinct modes of onset: gradual, when the result of thrombosis; sudden or apoplectic, when due to embolism.

Cerebral thrombosis is most common in the aged. Persistent headache and vertigo, at one time severe and at another mild, are early symptoms. Next are alterations in the patient's character. He becomes irritable, morose, and despondent, with periods of absent-mindedness, disorders of vision, and impairment of memory. Speech may be hesitating and mumbling. There is impaired locomotion, the result of the vertigo, and of muscular weakness and trembling, followed sooner or later by hemiplegia, which may be preceded by sudden insensibility or occur gradually, the symptoms slowly proceeding to senile dementia and death from exhaustion; or, rarely, the symptoms are not so grave, and partial or complete recovery occurs after the hemiplegia, from establishment of the collateral circulation.

Cerebral Embolism.—The symptoms are sudden, but mild or grave in character.

Mild Variety.—There are sudden and severe vertigo, confusion of mind, muscular twitchings, usually one-sided, and vomiting, followed by hemi-

plegia, most frequently of the right side. The intellect is clear, but hesitating. After some weeks or months the paralysis usually disappears and recovery is complete.

Grave or Apoplectic Variety.—There are sudden headache, vertigo, flushing or pallor of the face; the patient may utter a sharp cry, suddenly fall to the ground unconscious and with complete muscular relaxation, followed by death; or there may be a gradual return of consciousness with hemiplegia, which is generally right-sided, with aphasia, remaining for several weeks or months, or persistent, the mind remaining normal or enfeebled and the emotional nature highly excitable and the reason and judgment clouded; this may continue for years, or gradually develop into dementia, exhaustion, and death.

The following are some of the symptoms, according to the particular vessels occluded:

Embolism of the *vertebral artery*, the left most frequently, results in acute bulbar paralysis from involvement of the nuclei in the medulla, associated or not with hemiplegia.

Embolism of the *basilar artery* causes diplegia with bulbar symptoms. There is rapid rise of temperature. Death follows within a day or two, or suddenly, if the respiratory centers are involved.

The middle cerebral artery is the most frequent seat of embolic or thrombotic occlusions. The symptoms depend upon the exact branch involved: if plugged before the central arteries are given off, the internal capsule is deprived of its blood supply and permanent hemiplegia may follow; if the occlusion is in the central branches, the hemiplegia involves the arm and face; and if on the left side, aphasia occurs. The individual branches passing to the third frontal may be plugged, producing aphasia; the ascending parietal, producing hemiplegia, particularly of the hand; supramarginal and angular gyri, with word-blindness; and the temporal gyri, with word-deafness.

Course.—*Thrombosis*, essentially an affection of the elderly, has a chronic course. Months or years may be occupied with the various symptoms until the phenomena of senile dementia develop.

Embolism is of sudden onset, and may be followed by a rapid recovery.

Diagnosis.—*Thrombosis* is associated with changes in the vessels, with arcus senilis, and with other evidences of senile degeneration.

Embolism may be mistaken for cerebral apoplexy, and while a positive differentiation cannot always be made, the chief point to be considered is the presence of cardiac murmurs.

Prognosis.—*Thrombosis* is a permanent and progressive condition in the majority of instances. Recovery is a rare termination.

Embolism may be followed by a perfect recovery. Usually, however, some evidences of the plugging remain permanently. Death may be the result within a day or two from the plugging of a large vessel, the patient never emerging from the coma. In other cases the coma disappears, the hemiplegia with aphasia persisting, and the case pursues the usual course of localized cerebral softening.

Treatment.—The indication in the early stage of embolism and thrombosis is the reestablishment of the circulation within the district deprived of blood supply, in order to prevent the changes incident to defective nutrition. This is accomplished by means to strengthen the heart's action, tonics, perfect rest for some time after the attack, a plain but nutritious diet, and attention to the various excreta.

Bartholow recommends 10 grains of ammonium carbonate, with 5 grains of ammonium iodid, 3 times a day, continued for several months, the object being dual—to increase the action of the heart and arteries and to effect a solution of forming thrombi by maintaining the alkalinity of the blood.

In the aged presenting indications of degeneration, much benefit results from the use of:

℞. Solution of potassium arsenite, ♏ iij to v
Syrup of calcium lactophosphate, ʒ j to ij.
After meals.

It may be combined with cod-liver oil with decided advantage.

For embolism, the immediate and persistent use of the following may dissolve the plug:

℞. Ammonium carbonate, gr. v.
Solution of ammonium acetate, ʒ j.
Three or four times daily.

In a month or two a very light galvanic current may be passed through the brain in both directions.

See Brain (Anemia).

BRAIN, TUMORS.—A brain tumor is either a growth in the cerebral tissue, on the meninges, or in the vessels, characterized by symptoms of pressure upon the brain-structure. The sizes of tumors vary, and they may become as large as an orange before they will give rise to symptoms.

Tumors of the brain are of various kinds: namely, vascular tumors, as aneurysms; parasitic tumors, as cysticercus; diathetic tumors, as tubercle or syphilis; accidental tumors, as glioma, fibroma, or fibrosarcoma.

Whatever the character of the growth, it produces irritation of the surrounding parts, and, by pressure, destruction of the tissues; or it interferes with the arterial or venous flow.

Symptoms.—Those common to tumors in general are: Headache, persistent and increasing in intensity; defects of vision, even blindness, due to optic neuritis, a very constant symptom; defects of hearing, of taste, and of speech, the result of paresis of the vocal cords; vertigo, associated with nausea and vomiting; convulsions, epileptiform in character, usually limited to one side of the body, occurring at regular intervals, or confined to the eyeballs (nystagmus) or one limb, with no loss of consciousness; palsies, beginning first as strabismus, ptosis, and dilatation of the pupil, of the facial muscles, paraplegia, and general hemiplegia; defects of sensibility: namely, sensations of numbness and coldness in the limbs and body. Occasionally

disturbances of equilibrium, manifested by a tendency to go backward or to turn to the right or left; intellectual faculties well preserved until late in the affection, when the memory becomes impaired or lost for certain articles, and finally a gradually advancing imbecility.

Diagnosis.—The following points will aid in a positive diagnosis: Long-continued, persistent headache, without appreciable cause; epileptiform convulsions, unilateral, without loss of consciousness; difficulty of vision, hearing, and speech, associated with nausea and vomiting; and local and general palsies. Spiller has recently called attention to the importance of gradually developing hemiplegia as a sign of cerebral tumor.

The location of the tumor may be determined by the more or less pronounced character of certain symptoms. The diagnosis of the character of the growth can only be determined by a close study of the history.

Syphilis.—According to Herter, the indications that suggest that the tumor is syphilitic are as follows: Syphilitic history; symptoms of irritative disease of cortex rather than destructive evidences of rapid growth at the onset, followed by a period of slow progress or stationary symptoms; gradual improvement under antisyphilitic treatment; development between 20 and 45 years of age. The Wassermann reaction has become an important aid in diagnosis, but, as Spiller has well said, it must not be forgotten that a syphilitic person may have a nonsyphilitic tumor.

Indications suggesting **tubercular growth** are: Family history of tuberculosis or tuberculosis in some other organ; rapid development of symptoms; indications of the growth in the cerebellum or in the pons; early appearance of the symptoms, especially before the tenth year, and history of injury to head.

Indications suggesting **sarcoma** or **carcinoma** are: The presence of a sarcoma elsewhere and rapidly failing health, with symptoms of cerebral tumor in patients over 50 years.

Indications suggesting **glioma**: Sudden loss of consciousness, with exacerbation of all symptoms in the clinical history of cerebral tumor; cortex irritative symptoms, as in syphiloma, developing after 50 years of age, and the absence of all evidences of tubercle, syphilis, sarcoma, and cancer.

The focal symptoms of intracranial tumors are so important in diagnosis that the following summary is given of symptoms caused by brain tumors:

Prefrontal Region.—Mental impairment; pressure in central region, causing aphasia; Jacksonian epilepsy, and disturbances of smell.

Central Region.—Motor aphasia; monoplegia; partial anesthesia; Jacksonian epilepsy.

Posterior Parietal Region.—Word-blindness; homonymous hemianopsia; disturbed muscular sense.

Corpus Callosum.—Progressive hemiplegia.

Crus Cerebri.—Crossed paralyses of oculomotor nerve and limbs.

Corpora Quadrigemina.—Oculomotor paralyses; reeling gait; possibly blindness and deafness.

Pons and Medulla.—Crossed paralyses of face and limbs, or tongue and limbs; other lesions in cranial nerves.

Cerebellum.—Marked cerebellar ataxia; vomiting; convulsions; coma.

Base, Anterior Fossa.—Mental enfeeblement; disturbances of smell and vision; exophthalmos.

Base, Middle Fossa.—Impairment of vision; hemiplegia; oculomotor disturbances.

Base, Posterior Fossa.—Trigeminal neuralgia; neuroparalytic ophthalmia; paralyses of the face and tongue; impaired hearing; crossed paralyses.

Diagnosis between Cerebral Tumor and Abscess.—In both there may be any or all of the following symptoms: Headache, vomiting, double optic neuritis, monoplegia, hemiplegia, paralysis of cranial nerves, and mental failure. Tumor has, in addition, marked focal symptoms and optic neuritis; the absence of these favors the diagnosis of abscess; or, if there is hemiplegia, the ankle-clonus and knee-jerk are exaggerated. Fever and rigors point to abscess. The causes of abscess are very clear; those of tumor often uncertain.

Prognosis.—Unless of syphilitic origin, unfavorable; but it is to be remembered that all syphilitic tumors of the brain do not have a favorable termination.

Treatment is unsatisfactory and mostly symptomatic. Potassium iodid, 20 grains, 3 times a day, increased gradually and continued until the physiologic effects are produced, should be used in all cases, and discontinued only if no benefit follows. Mercurial inunctions, or the bichlorid, 1/12 of a grain, or the biniodid, 1/24 to 1/12 of a grain, may be given as required, though the biniodid is less valuable than the separate use of the iodid of potassium and the bichlorid of mercury.

In tuberculous tumors the usual constitutional treatment of tuberculosis by cod-liver oil, iron, and other tonics, with nourishing food and healthful indoor and outdoor life, is to be carried out. The usual remedies indicated to relieve pain are to be used: bromids, if necessary, in large doses, phenacetin, antifebrin, and antipyrin, and, if necessary, morphin. The ice-cap may be used, and, above all, leeching tried. The most beneficial effect is sometimes produced by free leeching, though it is, unfortunately, of but temporary duration. Other symptoms should be treated by appropriate remedies.

The hygienic treatment is of the greatest importance. Excesses of every kind should be avoided; alcohol should be rigidly excluded, as well as all sexual excitement and mental excitement of any kind, for the slightest increment of blood in the brain may bring on a convulsion and cause death.

Exploratory operation, being comparatively harmless with the aseptic precautions of the present day, should be made whenever the tumor can be localized with any approach to accuracy. Although cerebral localization has been developed to a very high degree, we frequently fail to accurately locate a tumor.

BRAN.—The ground husk of the wheat-grain, usually mixed with a very small proportion of starch. Barton's bran dressing was formerly much used in compound fractures of the leg. It has been entirely supplanted by the modern antiseptic dressings.

In the treatment of simple fractures of the femur, long, thin bags filled with bran may replace sand bags as padding for the long splint of the Liston apparatus. It has been found that good support may be given to the limb by the use of a bran bag, with this splint running from below the ankle to the axilla, and the short splint passing from the ankle to the perineum and retained by means of a splint cloth. In the absence of the air-pillow, small, circular pads may be made and filled with bran and placed under the back to relieve pressure, for the prevention of bed-sores.

In obstetric practice a shallow bag made of cheese-cloth and filled with bran will be found a satisfactory means of absorbing discharges. It may be placed over the rubber sheet. At the termination of the labor it is readily slipped from under the patient, leaving the bed clean and dry. It is superior to old blankets and comfortables, such as are ordinarily used for this purpose. A flat bag filled with bran and heated in an oven is a satisfactory means of applying dry external heat, and a good substitute for the rubber hot-water bag. It is light and easily borne, and adapts itself to all parts of the surface of the body where it may be placed. Dry external heat may be applied to the trunk in this way in the treatment of shock; it assists in hastening reaction, and adds to the comfort of the patient.

BRANCHIAL CYSTS.—Branchial cysts are developed in connection with the branchial clefts. They occur as smooth-walled unilocular cysts lined with columnar-celled epithelium, which secretes a glairy or mucoid fluid. They are sometimes associated with branchial fistulæ, which are also due to imperfect closure of the branchial clefts and usually open externally along the anterior border of the sternomastoid muscle, and internally into the pharynx. Treatment consists either in incision and drainage, or in excision.

BRAND'S TREATMENT.—A cold bath for treating fever—especially that of enteric form—consisting of immersion in a bath, at the temperature of 68° F., every 3 hours, or when the bodily temperature reaches 102° F. Friction of the surface is essential, while the temperature of the water is gradually reduced, and cold is applied to the head. Stimulants are administered after the bath, when the patient is put back to bed and dried between sheets—preferably flannel. The duration of the bath is usually from 5 to 15 minutes, the condition of the patient being the index, as shown by chattering of the teeth or cyanosis of the lips or face. Hot-water bottles are put at the feet after the bath. See Typhoid Fever, Bath.

BRASS POISONING.—In the casting of brass—an alloy of copper and zinc—workmen are subject to acute poisoning through inhalation of the fumes. Chronic brass poisoning is due to inhalation of minute particles of triturated brass.

Acute brass poisoning, *brass-founder's ague,* is usually ushered in (after a holiday) with fatigue, malaise, and also frequently a sense of oppression in the chest, nausea, and muscular pains. Then follow chills and more severe pains in the muscles and head. Finally, after copious perspiration, the patient, completely exhausted, falls asleep.

Chronic brass poisoning may attack workmen at once or after years. Some may never be affected. The initial symptoms are those of anemia. There is a metallic taste in the mouth, a metallic odor to the breath, a green line on the teeth, laryngeal or pharyngeal catarrh, gastrointestinal derangements, a sense of oppression, itchings with or without eruptions of the skin, greenish sweats, sensations of coldness.

Prophylaxis.—A susceptible person should change his occupation. Cleanliness of the workmen is imperative. Food should never be touched in the workroom, and never without washing the hands.

Treatment of the acute attack consists in the administration of milk, lobelia, and tobacco; the latter should be abstained from during intervals between attacks. In the chronic form, phosphorus or dilute phosphoric acid and potassium iodid are indicated.

BRAYERA.—See Cusso.

BREAD.—A mixture of flour and water made porous by carbon dioxid and then baked. The flour may be of wheat, corn, oats, or rye. The carbon dioxid may be introduced by decomposing an alkaline carbonate (sodium or potassium) by an acid (cream of tartar), or by fermenting the starch with yeast.

Almond Bread for Diabetics.—Beat 1/4 pound of blanched sweet almonds in a stone mortar, put in a linen bag, and steep for 15 minutes in boiling water containing vinegar, and mix into this paste 3 ounces of butter and 2 eggs. Add a little salt and the yolks of 3 eggs, stirring well for a time. Whip up the whites of 3 eggs and stir in. Place the resulting dough in greased molds, and dry over a slow fire.

Bran Bread for Diabetics.—Boil 1 quart of wheat bran in two successive waters for 15 minutes each time, and strain through a sieve. Wash well with cold water (on the sieve) until it runs off perfectly clear. Squeeze the bran as dry as possible in a cloth; spread thinly on a dish, and dry in a slow oven. This prepared bran is ground fine, until it is very soft.

Mix 3 newly laid eggs with 1/2 pint of milk. Warm 1 1/2 or 2 ounces of butter. Stir all together, adding a little nutmeg and ginger or other agreeable spice. The resulting dough should be baked in small pans, well-buttered, for half an hour in a quick oven. The bread should be but little thicker than a ship's biscuit when baked, and may be eaten at breakfast, dinner, and supper, with a little cheese or meat. At tea, butter may be freely allowed, or they may be eaten with curd or any of the soft cheeses.

In its common state the bran is soft and not easily reduced to a fine powder, hence care must be used to have it finely broken up. If moisture changes it, the cake may be put before the fire for from 5 to 10 minutes every day.

Brown Bread.—A kind of bread made from a mixture of corn, rye, and wheat flour.

Graham bread is made from unbolted wheat

flour; it contains more gluten, diastase, and mineral phosphates than white bread.

Bread-jelly is a serviceable food as an occasional change from mushes, but with a tendency to constipate if given freely. It is prepared by pouring boiling water upon stale bread and allowing it to soak for an hour. The water is then removed, fresh water added, and the whole boiled until a thick mass forms. On pouring off the excess of water and cooling, a jelly-like mass remains, which may be eaten with milk or sugar.

Bread-paste is a culture medium for bacteria. Stale, coarse bread is dried, ground to powder, and made into a paste with water. It is well suited for the growth of molds.

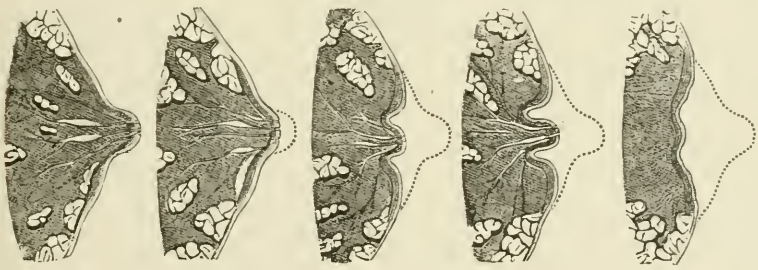
White bread is made from bolted wheat flour, and is therefore deficient in diastase, gluten, and mineral phosphates.

Other kinds, such as rye (or black), corn, barley, etc., indicate their composition by their name.

BREAK-BONE FEVER.—See DENGUE.

BREAST, DISEASES.—The more important disorders of the breasts after childbirth are: (1) Diseases of the nipple; (2) defective secretion (agalactia); (3) galactorrhea; (4) congestion and engorgement; and (5) inflammation.

Care of the Nipple.—During the last weeks of pregnancy the nipple should receive some special attention, so that it may properly perform its function during lactation. This consists in anointing it twice daily with equal parts of glycerol of tannin and water. By this treatment it is rendered firm and tough, and thus cracks and fissures are prevented later on. During lactation the nipple should be carefully washed with soap and water, or boric acid solution, after each nursing, and a little sweet oil applied.



A B C D E

SAGITTAL DIAMETER OF VARIOUS DEFORMITIES OF THE NIPPLE.

A. Normal nipple. B. Short nipple. C. Inverted nipple. D. Umbilicated nipple. E. Retraction of nipple in cancer.—(*Beck.*)

Inversion of the nipple is a not uncommon affection, and is usually due to pressure from corsets. The child is unable to take a firm hold of the nipple, and therefore nursing is interfered with. If this condition is discovered during pregnancy, the patient should be instructed to grasp the nipple firmly between the thumb and forefinger and draw it gently outward. This procedure should be practised several times daily during the last month of pregnancy.

Soon after labor effects should be made to draw the nipple out with the fingers or a breast-pump, or a shield may be used. Failing in this, artificial feeding must be resorted to.

Excoriation and Fissure of the Nipple.—This is caused by the maceration and irritation of nursing. This condition should be prevented by proper care during pregnancy and lactation, as described. The treatment consists in the application of an ointment composed of 1 dram each of subnitrate of bismuth and castor oil, or compound tincture of benzoin. Fissures may be touched with a 10-grain solution of the nitrate of silver. Sterile water and alcohol may be used to bathe the nipples. A mild or soothing ointment, such as almond oil, may be applied, and a shield should be used. Washing, drying, and dusting with dried talc powder during lactation is advisable. The following may be used as a wash:

℞. Mercuric iodid,		gr. ij
Alcohol,		ʒ jss
Glycerin, Distilled water,	each,	O j.

When a small abrasion is found, a nipple shield may be worn, the part being washed with sterile water, dried, and dusted with borated talc after each nursing. The fissure itself causes the mother intense pain during nursing, and this pain causes her to prolong the intervals between nursing, during which the breasts become swollen with milk. An area of acute inflammation surrounds the ulcer, and abscess of the breast may result. In severe cases the child must be weaned.

Defective Secretion of the Breasts.—The secretion of milk may be defective in quantity or in quality. This may be due to certain diseases—as the acute infectious diseases, syphilis, or phthisis—to severe hemorrhage, to profound emotion, or to diet. If the defective secretion is due to any acute disease, the child should be fed artificially until the disease subsides, when, on the return of the milk, it should be put back to the breast. A syphilitic or phthisical mother should not nurse her child, for fear of infecting it. Drugs are of little value in stimulating the flow of milk. If a generous diet, supplemented by 1/2 of a pint of milk twice daily, with perhaps a glass of malt liquor at dinner, fails, artificial feeding is required.

Galactorrhea.—An excessive secretion of milk, or a dribbling of milk from the breast.

The cause of this condition is not definitely known. It has been atrributed to anemia, plethora, and paralysis of the openings of the lactiferous ducts.

Treatment is usually unsatisfactory. A firm mammary binder, supplemented by the administration of ergot and potassium iodid, will sometimes prove effectual. Belladonna is an anti-

galactagog, acting when either given internally or applied locally. Camphor has been used locally and generally in hot olive oil. Antipyrin and potassium iodid have been given internally.

℞. Belladonna ointment, Lanolin, } each, ℥ ss.

Apply locally twice daily.

Congestion and Engorgement of the Breasts.—This occurs on about the third or fourth day after labor. The breast is tense, swollen and painful.

Treatment should be prompt, or inflammation may develop. A brisk saline purge should be given. The breasts should be emptied at regular intervals by the infant, the breast pump or massage. The most effective means of relieving pain and reducing congestion is the continuous application of cloths wrung out in hot water, as hot as the patient will tolerate. To have the cloths sufficiently hot, they must be placed in a thick towel to be wrung out. Massage is too painful at first; the movements must be gentle and from the nipple outward, in the direction of the venous current. A firm mammary binder should be applied as soon as the breasts begin to fill, and should be worn during the first two weeks of the puerperium.

Inflammation of the Breasts (Mastitis).—This is a not infrequent complication of the puerperium. It is usually septic in origin, the infection taking place through a crack or fissure in the nipple. Occasionally it originates in overactivity of the gland, with retained secretion (**caked breast**).

This condition is attended by more or less constitutional disturbance: fever, which may be ushered in by a distinct chill, and rapid pulse. The breast is swollen and painful; the skin is red and brawny. If suppuration supervenes, the temperature will become irregular, and fluctuation may be detected. The most distinctive **signs of suppuration** are a dusky hue of the skin and edema.

Attention to the condition of the nipples, with absolute cleanliness, will usually prevent inflammation. If it occurs, suppuration should be prevented, if possible, by free purgation, regular evacuation of the breasts, lead-water and laudanum, hot compresses as described, and a mammary binder. On the first appearance of positive signs of suppuration the patient should be anesthetized, an incision made through the skin, the pocket of pus located, evacuated, irrigated, and drained. Incisions into the breast should always be made in a line radiating from the nipple, and either wholly inside or beyond the areola. One should not hesitate to make incisions enough to thoroughly evacuate all collections of pus. Subsequently they should be irrigated several times daily and drained, or they may be packed with gauze. The child should be deprived of the breast as soon as symptoms of suppuration appear.

Mammary Abscess.—It is usual to divide mammary abscesses into 3 classes, according to their situation—superficial, intraglandular, and submammary.

Superficial Abscesses.—These require no special description; they should be opened and drained as soon as the diagnosis is made, to prevent the skin becoming undermined.

Intraglandular abscesses are more serious. The earlier symptoms—those due to the inflammation—have already been described; suppuration may begin acutely, with a definite chill; more frequently, the pain and swelling merely grow worse. After a few days, when the tough fibrous tissue that surrounds the suppurating lobule—if it commences in one—has given way, there is often a certain degree of improvement the pain is less severe, and the temperature falls a little; then, by degrees, the skin at one spot becomes thickened, edematous, and tied down, giving some indication as to the direction in which the suppuration is progressing, and at length one spot softer than the rest can be made out in the center of the swelling.

The earlier the pus is evacuated the better, but it is necessary to wait until a clear conception is had as to its position and the direction it is following; exploratory operations in a breast in a state of full physiologic activity are not advisable. As the interior of the abscess is always irregular in shape, it should be thoroughly explored with the finger, a drainage-tube introduced into every pocket, and the whole circumference packed with soft absorbent dressings, so that the fluid that exudes may be driven toward the opening. More than one incision may be required if the abscess is allowed to burrow in all directions through the gland before it is opened. Such cases, and still more those in which the pus is left to work its way out, often leave irregular sinuses that persist for years, draining the person's strength, and ultimately leading to the destruction of the gland as a secreting organ.

Submammary abscesses are fortunately rare. The breast itself is but little affected; it is thrust out from the chest-wall and floats as on a water-bed. Sometimes the abscesses develop insidiously; more often they are attended with very severe symptoms. If allowed to remain, the skin usually gives way below the gland; but frequently large tracts slough, leaving great cavities fringed with blue, congested, overhanging flaps. Great care must be taken in opening these to secure efficient drainage, and to bring the opposing surfaces into accurate contact, so that no decomposing pus may be retained in outlying pockets.

Chronic interstitial mastitis, affecting one or more of the lobules, is of very great importance, from the pain and anxiety it occasions, and from the difficulty of distinguishing it from the early stage of scirrhus.

No cause can be found in the majority of cases. It is most common about the menopause; is often associated with disorders of menstruation, and at each period it usually becomes painful and tender; but, on the other hand, it may occur at any age, and in those who are to all appearance perfectly healthy. Pain, often of a neuralgic character, and sometimes very severe, and made worse by handling, is usually the first symptom; and the induration is only found on examination.

The diagnosis, so long as the patient is under 30 years of age, is not very difficult (although the

possibility of carcinoma must not be overlooked); in older patients it rests chiefly upon the physical sign. The hardness is not of that stony description characteristic of contracting scirrhus; the surface is usually more nodular, from the presence of cysts; it may vary in size at each menstrual period.

The treatment of chronic interstitial mastitis is very unsatisfactory. Sometimes it slowly undergoes resolution, or disappears so far that the patient takes no more notice of it, but it is rarely possible to connect this with any particular remedy. Paget recommends small doses of potassium iodid with liquor potassæ, well diluted; and, of course, any menstrual irregularity must receive careful attention. Tonics, especially iron, often succeed better than anything else; but the chief thing is to protect the breast against every source of irritation, and to withdraw it as far as possible from notice by covering it with a well-shaped belladonna plaster.

Neuralgia of the breast is common among young married women, and is often associated with ovarian disease. The pain is sharp, severe, and lancinating in character, and often extends to the axilla and runs down the arm. The mammary gland and the skin over it are very tender, even to the slightest touch, and there is no tumor.

Treatment.—Since many of these patients have a great dread of carcinoma, the fear of carcinoma is to be first driven out of the mind. Ovarian or uterine disease, when present, should be appropriately treated; tonics, healthful occupation of body and mind, change of air, and the best hygienic surroundings obtained. The ordinary antineuralgic remedies and soothing applications should be tried.

Paget's Disease.—This disease, beginning upon the nipple, spreads to the areola, and often involves the skin of the entire gland. It is usually limited to one side—generally the right. It begins upon the summit of the nipple, with the formation of small corneous crusts, firmly adherent to the parts beneath. On removing the crusts a reddened surface is disclosed, which later becomes superficially ulcerated and fissured.

The areola, at first red and scaling, becomes excoriated, and discharges a yellowish, transparent, sticky fluid. There is ulceration and crusting. When the disease is fully developed, the area involved is bright red and finely granular, oozing, circular or oval in shape, with the nipple for a center, and having a sharply defined, in some cases slightly elevated, border. Scattered over the surface are small, smooth, pearly-looking islets of epidermis, round or irregular in shape, characteristic of the disease.

Early in the disease there is parchment-like induration of the superficial tissues, with itching and burning sensations. Retraction of the nipple is a prominent and early symptom of this malady, leading in some cases to its complete disappearance.

After a varying period cancerous degeneration develops, beginning upon the ulcerated superficial surface as nodules of proliferating epithelium, or in the deeper parts. Then symptoms of ordinary mammary cancer arise, with deep-seated, lancinating pain, extensive ulceration, and involvement of the axillary glands. Schambacher's recent studies tend to confirm the views of Thin, Duhring and others that the morbid process is malignant from the very beginning. He believes it to be an intra-epidermoid carcinoma which invades both milk ducts and skin. The eczematous character of the skin lesions he has found to be due to inflammatory infiltration.

The disease is usually unilateral, 75 percent of the cases occurring in the right breast.

Treatment.—If soothing and antiseptic lotions do not avail, the breast should be excised.

BREAST, EXCISION.—See Breast (Tumors, Carcinoma).

BREAST, TUMORS.—Familiarity with the normal and varied conditions of the mammary glands is most important for the examiner. A healthy gland may be mistaken for a tumor or new formation. With the gland grasped between the thumb and finger, the density, the presence of irregularities in contour and of nodules, etc., are to be noted. A greater sense of induration than normal may be set down to chronic induration. Hyperesthesia and neuralgic pain indicate a neurosis. If a tumor is found, the following questions are suggested: Is it in the center or near the periphery? Is it smooth, nodular, or lobulated? Are its edges sharply defined or rounded, or do they shade off into surrounding tissue? Is it hard, soft, elastic, or fluctuating? Is there ulceration, and what is the nature of the discharge? A mucous discharge would indicate a glandular cyst, while a bloody or thin serous discharge indicates carcinoma. Milk found in connection with a tumor indicates a glandular tumor. The condition of the axilla and the subclavicular space should be observed. Associate enlargement of the contained glands is diagnostic of malignant disease. Benign tumors are recognized by their glandular shape, painlessness, slow growth, and fluctuation.

Cysts.—The cysts met with most frequently in the breast are the serous cysts and certain of the retention cysts.

Symptoms.—Cysts in the breast form painless, tense, or semifluctuating, smooth, rounded tumors, evidently connected with the breast tissue. *Serous cysts* may occur in any part of the breast. They are often very tense and hard, and breasts containing cysts have been mistaken and removed for cancer. Hence the valuable rule of making a preliminary incision if in doubt as to the nature of the tumor. The *galactoceles* occur during lactation; they are situated near the nipple, from which a milk-like fluid may sometimes be squeezed out on pressing the cyst. They are soft and fluctuating, and usually single, form quickly, and may attain a large size. *Glandular cysts* occur chiefly in women of from 35 to 50. They are tense and painless, form slowly, may occur singly, but are often multiple. A sanguineous fluid sometimes escapes from the nipple if the cyst contains a papillary growth.

Treatment.—*Simple serous cysts* may be laid open freely and allowed to granulate from the bottom, or, better, may be dissected out. *Galactoceles*, with semisolid contents, may also be laid open freely and their contents squeezed out. *Glandular*

cysts, when numerous, call for the excision of the affected lobule, or if the whole breast is affected and they contain proliferating growths, for excision of the entire gland. The possibility of malignant change must always be borne in mind, and when operating in doubtful cases, a microscopic examination of frozen sections of tissue should be made before the operation is completed. If carcinoma cells are demonstrable the radical operation should, of course, be performed. *Involution cysts* require no treatment.

Classification.—The mammary gland, like the parotid and thyroid glands, is the seat of tumors peculiar to itself.

The following classification is based upon the investigations of Warren, Halsted, Rodman, and Wieder.

A. Benign Tumors.

Fibroepithelial tumors:

(1) Fibrous type:

1. Periductal fibroma { Intracanalicular. Pericanalicular.
2. Periductal myxoma.
3. Periductal sarcoma (slightly malignant).

(2) Epithelial type:

1. Fibrocystadenoma.
2. Papillary cystadenoma.
3. Simple adenoma.

Lipoma.
Enchondroma.
Myxoma.
Angioma.
Endothelioma.

B. Malignant Tumors.

Sarcoma:

1. Round cell.
2. Spindle cell.
3. Mixed cell.
4. Giant cell.
5. Alveolar.
6. Melanotic.

Carcinoma:

1. Adenocarcinoma.
2. Medullary carcinoma.
3. Carcinoma simplex.
4. Scirrhus carcinoma.
5. Carcinomatous cyst.

Of the benign tumors the **fibroepithelial** are the most common. They were formerly grouped under the general terms of fibroadenoma and adenofibroma, but the recent studies of Warren and Greenough and Simmons have resulted in the adoption of a much more rational classification. The fibrous type of this group is especially characterized by free movability. As it increases in size it often becomes lobulated. Although usually found in the upper, outer quadrant of the breast, it may occur in any part of the gland. As a rule, only one breast is affected. Subjective symptoms are slight or wanting. The fibrocystadenoma is the same as the periductal fibroma except that a secondary proliferation of the epithelial elements has taken place. The papillary cystadenoma is described by Warren as follows: "The histologic picture is that of a connective-tissue pedicle surmounted by an epithelial covering. Papillary structures of this character are the distinguishing feature of the tumors of this group and serve to differentiate them absolutely from other benign tumors of the breast. Their consistency is hard, although fluctuation may occasionally be detected. The situation of the tumor is generally beneath or in close relation to the nipple. The fluid content of the cyst is generally hemorrhagic." Simple adenoma is the rarest of the fibroepithelial tumors, and by some its existence is even denied. Apparently authentic cases have been observed by Gross, McFarland, Geo. P. Müller, and others.

The treatment of the fibroepithelial tumors is purely surgical and consists in extirpation of the growth. Small growths superficially situated may be excised under local anesthesia, and larger ones removed by Warren's method of plastic resection.

In this operation the preliminary incision is begun at the lower border of the breast, opposite the middle of the outer arc of the lower quadrant, and runs along the lower fold and outer margin to the inner border of the axilla, thus severing the lymphatic connections of the breast with the axillary lymph nodes. The incision is carried down to the lower border of the pectoralis major muscle, which should be freely exposed. The dissection is then carried along through the loose connective tissue which lies between the pectoral fascia and the posterior layer of the fascia in which the mammary gland is contained. The posterior surface of the gland is exposed by turning the breast upward and inward. The neoplasms are then removed by a V-shaped incision, the apex of which lies directly under the nipple. Radiating from this point incisions can be carried into the gland tissue in all directions. After arresting hemorrhage the V-incision is closed with two rows of catgut sutures, one along the anterior border and one bringing the posterior edges together. The gland is then dropped back onto the pectoral muscle and anchored there at its outer edge. Another row of sutures is advisable to hold together the deep layers of the superficial fascia before the outer edges of the wound are closed with silkworm gut.

Mammary lipomata are rare. They may be either subcutaneous, intraglandular or retromammary. They are well defined unless they become so large as to obliterate the breast.

The remaining benign tumors of the breast are extremely rare. Some pathologists deny the existence of pure myxoma.

Sarcoma is one of the rarest of mammary neoplasms. The older surgeons believed it to constitute from 5 to 9 percent of all tumors of the breast, but recent investigations have shown that this estimate is too high. Thus, Finsterer and Rodman and Bonney find that it constitutes about 3 percent of all mammary tumors, and Sick of Hamburg finds the percentage to be somewhat smaller. It has generally been taught that sarcoma is a disease which affects young women, but Rodman and Bonney's investigations show that it is, unquestionably, a disease of middle life.

Cystic or adenosarcoma, described by older writers, is the periductal sarcoma of more recent classifications. It is much less malignant than pure sarcoma. Tumors of this group are round or ovoid in shape, circumscribed, and freely movable beneath the skin. They are usually firm and indurated, although when large cysts are present fluctuation may be detected. They vary in size, although they are usually large when first seen by the surgeon. Not uncommonly they ulcerate and may extend to neighboring structures after the capsule has been broken through. Pure sarcomata are smaller, harder, and more regular in shape than the periductal tumors and do not contain cysts. Encapsulated at first, they eventually break through the capsule and become diffuse.

Sarcomata are not painful at first, and may not increase much in size for some time after they are first detected, but a time always comes when they grow very rapidly, break through the skin and form large fungating excrescences. Round cell sarcoma is the most malignant variety, mixed cell the most common. Treatment consists in removing the breast and clearing out the axilla.

Carcinoma.—When a patient with a mammary tumor presents herself for examination, our first effort should be to obtain a careful history of the case. Heredity, age, sex, race, its possible relation to traumatism and the menopause, functional activity, previous breast abscess, discharge from the nipple, rapidity of growth, and the presence or absence of pain, are all of the greatest importance.

Heredity no longer bears the significance that was credited to it in the past, when carcinoma was considered a constitutional disease; but it is still of some importance. Statistics indicate that about one-third of all cases of mammary carcinoma occur in those whose ancestors and relatives have suffered with the same trouble. Delbet states that heredity is unquestionable in 5 to 10 percent of all patients.

Of greater importance is the *age*. Carcinoma is a disease more prevalent after 40, but many cases are met with between 30 and 40, and not a few prior to 30. Statistics compiled by Gross, Williams, and Mahler give the average age incidence as 48 years. Rodman's statistics show that of 5000 cases carefully analyzed 11 percent occur in the decennium between 20 and 30; 12 1/2 percent between 30 and 40; 27 percent between 40 and 50; 28 1/2 percent between 50 and 60; and 21 percent beyond 60. More than one-tenth of the entire number occurred in women between the ages of 20 and 30. Rodman operated on several cases of cancer of the breast in young patients, five in all, ranging from 23 to 28 years. Others—McCosh, Richardson, Park and Warren—have operated upon even younger patients, the youngest being 19 years of age.

Not more than 1 percent of all cases occur in men. Keyser collected only ten instances affecting the male breast out of 1460 cases. Warfield, reporting the statistics of Johns Hopkins Hospital, found 3 out of 307 cases; Fantino, 1 case in 228; and Sick, 2 out of 216 cases.

The American Negroes and Indians have become as susceptible to carcinoma as the Whites, since they have lived under identical conditions. It would seem that both of these races were originally more or less exempt, as nearly all writers testified to their relative immunity. Many cases are encountered in negroes, and it is apparent that while they still enjoy a comparative immunity to cancer in general, they are even more prone to carcinoma of the breast and uterus than the white race. This fact is amply attested by the United States Census Reports.

Roger Williams states that carcinoma of the breast is common in China. It has been said that Hebrews are less subject to carcinoma than other white races. This belief is without foundation, as they are equally, if not more, susceptible.

A history of *traumatism* is of some importance, but distinctly less so in carcinoma than in sarcoma. The latter is frequently secondary to trauma. Rodman encountered two cases of cancer of the male breast where it seemed reasonably clear that trauma produced the disease. One was a shoemaker who habitually held his last against the affected part. The other, a laborer, was of the habit of resting the handle of his shovel against the breast.

With the return to the theory of the local origin of cancer, it would seem reasonable that trauma must have greater potentialities than was believed to be the case so long as the constitutional origin of the disease was taught. Very recent statistics of Coley indicate that trauma frequently precedes, and may cause, cancer of the breast.

Functional activity of the gland may have some influence, as carcinoma is undoubtedly more often found in married women who have borne and nursed children than in single or infertile married women. Ninety percent of 982 patients treated in Von Bergman's clinic, and 316 out of 416 women affected with mammary cancer, reported by the late S. W. Gross were found to have nursed children. It may be the result of the mammary epithelium assuming an activity to compensate for the deprivation of the normal function, as it is also logical to infer that the epithelial proliferation may overstep the physiological limits in the functionally active gland.

The climacteric seems to have some influence, as the majority of cases, as has been mentioned, occur at that time of life.

Statistics relative to the influence of mastitis are misleading. It would seem reasonable to suppose that inflammation prepared a better field for the future development of carcinoma.

A bloody discharge from the nipple leads us at once to think of a papillary cystadenoma, of which it is almost a pathognomonic sign, yet Rodman has known it to occur in two cases of abnormal involution, but does not recall ever having seen a bloody discharge in connection with carcinoma of the breast; he thinks that it should not be encountered unless the carcinoma is secondary to papillary cystadenoma, duct cancer, or abnormal involution.

The duration of the tumor may be helpful, but on the other hand may be misleading. Rodman

reports cases of scirrhous carcinoma of very long duration, and, per contra, four cases of acute cancer where the disease had made remarkable progress in a few months. One case belonging to this group of acute cancer, so aptly called carcinomatous mastitis by Volkmann, was operated upon September 21, 1908. Her left breast was very much larger than the opposite one, was tender, the skin inflamed, the axillary glands enlarged, and the whole clinical picture was not unlike that of subacute mastitis. As a matter of fact, her breast had twice been lanced at one of the very best hospitals in Philadelphia, a diagnosis of acute mastitis having been made. The condition had lasted 8 months. An operation was performed only at the urgent request of the patient's husband, after both the diagnosis and prognosis had been carefully explained. The breast was removed and a very extensive operation performed; the axillary glands were found enlarged, hard and matted together, but could be removed.

She remained well for 2 months, then developed a marked edema of the arm, also mediastinal metastases and died 6 months after the operation. The pathological report in this case was "carcinoma simplex of the left mammary gland, involving the axillary glands."

The second case was operated upon at the Presbyterian Hospital on May 18, 1910. She presented an even more typical picture of carcinomatous mastitis than did the former case, her breast being enlarged, inflamed, tender, and the axillary glands enlarged, with a history of growth extending over 3 months. The characteristic orange-peel skin was perfectly shown in this case. Acute cancer was diagnosticated and immediate operation practised. The patient was thoroughly examined 1 year after the operation, and was without sign or evidence of either local recurrence or internal metastases; her health was perfect. This case is the only one out of the four where operation has apparently been followed by great benefit, the remaining three all dying within eight months after operation.

When simple tumors take on rapid growth, the possibility of sarcomatous degeneration of either a periductal myxoma or fibroma should be considered. Rodman very recently reported a most interesting case of this kind.

Unfortunately, pain is usually a late symptom of carcinoma and is evidence of either adhesions or ulceration. This is much to be regretted, since the absence of pain gives victims of carcinoma a false sense of security which encourages them to abstain from seeking medical advice.

Of greater importance than the history is a thorough and systematic *examination of the breast itself.* It is best to have the entire chest bared when seeing such patients in office consultation. In hospital practice a still more thorough physical examination is accomplished by having the patient in bed with all clothing removed. Having the entire chest bared is insisted upon so that the affected breast may be compared with the other one, and enlarged glands of the supraclavicular and axillary spaces if present may be palpated. The size of the affected breast is of importance, as there is usually a difference in the two, the affected one being somewhat larger, particularly in those acute, rapidly growing tumors, instances of which have been cited. As a rule, however, the lesion is not strikingly apparent, and when there is a large tumor of irregular outline the probabilities are that the condition is one other than carcinoma, possibly a myxoma which has undergone sarcomatous change. The condition of the skin over the mamma should be carefully noted. It is quite characteristic in cancer for adhesions to the skin to occur early, and later to the underlying structures. Such adhesions to the skin result in dimpling or other irregularity, and more rarely the typical orange-peel appearance will be encountered. There is usually no evidence of inflammatory reaction except in the rare cases of carcinoma to which reference has already been made.

The most important point to ascertain is the *mobility of the diseased breast* compared with the healthy one. This physical sign is of the greatest importance, as restricted motion sooner or later occurs indicating that adhesions have formed which bind the breast to the underlying structures and skin. Restricted mobility is made apparent by the examiner who stands behind the patient taking the breast in both hands and moving it in the half arc of a circle. Dimpling of the skin and retraction of the nipple, later to be referred to, are also accentuated by this procedure.

Having determined these general facts regarding the diseased breast, attention will now be drawn to the tumor itself. Should there be multiple tumors, the probability of malignancy is lessened, since carcinoma is usually single; whereas benign tumors, such as adenofibromata and cysts, particularly those occurring during the stage of cystic formation is abnormal involution, are on the other hand, characteristically multiple.

The *position of the tumor* is of importance and should be considered. Carcinomata are more frequently situated in the upper and outer quadrant of the gland. They are hard, firm in consistency, can readily be palpated, and, as a rule, may not be definitely isolated since they are a part of the glandular parenchyma. The patient does not generally complain of pain on manipulation of such a tumor, and, as has been mentioned, carcinoma does not give rise to subjective pain or objective tenderness, save in advanced cases where ulceration has taken place. Benign tumors, such as the adenofibromata, are sometimes very painful.

Retraction of the nipple was formerly thought to be pathognomonic of carcinoma, but this has not been confirmed by clinical experience. While a considerable number of cases (51 percent) have shown this phenomenon, nearly as many others, unmistakably malignant, have not; furthermore others, unquestionably benign, have, in rare instances, manifested this sign. Only those tumors which are *centrally* located will give rise to *retraction.* Carcinoma is very much more prone to do so than benign tumors, since, as we have stated, adhesions to the skin are almost characteristic of this form of growth. But it must be repeated that

retraction of the nipple sometimes occurs in abnormal involution, centrally located cysts, sarcomata and, more rarely, in perfectly benign tumors. In benign conditions the nipple, if depressed, is mobile, whereas in cancer it is not only depressed but fixed.

A word should be said regarding a *discharge from the nipple.* Should there be no history of such discharge, but, upon examination, a bloody drop should appear after the manipulation of the breast, the evidence is in favor of a papillary cystadenoma situated behind the nipple. Should epithelial plugs appear after squeezing the breast, duct cancer or comedo carcinoma is to be thought of.

Having finished the examination of the breast itself, the *axillary spaces* on both sides, but especially the affected side, should be most carefully palpated to detect the presence of any enlarged lymph glands. Fortunately, there are fewer patients presenting such enlargement than formerly, as general practitioners are beginning to realize the importance of early operation. Should enlarged glands be found in both the axillary space and the supraclavicular triangle, the propitious time for surgery has passed; nevertheless, cases with axillary involvement are frequently operated on and, with a thorough procedure 25 percent of them are permanently cured.

The local examination being completed, one should now make a *careful general physical examination* to detect, if possible, any internal metastases in the liver, lungs, mediastinum and bones. It may be advisable, of course, to treat medicinally coexisting complications such as bronchitis, endocarditis, and the various forms of nephritis before attempting such a radical operation as removal of the mammary gland. The short time lost in waiting may be justified, but the desirability of operating, at the earliest practicable moment should never be lost sight of. Furthermore, it should be distinctly understood that nothing short of the complete method introduced by Halsted and Meyer is to be considered as sufficiently radical; that is to say, a large wound, free removal of skin, removal of both pectoral muscles, and an accurate and painstaking dissection of the axilla always, and sometimes in addition a clearing out of the subclavian triangle of the neck are absolutely necessary for success. The several flap operations exploited are alluring and seductive to the operator, facilitating as they ofttimes do, the closure of a large wound. But that all of them are open to objections (anatomic, pathologic, and surgical) is unfortunately true. Cancer is so protean and variant in its manifestations that it is unsafe to fashion skin flaps similarly for all cases. The growth will be in the upper and outer quadrant more often than elsewhere and yet a popular operation retains this infected skin in every case as a means of closing the wound. The end results, where flap operations are practised, are so disappointing and disheartening that they should definitely be put to one side. While convenient and time-saving to the surgeon, they are a menace to the patient and not in harmony with either modern pathology or recent discoveries concerning the lymphatic supply of the mammary gland. Moreover, they are wholly unnecessary as the largest wound can be closed without them.

It now remains to describe briefly a modern operation (that of Rodman) for attacking cancer of the mammary gland. After a thorough trial it has given uniformly satisfactory results. Its advantages are as follows:

First; the incision does not extend on to the arm. thereby avoiding secondary cicatricial contraction with limitation of its movements.

Second; it offers adequate axillary exposure. This important part of the operation is completed first for the following reasons: It enables the operator to attack vessels at their roots, thus lessening hemorrhage otherwise necessarily great from cutting and recutting the same vessel during the operative procedure. By attacking the glands and completing the axillary dissection primarily, the possibility of expressing carcinoma cells by manipulating the breast is greatly lessened. The muscles are attacked and cut at their origin. thus enabling the assistant to use the divided ends as tractors, thereby facilitating such free exposure of vessels and nerves as is compatible with safety.

Third; the axillary involvement may be so extensive that complete eradication of the growth is impossible and further surgical interference therefore futile. These are the best reasons for not working from sternum to axilla as all formerly did, and many still do.

At the time of operation, closure of the wound should not be considered, the surgeon being prepared to graft should it become necessary, but if the technic which is now being described is employed it will rarely if ever be found necessary, notwithstanding the fact that the wound is very large and the skin over the entire breast is always sacrificed. If the tumor is a peripheral one, then a still greater amount is embraced between the incisions, for it is our conviction that to insure success a free removal of skin is absolutely indispensable.

The upper portion of the sheath of the rectus muscle is removed, Handley having demonstrated that cancer of the breast metastasizes more frequently to the liver than elsewhere, and that by removing that portion of the fascia covering the rectus in the epigastric triangle, such metastases are rendered far less likely. The carcinoma cells drift along the lymphatics toward the deeper fascial planes and ultimately reach the peritoneum and then, by selection, the liver.

A straight incision is made beginning 1 inch below the clavicle, an inch and a half from and parallel with the sulcus between the deltoid and the clavicular portion of the pectoralis major. It extends well below the free edge of the pectoralis major muscle and is usually from 4 to 6 inches, in extent or possibly more, according to the stature of the patient. The great pectoral muscle is soon reached and the index-finger of the left hand inserted under the lower border of the tendon of the muscle and made to emerge above its upper border, or, if only the costal origin of the muscle is to

be removed, in the interval between the costal and clavicular portions. The tendon is divided at or near its insertion into the humerus. This may be facilitated by slightly dissecting up the external flap and using retractors. If the growth is peripheral and in the upper hemisphere, the entire muscle should unquestionably be sacrificed, but in the average case there is no reason for removing the clavicular portion.

The lower edge of the tendon of the pectoralis minor will be easily discovered after opening the costocoracoid membrane. It should be carefully separated from the fascia which covers it to avoid wounding the long thoracic artery which runs in the fascia parallel with and just below the tendon. By lifting up the muscle with the index-finger, which has been inserted under it, the tendon is made tense and prominent and one can easily ascertain whether or not other tissues are included with it. Care must be taken not to cut the acromiothoracic artery which runs just above and

Primary skin incision.—(*Rodman.*)

parallel with this tendon, which is divided at its insertion into the coracoid process. Rodman has never wounded either the acromiothoracic artery on its upper border, or the long thoracic just below its lower border, and believes that both can be avoided if care is taken. Each muscle retracts inward as soon as its tendon is severed. As this uncovers the axilla, its subsequent thorough dissection is greatly facilitated. The costocoracoid membrane is largely sacrificed, thus giving ready access to the subclavicular fat at the apex of the axilla. In removing a part of this membrane the cephalic vein at the upper and outer aspect of the wound must not be wounded. A branch of the acromiothoracic and its accompanying vein, which are to be found in the fascia, should be clamped and tied. A nerve which supplies the pectoral muscle should be sacrificed now, as would necessarily be done later when the muscles are removed.

The dissection is from the apex of the axilla downward, and must be most carefully carried out. The finger, covered with several thicknesses of gauze, is all that is necessary or desirable in the

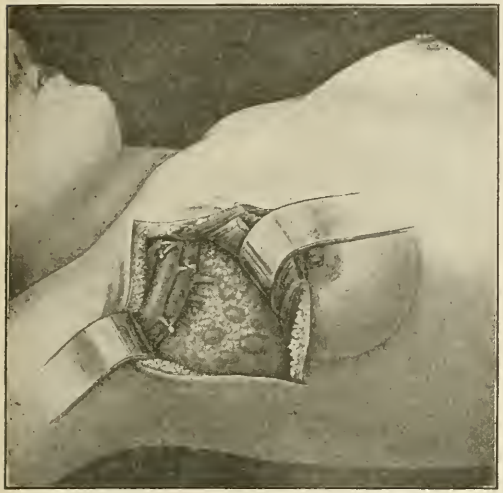
Division of pectoralis major near its insertion.—(*Rodman.*)

removal of the fat and fascia from the upper third of the axilla. An incision is now carefully made through the fascia to the outer side of the axillary vessels simply to start the dissection from without inward. This is made to the extent of the lower two-thirds of the axilla but not in the upper third where it is dangerous to cut.

Division of pectoralis minor near its insertion.—(*Rodman.*)

As the sheath and fat are removed from the vessels we come down upon the acromial, long and alar thoracic branches, and the subscapular branch of the axillary artery, in the order named, which with their accompanying veins are to be carefully

clamped in two places and then divided between the clamps. By ligating both ends the subsequent hemorrhage is greatly lessened and very little blood will be lost.

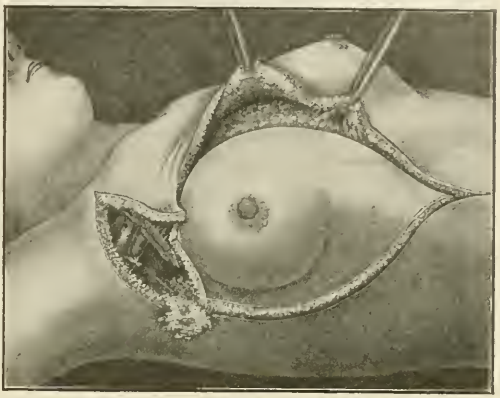


Axilla freely exposed and vessels divided at their origin —(*Rodman.*)

The enlarged lymphatic glands will usually be found at the base of the axilla between the latissimus dorsi, teres major, and subscapularis muscles posteriorly, the serratus magnus internally, and inferior to a line formerly indicated by the

Axillary dissection completed. Fascia, fat and enlarged glands *en masse* shown at base of axilla. External respiratory, or nerve of Bell, shown on the inner wall of the axilla. Subscapular nerve on the posterior wall. Sheath covering all muscles removed.—(*Rodman.*)

situation of the lower border of the pectoralis minor. The midaxillary and subclavian glands may, however, be infected. All such enlarged glands and surrounding fat should be carefully dissected from the several muscles, and to do this best the fascia covering the muscles must also be sacrificed. The axillary dissection should be so thorough that nothing is left on its inner aspect save the posterior thoracic or nerve of Bell, on the posterior aspect the subscapular nerve, and superiorly, possibly the superior thoracic artery, if it



Second skin incision. Observe the extensive undermining anteriorly.—(*Rodman.*)

arises as an independent branch high up on the first portion of the axillary.

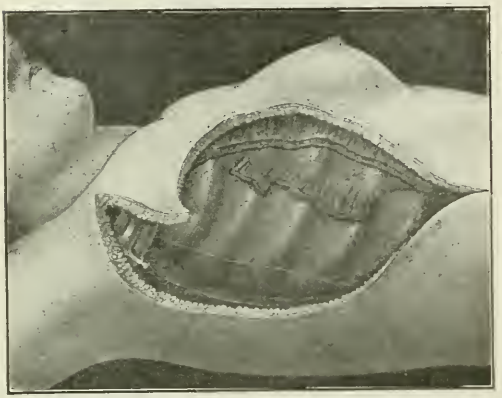
Dissection of the axilla should invariably be from above downward, without inward, and *en masse*—a piecemeal extirpation must not be considered. Though sharp instruments are not to be used at the apex of the axilla they may greatly

Undermining inferiorly. Muscles, breast and axillary mass being reflected prior to removal.—(*Rodman.*)

facilitate dissection at its base. Should there be an accidental injury to the vein, which is not common, it may be treated by suture or lateral ligature. The entire dissection is carried out through the single straight incision, and by working with blunt dissectors in a good light, can usually be completed in about twenty minutes.

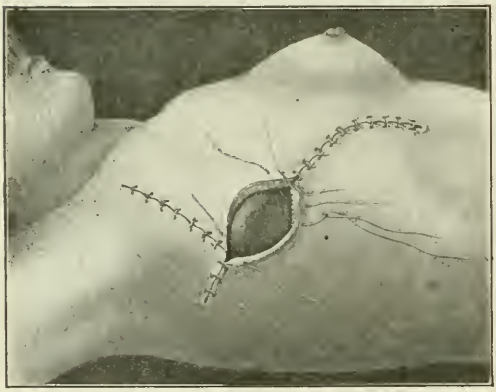
It now remains to complete the skin incision by

beginning at the middle of the initial incision and circumscribing the entire breast with an oval, broadly elliptical or egg-shaped incision. The oval is at least 5 inches in its greater diameter or over 6 inches if the breast is large or the cancer situated peripherally, for under no circumstances



Appearance of the wound after removal of the breast muscles and axillary mass A .small part of the origin of pectoral muscles left as a covering for the ribs. This very much facilitates grafting, when necessary, which is rarely the case. In fourteen operations during one winter it was necessary in only two cases.—(*Rodman.*)

must the skin incision come nearer than 2 inches to the edge of the growth. The knife should be slanted so as to divide the subcutaneous tissue or the paramammary fat at least two inches further out than the skin has been cut, which will take it nearly to the clavicle superiorly, quite beyond the



Wound being sutured. Middle third of horizontal incision may be, if necessary, covered by skin-grafting. It is rarely necessary. Latterly the drainage tube at either end of horizontal wound is omitted.—(*Rodman.*)

sternum internally, below the border of the great pectoral inferiorly, or well on to the external oblique and rectus.

Undermining insures approximation of a very large wound. The breast with its axillary tail still attached, the pectoral muscles, paramammary fat, and deep fasciæ are all lifted up on the costal wall preliminary to cutting the costal attachments of both pectoralis minor and major. In cutting the attachments of the great pectoral muscle the perforating branches of the internal mammary will be severed and should promptly be seized with forceps. The perforating branches of the opposite side may also be cut when the flap is undermined internally and should immediately be clamped and ligated. The wound is now very large; over the chest the intercostal muscles are exposed, inferiorly the external oblique and rectus, posteriorly the latissimus dorsi, teres major and subscapularis muscles and the subscapular nerve, on the inner aspect of the axilla, the digitations of the serratus magnus and the nerve of Bell are seen.

Should the tumor be situated in the upper hemisphere an incision should be made above the clavicle and the posterior triangle of the neck carefully explored. This incision should be preceded by pulling the skin downward so as to prevent injury to the external jugular vein and should extend from the posterior border of the sternomastoid to the anterior border of the trapezius. This second incision is greatly to be preferred to the extension of the original wound, as an unsightly and possibly disadvantageous scar is thereby eliminated. Cutting through the skin, superficial fascia, platysma and deep fascia, the omohyoid is exposed, held upward by a retractor, and the triangular space which it bounds carefully freed of fat and enlarged glands if any be present. The external jugular vein is usually resected. This step of the operation cannot safely be dispensed with, though supraclavicular involvement is rarely encountered, for in malignant growths situated in the upper and peripheral portions of the breast a chain of lymphatic vessels passes from the breast over the clavicle to empty into glands in the posterior cervical triangle.

Oozing may be quickly stanched by the application of hot water at a temperature of 120°. This is the best hemostatic and the part should be freely douched whether it is bleeding or not as it is advantageous in the event that cancer cells have been expressed on any part of the wound during the operation. Any vessel of sufficient size to require a ligature is tied, others are twisted. Very few ligatures will be necessary if the large branches already mentioned have been ligated at their origin; complete hemostasis is necessary. Hemorrhage must be thoroughly arrested before the suturing is begun, for a certain amount of serum must be expected in so large a wound. Closure of the wound is begun near the clavicle and is best accomplished by interrupted sutures. The first incision having been closed, the suturing of the oval part of the wound is begun at the sternal end. Approximation without tension is, as a rule, easily accomplished; hence it is unnecessary to graft.

An abundant dressing of aseptic gauze is now applied, obliterating the axillary space; and the arm is firmly bound to the side by broad adhesive straps, for at least twenty-four hours. Tension upon the flaps is increased by applying the dress-

ings so that the arm is held at a right angle to the body; moreover, there is no advantage in such a position for hemostasis certainly is not favored by it and the axillary space is made to gap, thereby inviting a subsequent collection of serum which may be troublesome. At the end of twenty-four hours the arm is released and is not included in the subsequent dressing. If it is painful it may be rubbed with alcohol. Drainage is unnecessary, though a vast majority of surgeons still employ it.

Patients, after so formidable an operation, are usually sitting up in forty-eight hours, and are able to leave the hospital when the sutures are removed on the tenth day. Primary union nearly always takes place and the functional use of the arm is as good after as before operation.

The mortality following such a radical procedure is almost negligible, being less than after incomplete operations, simply because the wound is large, the dissection carefully made, and injuries to the blood-vessels avoided. Less than 1 percent are fatal. The ultimate result is much better than was thought possible 10 years ago. If the axillary glands are not enlarged 80 percent are well and free from recurrence at the end of 3 years. If the glands of the axilla are palpably enlarged only 25 percent will be saved by operation. Taking early and late cases as they come at least 50 percent should be permanently cured. Could a stronger argument for early and radical operation be given?

Local applications, X-rays, radium, etc., are impotent and should never be employed save as adjuvants to operation. There is no reason to employ them after operation unless it is to be assumed that infected tissue may have been left behind.

BREATH, FOUL.—The *chief causes* of this condition are: pyorrhea alveolaris; adenoids; tonsillitis; diphtheria; indigestion; diseases of mouth, pharynx, or stomach; decayed teeth, and neglect of proper hygiene of mouth and teeth; diseases of nose, bronchi or lungs; chronic constipation; mineral poisons.

The *treatment* consists in discovering and, if possible, removing the cause. The teeth and gums should receive the first attention; the former should be cleansed, and the latter sponged with a solution of myrrh and water. A mouth-wash of thymol gr. vijss, borax gr. xv, and distilled water 1 pint may be used; or 1 grain of potassium permanganate to 1 ounce of rose water. The following, to be used as wafers, have also been recommended:

℞. Powdered caraway seed,
Powdered coriander seed,
Powdered cinnamon, āā ʒ ss
Sugar, ʒ j
Mucilage of acacia, q. s.
Make fifty pills. Dissolve one in the mouth when necessary.

℞. Powdered cinnamon,
Allspice,
Cardamom, āā ʒ ss
Sugar, ʒ j
Mucilage of acacia, q. s.
Make fifty pills. Dissolve one in the mouth when necessary.

BREATHING.—See Chest (Examination).

BREECH PRESENTATION.—See Fetus (Positions and Presentations).

BRIGHT'S DISEASE.—A name formerly incorrectly used as a synonym of albuminuria, and at present covering several forms of disease of the kidney associated with albumin in the urine. It may be acute (*acute parenchymatous nephritis*) or chronic (which includes *chronic parenchymatous nephritis*, *chronic interstitial nephritis*, *granular contraction of the kidneys*, and *albuminoid degeneration of the kidneys*). Bright's disease is considered by Fothergill as a secondary condition arising from a tendency toward the reversion to that preanthropic type in which the liver performed the additional office of excreting uric acid. See Nephritis.

BRILL'S DISEASE.—See Typhus Fever.

BROMETONE.—A product of the interaction of bromoform and acetone, containing 77 percent of bromin. It is said to have the properties of the bromids without producing bromism and gastric disorders. Dose, 5 grains.

BROMIDROSIS (Osmidrosis).—An affection of the sweat-glands in which the sweat has an offensive odor. It is usually associated with chronic local hyperhidrosis, especially of the feet. The odor is due to a specific decomposition of the sweat, from the presence of the bacterium fœtidum.

It is a frequent accompaniment of systemic diseases, such as small-pox, typhus, rheumatism, and pyemia. The local varieties of bromidrosis are of the axillæ, groins, perineum, genitalia, and soles of the feet. The confinement of sweat by waterproof or other clothing, dress-shields, etc., tends to make matters worse. Bromidrosis of the feet is the most common. Soaking the stockings every night in a saturated solution of boric acid, and the use of cork soles, is a very efficacious treatment. From 10 to 40 grains of chloral in solution is also recommended externally. Activity of the kidneys should be brought about by free administration of diuretics, in order to lessen the excessive sweating. Astringent lotions, dusting-powders, especially those containing boric acid and salicylic acid, and the continued application of diachylon ointment are all recommended.

℞. Powdered salicylic acid, gr. xx to xl
Powdered boric acid, ʒ ij
Powdered starch, ʒ vj.
Mix well into a dusting-powder and apply night and morning.

BROMIN.—Br = 80; quantivalence 1. A reddish-brown liquid that, at ordinary temperatures, gives off a heavy, irritant, suffocating vapor. In its elementary form it is a very active escharotic, and internally a violent poison. It is used by inhalation and as an escharotic. The salts of bromin are cerebral and cardiac depressants, and are highly valuable as hypnotics. The salts of the alkaline metals are those most commonly used. They are cerebral and spinal depressants, also alterative, antispasmodic, and hypnotic.

The bromids of calcium, ammonium, potassium, and sodium are those mainly used in medicine. They allay nervous excitement, promote tranquil-

lity, and are largely employed as sedatives. Bromids have a saline taste, are very diffusible, but are slowly eliminated. Continued administration produces gastric catarrh. They reduce the heart's action and force, the number of respirations, the activity of the brain-cells, and diminish peripheral sensibility, impair motility, and depress the sexual function. Poisoning by long-continued use of the bromids is known as Bromism (*q. v.*). They are not to be used in anemic conditions, and are more effective when given with opium. The potassium bromid and chloral mixture is unsafe when a weak or fatty heart exists. Occasional purgation prevents accumulation of the salts, and arsenic combats the acne resulting from overadministration.

Differences in Action Between the Ordinary Bromids.—**Potassium bromid** is the most toxic to the heart and the muscular system, and is the least hypnotic. It contains 66 percent of bromin.

Sodium bromid is the least toxic, but the most hypnotic, and acts most energetically on the circulation. It contains 78 percent of bromin.

Ammonium bromid resembles the potassium salt in action, except that it exerts less influence on the heart and muscular system, and is somewhat more stimulating.

Lithium bromid contains the most bromin (92 percent), and resembles the sodium salt in action. It has proved better than the other bromids in some cases of epilepsy, and by several authorities is considered the best hypnotic of the series.

Calcium bromid is an efficient hypnotic, but otherwise much less active than the other bromids.

Strontium bromid is said to be less likely than the other bromids to produce bromic acne and other results of bromism.

Zinc bromid, in large doses, is violently irritant. It is supposed to combine the tonic effects of zinc with the sedative action of the bromids.

Antagonists and Incompatibles.—Vasomotor stimulants, such as digitalis, ergot, belladonna, antagonize many of the effects of the bromids, but morphin is the most efficient antagonist, especially for the mental symptoms.

Incompatible with *Bromin* are: Alkali hydrates, arsenites, ferrous salts, hypophosphites, hydriodic acid, mercurous salts; with *Bromoform* are: Caustic alkalies, aqueous liquids; with the *Bromids* are: Acids, alkaloids, antimony salts, bismuth salts, chlorin water, chlorates and chromates in acid solutions; salts of copper, lead, and silver; mercurous salts, nitric acid, spirit of nitrous ether if acid.

Therapeutics.—The bromids are used as sedatives to the nervous system, to lower reflex activity, to produce sleep, to subdue sexual excitement, and to relieve cerebral congestion. They are used in epilepsy, diabetes, acute rheumatism, myalgia, uric acid toxemia, gout, tetanus, insomnia, all kinds of cerebral irritation, delirium, reflex coughs, colic, cholera infantum, and sexual disorders.

Preparations.—**Acidum Hydrobromicum Dilutum,** *diluted hydrobromic acid,* is composed of absolute hydrobromic acid, HBr, 10 percent, and water, 90 percent, and occurs as a clear, colorless and odorless liquid, of pungent and acid taste. It is produced by decomposing potassium bromid with sulphuric acid and distilling. Dose, 20 minims to 2 drams, well diluted. **Potassii Bromidum,** *potassium bromid,* KBr—colorless, cubical crystals, soluble in 1.6 of water and in 200 of alcohol. Dose, 2 to 60 grains, well diluted. **Sodii Bromidum,** *sodium bromid,* NaBr—colorless, monoclinic crystals, soluble in 1.2 of water and in 13 of alcohol. Dose, 2 to 60 grains, well diluted. **Lithii Bromidum,** *lithium bromid,* LiBr—a white, granular, deliquescent salt, very soluble in water and in alcohol. Dose, 2 to 40 grains, well diluted. **Ammonii Bromidum,** *ammonium bromid,* NH_4Br—colorless, prismatic crystals, soluble in 1.5 of water and in 30 of alcohol. Dose, 2 to 40 grains, well diluted. This bromid is well borne by children in comparatively large doses if epileptic from reflex causes. A child one year old can tolerate 5 grains every 4 hours (Barton). **Calcii Bromidum,** *calcium bromid,* $CaBr_2$—a white, granular, deliquescent salt, very soluble in water and in alcohol. Dose, 2 to 60 grains, well diluted. **Strontii Bromidum,** *strontium bromid,* $SrBr_2+6H_2O$—colorless, hexagonal crystals, very deliquescent, very soluble in water and in alcohol; insoluble in ether. Dose, 2 to 30 grains, well diluted. **Zinci Bromidum,** *zinc bromid,* $ZnBr_2$—a white, granular deliquescent powder, very soluble in water and in alcohol. Dose, 1/2 to 3 grains, well diluted.

BROMIPIN.—Brominized Sesame Oil. It is marketed in two forms, one containing 10 percent, the other 33 1/3 percent, of bromin. It is said to be as active as the bromids without producing untoward effects even if used for a long period, and is claimed to be more lasting in its action. Dose, 1 to 4 drams in capsules, warm milk or emulsion.

BROMISM.—Certain peculiar phenomena produced by the excessive administration of the bromids. The most marked symptoms are headache, coldness of the extremities, feebleness of the heart's action, somnolence, apathy, anesthesia of the soft palate and pharynx, pallor of the skin, and a peculiar eruption of acne that, with lowered faucial sensibility, is one of the earliest and most constant symptoms. There is also anorexia, with loss of sexual power and atrophy of the testes or mammæ. The patient may become almost imbecile.

The most efficient antagonist, especially for the mental symptoms, is morphin. Digitalis, ergot, and belladonna antagonize many of the effects of the bromids, as do most vasomotor stimulants. In the administration of bromids arsenic, in the form of Fowler's solution, may prevent bromism. Prolonged previous use of opium or morphin renders the organism extremely susceptible to the action of the bromids.

BROMOFORM.—$CHBr_3$. A bromid having a structure like that of chloroform, $CHCl_3$; it is an active anesthetic. Its use is not followed by vomiting. It causes irritation of the conjunctiva and respiratory organs. It is used in whooping-cough in daily doses of 5 to 20 minims.

BROMURAL.—A condensation product of urea

and brom-isovaleryl bromid. It is a nerve sedative and soporific recommended in functional nervous diseases. It has no cumulative or side effects. Dose, as sedative, 5 grains; as soporific, 10 grains.

BRONCHIECTASIS.—A term denoting the dilatation or relaxation of the walls of the bronchi, arising from inflammation and other causes.

Etiology.—(1) Secondary to chronic bronchitis, phthisis, asthma; (2) pleurisy with adhesions; (3) congenital defect. It is very rare as a primary condition, but is frequently associated with some chronic pulmonary disease. It occurs most frequently in pulmonary tuberculosis at the apex of the lung, but is also frequently seen in the bronchi at the base of the lung. It may involve a tube uniformly for some distance, producing the *cylindric* form; or it may occur irregularly in sacs or pockets—the *sacculated* form. If the whole lung is involved in the change, we have the so-called *turtle lung.*

Pathology.—Occasionally there is a *hypertrophic* condition of the bronchial tubes, while some cases show an *atrophic* condition. Atrophy occurs when there is diminished elasticity, giving rise to dilatation, usually circumscribed. In the hypertrophic form cellular infiltration takes place in the peribronchial tissue, lessening the lumen of the tubes in certain areas, and the increased pressure causes a localized dilatation (cylindric or saccular).

The mucous membrane shares in the process in each variety, while the epithelial cells, as a rule, remain unaffected.

Symptoms and Clinical Course.—There are severe cough, especially at night, dyspnea, and the expectoration of large quantities of a mucopurulent grayish or brownish material, occurring generally after a paroxysm of coughing. The sputum is offensive, and if discharged into a glass vessel, is seen to separate into two layers, the upper stratum being frothy and brownish in color, while the bottom layer is composed for the most part of pus-cells, fatty acids, and crystals of hematoidin.

Physical signs are the same as in chronic bronchitis. If due to phthisis, the characteristic physical signs of that disease will be present. The signs of a cavity (bronchiectatic) may be present.

Diagnosis is not always possible. If due to phthisis, the presence of tubercle bacilli will confirm the diagnosis. See BRONCHITIS (Chronic).

Prognosis depends on the disease to which bronchiectasis is secondary. It is usually unfavorable.

Treatment must be directed to the underlying cause. See BRONCHITIS (Chronic), TUBERCULOSIS.

BRONCHITIS, ACUTE (Acute Catarrhal Bronchitis, or Bronchial Catarrh).—An acute inflammation of the bronchial mucous membrane, accompanied by cough, a mucopurulent expectoration, and the presence of dry and moist râles in the bronchial tubes.

Etiology.—(1) Exposure to cold and wet; (2) changeable weather; (3) inhalation of irritating substances; (4) it is often associated with such diseases as influenza, measles, typhoid fever, nephritis, and heart-disease.

Pathology.—The mucous membrane of the bronchial tubes is reddened and swollen; the epithelial cells undergo a mucoid degeneration, forming a coating of mucus. In the acute stages there may be an infiltration of the blood in the epithelial cells. Besides this mucoid degeneration the bronchial glands pour out large quantities of mucus, thus increasing the amount of fluid in the bronchial tubes.

Symptoms and Clinical Course.—The onset is usually within the first 24 hours, marked by chilliness, hoarseness (laryngitis), distressing cough, sense of pain and constriction over the region of the sternum, slight fever (100° to 101° F.), and the expectoration of a viscid, whitish secretion.

Physical Signs.—The respirations are normal, although slight dyspnea may be present. As a rule, the objective symptoms, determined by inspection, palpation, and percussion, are negative. Auscultation in first stages yields dry râles (sonorous and sibilant) both during inspiration and expiration; later, when the mucus is more fluid, moist râles (mucous râles, small gurgling râles) may be heard during the respiratory murmur.

The dry and moist râles may be modified by coughing.

Diagnosis.—

ACUTE BRONCHITIS.	INFLUENZA.	BRONCHOPNEUMONIA.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*
1. May occur at any age.	1. May occur at any age.	1. Most frequent in young or very old.
2. Pain in region of sternum.	2. Pain in forehead or back of neck; general bodyache.	2. Pain in region of chest.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*
1. Respirations normal or only slightly increased	1. Respirations slightly increased.	1. Respirations exaggerated; dyspnea may be present; livid color of lips.
2. Fever slight or entirely absent; pulse in proportion.	2. Pulse small, rapid, irregular; moderate and often high fever (103° to 104° F.).	2. High fever; pulse rapid and feeble.
3. In early stages sonorous and sibilant râles; later, mucous râles are heard.	3. Same as acute bronchitis.	3. Subcrepitant râles over base of lungs posteriorly.

Prognosis is favorable.

Treatment.—If the bowels are constipated or the tongue is coated, a purgative should be given at once. Free diaphoresis may be established by the use of hot foot-baths on going to bed, and repeated again during the night if necessary. Subsequent to the foot-bath hot lemonade will aid in aborting the disease.

The atmosphere of the room should be maintained at an even temperature—never below 65° F. or 70° F.—and the chest should be enveloped in flannel; mustard plasters may be applied to the

chest. Quinin (4 grains) with Dover's powder (5 grains) every 3 or 4 hours are indicated. The diet should be principally liquid. The majority of so-called expectorants are disappointing. The drug that most quickly relieves the distressing cough and pain is opium, or one of its alkaloids. Codein is reliable, and does not disturb the stomach so much as morphin.

In early stages:

℞.	Codein sulphate,	gr. iv
	Elixir of orange,	ʒ iij
	Solution of potassium citrate, enough to make	ʒ iij.

Two teaspoonfuls every 3 hours.

℞.	Codein sulphate,	gr. iv
	Chloroform,	♏ xl
	Acacia,	ʒ ss
	Sugar,	ʒ ss
	Glycerin,	ʒ ij
	Water, enough to make	ʒ iij.

Two teaspoonfuls every 3 hours.

The following may be substituted:

℞.	Antimony and potassium tartrate,	gr. j
	Elixir of curacao,	ʒ iij
	Solution of potassium citrate, enough to make	ʒ iij.

Two teaspoonfuls every 3 hours.

If cough is oppressive, with constriction, the chest may be thoroughly rubbed with—

℞.	Oil of mustard,	♏ x
	Olive oil,	ʒ j.

Or the following inhalation may be used:

℞.	Menthol,	gr. ij
	Chloroform,	♏ xvj
	Compound tincture of benzoin,	ʒ j.

Teaspoonful to a pint of boiling water and inhale twice daily.

In later stages of the disease, or after first 4 or 5 days:

℞.	Ammonium chlorid,	ʒ j
	Compound syrup of squill,	ʒ iv
	Camphorated tincture of opium,	ʒ iv
	Water, enough to make	ʒ iij.

Two teaspoonfuls every 3 hours.

BRONCHITIS, CAPILLARY.—See BRONCHOPNEUMONIA.

BRONCHITIS, CHRONIC (Chronic Bronchial Catarrh).—A chronic catarrhal inflammation of the mucous membrane of the bronchial tubes.

Etiology.—It may result from an acute attack, but is most frequently due to the presistent action of improper hygiene—especially damp atmosphere—or to diseases of the heart, liver, or kidney.

Differential Diagnosis

Chronic Bronchitis.	Bronchiectasis.	Emphysema.	Asthma.	Phthisis.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*
1. May result from acute attack.	1. Generally results from chronic bronchitis of long standing or from phthisis.	1. Same as bronchiectasis.	1. Hereditary tendency; frequently associated with gouty diathesis; neurotic tendency, heart- and kidney-disease, or phthisis.	1. Hereditary tendency.
2. Localized pain generally absent.	2. Localized pain uncommon.	2. Localized pain uncommon.	2. Localized pain uncommon.	2. Localized pain frequently present.
3. Bodily health remains good.	3. Great emaciation.	3. Slow loss of flesh and strength.	3. Slow loss of flesh and strength.	3. Rapid emaciation.
4. Slight dyspnea....	4. Dyspnea marked..	4. Dyspnea marked....	4. Dyspnea marked.....	4. Dyspnea marked.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*
1. Fever absent.....	1. Slight fever.....	1. Fever absent.....	1 Fever absent.....	1. Fever.
2. Diminished tactile fremitus.	2. If due to phthisis, tactile fremitus increased.	2. Tactile fremitus decreased.	2. Tactile fremitus decreased.	2. Increased tactile fremitus.
3. Percussion note hyperresonant.	3. If due to phthisis, dulness may be elicited.	3. Percussion-note hyperresonant.	3. Percussion-note hyperresonant.	3. Dulness on percussion.
4. Sonorous and sibilant râles most frequently heard.	4. Dry and moist râles.	4. Sibilant râles most frequently.	4. Dry and moist râles, most frequently sonorous and sibilant.	4. Moist râles most frequently.
5. Expectoration scanty and whitish in color.	5. Expectoration whitish or grayish and abundant, containing fatty crystals and hematoidin.	5. Expectoration whitish and scanty.	5. Expectoration copious, whitish, containing Curschmann's spirals and Charcot-Leyden crystals.	5. Expectoration copious, whitish, yellowish or greenish, containing nummular plugs and tubercle bacilli.

Pathology.—In chronic bronchitis the continued irritation may give rise to cellular infiltration or hyperplasia in certain areas, causing a narrowing of the lumen of the bronchial tubes. Other areas occur, however, in which there is atrophy, and the epithelial surface may be roughened considerably. When the tubes become dilated, *bronchiectasis* or emphysema may result. If the secretion is abundant and mostly serous, it is termed *bronchorrhea;* and if offensive or putrid, *putrid bronchitis,* or *bronchoblennorrhea.*

Symptoms and Clinical Course.—Distressing, violent attacks of coughing, especially at night; expectoration of a scanty, tenacious, mucopurulent character, and dyspnea are generally present. The health appears to remain in good condition, and fever is generally absent, but may be present as a septic symptom, accompanied by increase of cough, pain in the side, chill, loss of appetite, indigestion, and general failure of health.

Physical Signs.—There is usually emphysema of the chest, with diminished expansion on inspiration and diminished tactile fremitus. On percussion, the note is hyperresonant, and on auscultation the expiratory breath-sound is prolonged and wheezy in quality. Sonorous, sibilant, or mucous râles may be present.

Varieties of Chronic Bronchitis.—(1) Bronchorrhea; (2) putrid bronchitis; (3) dry catarrh.

Bronchorrhea.—Characterized by cough and expectoration of large quantities of serous material.

Putrid Bronchitis.—Secretion abundant, grayish or whitish in color, often containing yellowish masses, and generally associated with empyema or phthisis during the existence of cavities.

Dry catarrh generally occurs in the very old, characterized by severe cough and scanty or entire absence of secretion from the bronchial tubes.

Sequels.—Emphysema, bronchiectasis, bronchopneumonia, dilatation of right ventricle.

Prognosis.—For absolute recovery, unfavorable; chronic bronchitis, *per se,* rarely, if ever, causes death, the patient usually dying of some intercurrent disease.

Treatment.—Avoid contracting cold, wear flannel underclothing, and guard against wet feet. The skin may be kept in a healthy condition by use of baths and massage. If the disease is due to constant inhalation of irritating particles, the patient should select another occupation. If due to organic disease, treatment must first be directed to the diseased part. A change of residence will generally be of great benefit. If the health is not good, tonics are indicated, such as the syrup of hypophosphites (2 drams) or the elixir of phosphates of iron, quinin, and strychnin (2 drams), taken after meals. Cod-liver oil is of especial advantage, and should be given in the form of an emulsion. See Tuberculosis (Treatment). Beechwood creosote (2 to 4 minims) is valuable in lessening the amount of secretion, and may be combined with cod-liver oil or given in sherry wine. The carbonate of ammonium may be given for a day or two, but should not be continuously administered lest the digestion become impaired.

℞. Aromatic spirit of ammonia, ℥ ijss
Compound syrup of squill, ℥ iv
Camphorated tincture of opium, ℥ iv
Water, enough to make ℥ iij.

Two teaspoonfuls every 3 hours.

℞. Potassium iodid, ℥ j
Syrup of senega, ℥ j
Glycerin, ℥ iij
Water, enough to make ℥ iij.

Two teaspoonfuls one hour after meals.

Local Treatment.—Stimulating inhalants are indicated:

℞. Creosote (beechwood), ℥ j
Eucalyptol, ℥ j
Compound tincture of benzoin, ℥ ij.

Teaspoonful to a pint of boiling water, and inhale morning and at bedtime.

Subsequent to the use of inhalants, it is essential that the patient should remain indoors at least one hour.

Troches may be given:

℞. Oil of cubebs, ℥ ss
Oil of lemon, ♏ xv
Oil of cloves, ♏ x
Guaiac, ℥ ij
Althea, ℥ j
Acacia, ℥ iv
Sugar, ℥ jss
Confection of rose, enough to make 30 lozenges.

Allow 1 to dissolve in mouth every 4 hours.

BRONCHITIS, FIBRINOUS (Plastic Bronchitis).—A rare form of chronic bronchitis, characterized by the formation and expulsion of a cast formed in the bronchial tubes.

Etiology.—It is frequently associated with tuberculosis; spring season, adult life, male sex, specially predispose.

Pathology.—The disease is generally circumscribed, certain tubes being affected. The changes in the mucous surface are slight, but the submucous tissue may be infiltrated with serum. The casts are whitish or grayish in color, and composed of fibrin. They have a branched appearance, and may be several inches in length. Microscopic examination detects degenerated epithelial cells, leukocytes, and Charcot-Leyden crystals.

Symptoms and Clinical Course.—The disease may be acute or chronic. In the acute form the manifestations resemble those of acute bronchitis, except that the symptoms are more grave and a pseudomembrane is expelled.

The chronic form resembles chronic bronchitis, but symptoms are more severe. The disease may recur periodically.

Prognosis is unfavorable.

Treatment is the same as for Bronchopneumonia.

BRONCHITIS, INFANTILE.—Bronchial catarrh is a very common disease in early life, children under 3 years of age being those most often affected by it. In them, owing to the want of elasticity of the chest walls, the ease with which the bronchial tubes collapse, the tendency for the lungs to join in the inflammation, and from the diseases which are liable to follow, bronchitis is an important affection.

Etiology.—Improper feeding, unhygienic surroundings, teething, gastrointestinal disturbances, malnutrition, and rickets are common predisposing causes. The disease may be caused by exposure to cold or wet, sudden changes in the temperature, extension of inflammation from the upper air-passages, or contact with another case.

Bronchitis is present in children suffering from the acute infectious diseases, especially measles, pertussis, influenza, and typhoid fever.

Pathology.—The bronchial mucous membrane is congested, with at first a diminished and later an increased mucous secretion. In mild cases the large bronchi only are affected, but when severe, the medium and the small tubes may also be involved. Bronchitis is usually bilateral—both sides being equally affected.

Symptoms.—The attack may be primary or may begin with coryza, pharyngitis, or laryngitis. Tracheitis is usually present. As the inflammation extends to the bronchi it will be indicated by increased temperature (100° to 102° F.), cough, which may be slight or severe, and accelerated respiration accompanied by a wheezing or rattling in the chest, and soon by expectoration of mucus or mucopurulent secretions. Infants do not expectorate, but the secretions, when coughed up into the mouth or pharynx, are swallowed, and may excite vomiting or diarrhea. The appetite is diminished, the gastrointestinal tract sluggish or irritable, and the child is restless and fretful.

On physical examination the percussion resonance will be found normal, but a bronchial fremitus will be felt on palpation. Auscultation will reveal roughened breathing over all the affected area, and sibilant, sonorous, and mucous râles may be heard all over the chest, but especially between the scapulæ. In mild cases the symptoms mentioned will not be sufficiently severe to cause alarm, and recovery will gradually be effected in the course of a week. Relapses, however, are frequent, and in weak children or in those predisposed one attack may follow another during the entire winter and spring.

When the smaller tubes are involved, a more serious condition exists than that just described. The temperature is higher; prostration more marked; and dyspnea more severe, as shown by rapid breathing, laboring of the alæ nasi and of all the accessory muscles of respiration. In severe cases cyanosis is present, and in young infants there are sometimes sudden attacks of suffocation that may prove fatal.

Diagnosis.—In influenza the onset is more severe, with pains in the limbs and back, headache, and gastrointestinal disturbances; the temperature is higher and there is great prostration.

Bronchopneumonia.—Higher temperature, remittent in character; physical signs of consolidated areas, with greater severity of all symptoms.

Prognosis.—Recovery may be expected in the milder, uncomplicated cases. When the smaller tubes are affected, the prognosis is less favorable, but in infants not suffering from malnutrition or rickets a fatal termination is not common.

Treatment.—The hygienic treatment of acute bronchitis is very important. The patient should be confined to a sunny, well-ventilated room, kept at a temperature of about 70° F., and the air of which is moistened by steam. When any fever is present, the child should be kept in bed. Hot camphor liniment should be well rubbed over the chest, front and back, twice a day, and a woolen cloth or shirt or, better, an oiled silk jacket kept over this part of the child's body. The oiled silk jacket is made by enclosing cotton batting about 1/2 of an inch thick in a covering, on the outside of oiled silk and on the inside of cheese-cloth or thin muslin. In severe cases counterirritation with a mild mustard plaster is very valuable. A suitable plaster is made as follows: To 1 part of powdered mustard and 6 parts of wheat flour add lukewarm water to make a paste, and spread between 2 layers of muslin large enough to envelop the chest. This, when applied, should be allowed to remain from 5 to 10 minutes, or until the skin becomes well reddened, and it may be repeated 2 or 3 times a day, or every 2 or 3 hours, according to the indications; the jacket being kept on in the intervals and worn throughout the attack.

Inhalations of steam, using the croup-kettle and a tent—as recommended in the treatment of croup—are very useful. Either lime-water, compound tincture of benzoin, creosote, turpentine, or eucalyptus, or a combination such as the following, may be used in the water:

℞. Carbolic acid,
Benzoic acid, } each, ʒ ss
Oil of eucalyptus,
Oil of turpentine, ʒ ijss.

Add a tablespoonful to the quart of water.

At the first visit a laxative should be given—magnesia, 15 to 60 grains; castor oil, 1/2 of a teaspoonful to a tablespoonful, according to the child's age; or, better, for a young child, small doses of calomel, as follows:

℞. Calomel, gr. j
Powdered ipecacuanha, gr. ij
Sugar of milk, gr. xij.

Mix and make 12 powders, giving 1 every 2 hours until the bowels are acted upon, and repeat daily, or when necessary to keep the bowels freely open, in order that the mucus that is coughed up and swallowed may be cleared out of the system.

In children under 2 years of age cough syrups and expectorant cough mixtures are not indicated, but an occasional dose of syrup of ipecacuanha (2 to 5 drops every 3 or 4 hours) may be given. For older children one of the following recipes will be found

useful, given every 2 or 3 hours in 1/2 to 1 teaspoonful doses:

℞. Solution of potassium citrate, ℥ ss
Tincture of aconite, ♏xv
Camphorated tincture of opium, } each, ℥ ij
Syrup of squill,
Syrup of tolu, q. s. ℥ iij.

℞. Aromatic spirit of ammonia, ℥ vj
Tincture of hyoscyamus, } each, ℥ j
Tincture of belladonna, }
Syrup of ipecacuanha, ℥ ij
Glycerin, ℥ ss
Syrup of wild cherry, q. s., ℥ iij.

℞. Ammonium carbonate, ℥ j
Ammonium chlorid, ℥ ij
Spirit of chloroform, ℥ ij
Wine of ipecacuanha, ℥ iv
Compound licorice mixture, q. s., ℥ iij.

℞. Wine of ipecacuanha, } each, ℥ ij
Paregoric, }
Solution of potassium citrate, ℥ j
Syrup of acacia, ℥ jss

℞. Codein, gr. iij
Syrup of ipecacuanha, ℥ j
Solution of ammonium acetate, ℥ ss
Mucilage of acacia, ℥ j
Water, ℥ ss.

When the pulse is weak and there is general prostration, stimulants should be given, as brandy or whisky, 10 to 30 drops well diluted every 2 or 3 hours to a child 6 months old. Five- to ten-drop doses of aromatic spirit of ammonia act as an excellent stimulant, and may be alternated with the alcohol every 2 hours. Strychnin is also a valuable cardiac and respiratory tonic, and may be given to a child 6 months old in doses of 1/200 to 1/100 grain hypodermically every 3 or 4 hours.

When there are symptoms of suffocation, as sometimes occurs in severe cases in infants, it is necessary to stimulate the cutaneous circulation and compel the child to take deep inspirations. This is best accomplished by slapping the child's bare body with a wet towel or handkerchief until it cries lustily. For the same object, alternate hot and cold douching of the chest, the mustard bath, or the mustard pack will be effective.

The diet in older children during the febrile stage should be liquid (milk and broths), and they should be given mucilaginous drinks, such as linseed tea, elm-bark tea, or barley-water. Proper regulation of the diet is especially important in infants. In bottle-fed infants the milk should be carefully modified and prepared, the proteids being reduced to a lower percentage than in health, and the rule for feeding should be strictly observed. See Infant Feeding.

Nursing infants should not be allowed to take the breast more frequently than usual, unless their appetite is so poor that they take but a small quantity at each feeding; all children should be given cool boiled water to drink.

During convalescence, and to prevent the attack in infants who are predisposed to bronchitis, they should have a daily salt bath, followed by inunction of cod-liver oil or sweet oil; they should not be exposed to damp or extreme cold; should sleep in flannel night-clothes, in a warm room, well ventilated but free from draft; and, if possible, reside in a dry, temperate climate.

In other children tonics, such as iron, quinin, cod-liver oil, or creosote, should be given—the last in emulsion or in capsules, as:

℞. Carbonate of creosote, ℥ j
Magnesia, sufficient to make a mass.
Mix and make 30 capsules, giving 1 three times a day.

See Bronchopneumonia.

BRONCHOCELE.—See Thyroid gland (goiter.

BRONCHOPNEUMONIA (Capillary Bronchitis; Suffocative Catarrh).—A term applied to inflammation of the lungs caused by microbic infection that, beginning in the bronchi, finally involves the parenchyma of the lungs. This disease is most frequently encountered in children, but may occur in old age. Three varieties are described: (1) A simple acute form following a severe bronchial catarrh; (2) a secondary form, occurring after whooping-cough or some general febrile infective disease; (3) a rare suppurative form, with the formation of abscesses throughout the lung.

Etiology.—It may be primary in the very young or old; it is usually secondary to measles, diphtheria, whooping-cough, tuberculosis, scarlet fever, nephritis, and heart-disease. Emphysema is a common predisposing cause (Pepper). It may result from lodgment of food in the bronchial tubes (*aspiration pneumonia*). It is usually due to mixed infection, the organisms most frequently found being the staphylococcus albus and aureus, the streptococcus pyogenes, the pneumobacillus and the micrococcus lanceolatus.

Pathology.—The mucous membrane of the terminal bronchioles is red, congested, and swollen, and covered by a thick, very tenacious mucus. The lungs are larger than normal, and externally are lighter in color. On the pleural surfaces are dark spots over areas where collapse has taken place. On section, the cut surface is dark red in color, containing reddish-gray spots. Pressure causes the exudation of large quantities of mucopus from the cut end of the bronchioles. Certain areas are red and hepatized, and surrounded by airless tissue (collapse of lung, or atelectasis).

Symptoms and Clinical Course.—In children the onset is marked by convulsions, high fever (104° F.), violent cough, rapid respiration (60 a minute) or intense dyspnea, pulse rapid and feeble, blueness of the lips, and cold extremities.

Physical Signs.—There are symptoms of intense dyspnea, the lips are blue, the nose pointed, the alæ expand and retract, the suprasternal notch is retracted, the sternomastoid muscle is rigid. Localized areas of dulness may be present, but usually these are never detected. Fine subcrepitant râles are heard posteriorly at base of lungs; sibilant râles may also be present, but the presence

of subcrepitant râles on both sides of the chest is specially diagnostic of the disease.

Diagnosis.—The disease may be mistaken for lobar pneumonia, but the physical signs, if systematically elicited, should prevent this error.

Prognosis.—In children under 5 the mortality is from 30 to 50 percent. In the aged the prognosis is unfavorable. In adults or middle age prognosis is better.

Treatment.—Absolute rest in bed and a nutritious diet; the chest should be enveloped in a thick cotton jacket; the temperature of the room should be equable, about 65° or 70° F. The windows should be kept open so that the patient may breathe pure air while at the same time he should be protected from drafts. If the bowels are inclined to be constipated, fractional doses (1/6 grain) of calomel are advisable every hour until 6 or 7 doses have been taken.

In the earliest stages the tincture of aconite is of service. Its action should be *cautiously* watched, and as soon as the pulse become soft the drug may be omitted. Usually 6 or 7 doses are sufficient.

For a child over 2 years old:

℞. Tincture of aconite, ♏ xxx
Simple elixir, ʒ ij
Solution of potassium citrate, enough to make ʒ j

One teaspoonful every 3 or 4 hours.

After the second or third day its action is too depressing, and is not recommended. Stimulating applications to the chest and massage appear to give comfort:

℞. Oil of mustard, ♏ xv
Olive oil, ʒ ij.

Apply a small quantity to chest twice daily and rub thoroughly.

Both the hot and the cold baths are of great value. If the temperature rises above 102.4° F., it should be reduced by means of a cold bath. The cold bath stimulates the circulation, respiration, kidneys, and the skin—which is beneficial.

Phenacetin may be given in appropriate doses to relieve persistent hyperpyrexia, but as a routine practice its use is harmful. Ammonium carbonate is valuable if given in sufficient doses.

Mustard applications, packs or baths (at 85° F.) of mustard are highly recommended. After the third or fourth day, or when the secretion becomes more abundant, with increased respiration, heat may be applied to chest in the form of a flaxseed poultice containing mustard (1 1/2 drams), and removed every hour if necessary. After the poultice has remained on the chest about 2 hours, give syrup of ipecacuanha (15 minims for children) every 10 minutes, until emesis is produced. In adults larger doses (1/2 to 1 dram) must be given. The poultice may be applied on the following day, and syrup of ipecacuanha repeated in a similar manner. The poultice should never be bound too closely around the chest, otherwise the respirations may become embarrassed from its weight. When the poultice is removed, the cotton jacket should be immediately replaced to prevent undue exposure. If the heart is weak, tincture of digitalis combined with the aromatic spirit of ammonia is of great benefit. Strychnin is of especial value if respirations are embarrassed. See Bronchitis (Infantile.)

BRONCHOSCOPY.—See Larynx (Foreign Bodies).

BROOM.—See Scoparius.

BROVALOL.—The brom-isovaleric ester of borneol, containing 25.2 percent of bromin. A restorative, sedative and antispasmodic. It is claimed to be well tolerated even in large doses, and to be more potent as a sedative than other valeric acid derivatives. Dose, 1 to 3 capsules each of which contains 4 grains.

BROW-PRESENTATION.—See Fetus (Positions and Presentations).

BRUCIN.—A poisonous alkaloid found in *Strychnos nux-vomica* and in *Strychnos ignatia.* It crystallizes in prisms containing $4H_2O$, and melts at 178° F. Its taste is exceedingly bitter and acrid. Its action on the animal economy is similar to, but much less powerful than, that of strychnin. It is seldom used; dose, 1/10 to 1/3 grain. See Nux Vomica.

BRUISE.—A slight contusion or subcutaneous injury, occasioned by a blow, crush, or tear of the tissues, combined with extravasation of blood from ruptured capillaries and smaller vessels of the part, the overlying skin being seldom broken.

An *ecchymosis* is diffused hemorrhage over a large area; a *hematoma* is a blood tumor or circumscribed hemorrhage. When the damage is sufficiently great, sloughing and gangrene may result. More commonly, the superficial vessels only are ruptured, leading to extravasation of blood. Swelling soon follows the injury, and occasionally large bullæ form containing blood-stained serum. Inflammation may ensue, leading to suppuration. In persons with thin, delicate skins and a tendency to the hemorrhagic diathesis, the tissues will be bruised and discolored from the most trifling injuries. The tendency to the formation of bruises varies widely in different persons, and the extent of the discoloration is no indication of the violence employed.

If seen early, before discoloration has resulted, ice or an evaporating spirit lotion may be most beneficial. A cold, saturated, recently prepared solution of ammonium chlorid is of value in the contusion when a "black eye" is dreaded. The fresh root of convallaria is useful for the same purpose, while arnica should be used with caution, as it is of little or no value.

If ecchymosis has taken place, a warm spirit lotion, covered with oiled silk and thick layers of cotton-wool, and bandaged moderately tight, will cause absorption of the effused blood. Capsicum, camphor, mild counterirritants, and moderate pressure may be used to hasten the process. A solution of lead-water and laudanum, or aconite, belladonna, opium, or lead acetate, may be used. Leeches occasionally prevent discoloration if used

very early, but they are of doubtful value. Incisions into the skin in extensive extravasations are very seldom necessary, although the aspirator may be used.

BRUIT.—See CHEST (Examination).

BRUSH-BURN.—The complex injury caused by rapid and forcible friction of a body surface—a rapidly revolving body, as a strap connected with machinery striking the skin, or by a sliding or gliding along a tree trunk or pole with much velocity, slipping of rope through the hands, etc. The skin is usually abraded, severely bruised, and sometimes actually burned away. The subcutaneous tissue, fasciæ, and muscles are usually greatly contused. The skin may become gangrenous, and a slough result.

The treatment consists in applying lead-water and laudanum lotion, or similar anodyne solutions; and, if necessary, removal of the slough, and then dressing with a stimulating lotion or ointment. The ulcer is to be treated on general principles.

BRYONIA.—Bryony. The root of *B. alba* and *B. dioica;* indigenous to Europe, with properties due to an intensely bitter glucosid, *bryonin*, a strong irritant when applied to the skin or mucous membrane, often producing vesication. It is a remedy of value in pleurisy, pleuropneumonia, and rheumatic fever, and an excellent remedy in colds. It is soluble in water and in alcohol but not in ether. Dose of the powdered root, 10 to 30 grains. Bryonin is a violent poison in 3- to 4-grain doses. Dose as a drastic purgative, 1/6 to 1/3 grain.

BUBO.—See LYMPHATICS (DISEASES, LYMPHADENITIS), GONORRHEA, SYPHILIS.

BUBONIC PLAGUE.—See PLAGUE.

BUCHU.—The dried leaves of *Barosma betulina*, containing a volatile oil as its active principle, giving them an odor resembling peppermint. The dose of the leaves is 15 to 45 grains. The preparations are the fluidextract of buchu—the dose of which is 15 to 40 minims—and the infusion of buchu (1 ounce to the pint)—the dose being 1/2 to 2 ounces. Buchu increases the flow of the urine, and is of especial use in chronic affections of the genitourinary mucous membrane. It is very useful in bronchitis, pyelitis, cystitis, urethritis, lithiasis, and affections of the prostate gland. The infusion makes an excellent vehicle for saline diuretics. When the urine is highly acid, muddy, and laden with salts, and produces incontinence from its vesical irritation, the fluidextract of buchu in teaspoonful doses, with sweet spirit of niter, will be beneficial.

The following is serviceable:

℞. Potassium citrate,	ʒ iv
Spirit of chloroform,	ʒ iij
Tincture of digitalis,	ʒ j
Infusion of buchu,	℥ viij.

Give 2 tablespoonfuls 3 times a day.

BULIMIA—An insatiable and inordinate craving for food. Found in certain cases of true diabetes, and normally in convalescence from fevers such as typhoid and the exanthemata. It is met with as a *nervous or hysterical* manifestation as well as in cerebral disease, epilepsy, exophthalmic goiter, etc. In the hysteric and neurasthenic cases it may be associated with an absence of the sense of satiety (achoria) or there may be a craving for unusual, seemingly or actually injurious, or, possibly, disgusting articles, as is observed in hysteria, pregnancy, chlorosis and to a less degree in childhood, where it no doubt oftentimes represents in normal children a genuine structural need in so far as it relates to special types of ordinary food, the craving for sweets and fruits or the preference shown for an exclusive starchy or proteid diet being too often combated by parents.

BULLET WOUNDS.—See GUNSHOT WOUNDS.

BUNION.—The enlarged and thickened bursa resulting from distortion over the inner side of the metatarsophalangeal joint of the great toe. The constant wearing of short and narrow-pointed shoes (especially in women) crowds the toes together, and the pressure on the inner side has the effect of dislocating outward the two phalanges of the great toe. The head of the metatarsal bone forms an increasing projection, and the bursa met with there enlarges. At the same time the head of the metatarsal bone itself enlarges, and presents small bony outgrowths similar to those in osteoarthritis.

The chief sequels of a bunion are recurrent inflammatory attacks, suppuration leaving an ulcer most tedious to heal. On account of the feeble circulation after middle life, the ulcer is liable to lead to cellulitis, erysipelas, or even senile gangrene. Perforating ulcer may lead to disorganization of the joint and caries of the bones.

The treatment includes insistence upon the wearing of proper shoes, with straight inside border and rounded toes, giving sufficient room and play for the foot. The phalanges may be drawn inward by passing a strap between the first and second toes, around the phalanges of the first, and then carrying it along the inner border of the foot and around the heel as far as the center of the outer side. Bandages from side to side around the foot will help to retain this strip. Cotton-wool pledgets or "elephant plaster" should be worn between the first 2 toes. A glove of buckskin or linen may be fitted over the phalanges, with a few inches of elastic webbing attached, and this fastened to a strip that goes around the heel, and is kept in place as described.

If simple treatment is insufficient, mechanic contrivances must be devised, such as metal soleplates and bunion-springs, which draw the phalanges inward.

The internal lateral ligament and tendons may be cut, followed by forcible and steady replacement of the phalanges. Osteotomy of the first phalanx may be performed or amputation by the oval method. C. H. Mayo resects the head of the metatarsal bone and also cuts away two-thirds of the hypertrophy on the inner side. He then sutures the bursa into the joint area in front of the bone. The latter procedure is said to give a fairly movable joint.

When simple thickening and effusion exist, the bunion may be treated with flying blisters, ichthyol, iodin, silver nitrate (1 dram to 1 ounce),

strapping with mercurial ointment, etc. If inflammation exists, lead-water and laudanum, dilute lead acetate, or conium are indicated. Frequent hot foot-baths are beneficial. If suppuration intervenes, incision and drainage are indicated. If ulceration has developed, the undermined skin must be snipped away, the bursal cavity laid freely open, and obliteration by granulation obtained by cleanliness and stimulating applications.

A stimulating ointment:

℞.	Iodoform,	gr. xx
	Oil of eucalyptus,	♏. xx
	Vaselin,	ʒ j.

More stimulating is compound tincture of benzoin.

℞.	Mercury biniodid,	gr. x
	Vaselin,	ʒ j.

Warmth, elevation of the foot, and weak solutions of silver nitrate will stimulate the circulation and healing. Skin-grafting may be resorted to. In advanced life warmth (obtained by cotton-wool applications), avoiding exposure, and the raised position are of much importance.

BUPHTHALMOS.—See Keratoglobus.

BURDOCK.—See Lappa.

BURNS.—Injuries caused by fire or dry heat. Scalds are caused by heated fluids or steam, but there is no distinction as to the nature of the changes produced in the tissues or as to their results and treatment.

The classifications of burns are many, but they are herein regarded as of 3 degrees, viz.: (1) that of congestion; (2) that of vesication; and (3) that of more or less disorganization of the soft parts.

The lesion of the **first degree** is that of simple scorching; that of the second degree is marked by one or several patches of erythema and studded with bullæ containing clear and serous fluid. In the mildest form of the third degree a part of the cuticle, in addition to the epiderm, is destroyed. In the most severe form the burn extends to the muscular and other deep-seated parts. In the majority of burns of the first degree the injury is mild, and needs scarcely any treatment save the application of cold; yet if it involves two-thirds of the body surface, it is said, it will inevitably prove fatal.

In burns of the **second degree** there is always pain, at first very severe, and in favorable cases the heat and redness subside speedily, the vesicle bursts, the dry and shriveled epidermis is thrown off, and recovery ensues in a few days. The lesions of this degree are most common after scalds and applications of heated metals, and are, in the primary stage, more painful than those of any other degree. They are very serious when the chest and abdomen are involved, and sometimes fatal. In favorable cases of burns of the **third degree** the sloughs gradually separate in a few weeks, leaving the well-known pale-gray surface thickly studded with granulations, resulting in a scar that can never be effaced, but that is movable over the subjacent parts. The depth to which a burn has extended cannot be determined easily until disorganization has ensued. Burning clothes and the prolonged application of heated metals and other solid bodies are the most frequent causes of the third degree of burns. The danger of the detachment of the eschar or slough in this degree is the profuse bleeding that may ensue. The deep ulcer resulting heals very slowly, and after prolonged and exhausting suppuration.

The stages of prostration, reaction, and suppuration follow the course of most severe burns.

The first stage lasts from 18 to 24 hours, and pain is the most prominent symptom. Careless removal of the sufferer's clothing ruptures the vesicles and detaches the epidermis, leaving the raw cutis exposed. Profound collapse or extreme restlessness and excitement ensue. Death from shock or from gradually increasing prostration, or, in children, after convulsions and coma, may ensue. Obstinate thirst is often a symptom, and the desire to evacuate the bladder although it is empty is troublesome.

The second stage, or that of reaction, lasts for 2 or 3 days in mild injuries of the first and second degrees; but in severe burns of the third degree does not ensue until the sloughs are cast off. Two weeks are usually regarded as the period of inflammatory reaction. Complications, such as cough, pleurisy, or bronchopneumonia, vomiting, and diarrhea, must be closely guarded against.

The third stage, or that of suppuration, is characterized by the exhaustion due to the profuse discharge. Hectic fever, marasmus, cellulitis, erysipelas, pyemia, septicemia, with asthenic lung conditions and duodenal ulcerations, are the special complications.

The treatment of severe burns is directed to reaction from shock, relief of pain, quieting of any restlessness and agitation, and guarding against coma. Recumbency, stimulants, such as brandy and water, with blankets and hot-water bottles along the sides of the trunk and at the extremities are to be employed. Hypodermics of morphin or full doses of laudanum must be given for the pain. Potassium bromid may be given during the course of reaction, and thirst relieved by giving frequently and in small quantities hot beef-tea, soup, milk and soda-water, weak lemonade, barley-water, and dilute sulphuric or phosphoric acid.

In the stage of reaction the strength must be supported and undue stimulation avoided. The diet should consist of milk, beef-tea, and soups, and should be nourishing. Liquor ammonii citratis and small doses of antimony and potassium tartrate are indicated for pulmonary congestion or bronchopneumonia, if the patient is not very weak. Chalk and opium, small doses of laudanum and castor oil, zinc sulphate and opium should control the diarrhea.

The third stage, or that of suppuration and healing, requires stimulation, with a free and generous diet, wine and malt liquors, and, if possible, occasional change of scene and air.

Burns of the first degree should have instant application of a saturated solution of sodium bicarbonate. If this is made before the cuticle is

raised, a painful burn may be prevented. Cold, in the form of cold compresses, cold baths, iced water, lead-water, or diluted cologne water, will relieve the smarting pain in this stage. When an extensive surface is involved, prolonged immersion in a bath of slightly warmed water or the local application of some cooling and oily fluid, covered over with a thick layer of cotton-wool, is desirable.

In *burns of the second degree* the blebs should be punctured at their most dependent parts, and dusted with wheaten flour or boric acid and flour, 1 : 4, or boric acid mixed with starch or talc powder in 10 percent strength. Salol, thiol, bismuth, potassium sozoidol, and other powders may be used with talc or oxid of zinc. The principal object is to exclude the external air from the seat of the injury.

The list of dressings and applications is endless. The old-fashioned carron oil, made of equal parts of linseed oil and lime-water, or some modification of it, was good of its kind, and in the pre-antiseptic days; but it should not be used now if other (modern) methods are available. Olive oil and yolk of egg, or carbolic acid and olive oil (1 : 10), may be used. A 1 percent solution of picric acid makes an excellent application. Gauze saturated with the solution is laid over the burned surface, covered with cotton and then a bandage is applied. The dressing is left in place for two or three days. Before the gauze is taken off it is made wet with the same solution. Boric acid, or chalk and zinc ointment spread on strips of soft lint, makes a suitable application. Cotton wadding, absorbent cotton-wool, or cotton tissue treated with some antiseptic may be applied in thick layers over the mentioned lotions or ointments.

Treatment of *burns of the third degree* should be directed toward accelerating the separation and removal of eschars, of controlling putrefaction, and of advancing the cicatrization of the wound. Strong antiseptic solutions retard the separation of sloughs. Hot applications are indicated. Dilute peroxid of hydrogen may be used to cleanse the wound before dressing, or a tepid carbolic solution (1 : 30), or a weak iodin solution, or zinc chlorid (10 grains to the ounce).

Large granulating surfaces require procedures to overcome the effects of cicatricial retraction, and to favor the formation of a thin, soft, and lax scar. Burns about a large joint, as the elbow or popliteal region, call for measures to prevent a tendency to flexure. Burns of the neck need constant endeavors to prevent depression of the chin. The best means to resist this retractile action is extension of the distorted parts and compression by an elastic bandage.

Amputation is indicated (when the general condition of the patient does not forbid) if the extremity has been destroyed or if the resulting cicatrix renders the member quite useless.

The open-air treatment for extensive surface burns consists in letting nature do the work of repair, few dressings if any being used. Over the patient, who is kept perfectly quiet by morphin, is placed a cradle which is covered by blankets when the weather is cold, the head alone being exposed. In suspensions over the region of the burn glass may be substituted for the blanket so as to get the benefit of sunlight. When the weather is warm enough, blankets are discarded, a netting over the bed protecting the patient from flies. Thus the patient is exposed to air and sunlight. The temperature of the room should be kept constant. The patient may be placed on a water bed if the burn is mainly on the back. An electric heater beneath the bed is useful in warming the air when necessary.

Antemortem and Postmortem Burns.—In *burns* produced *before death:* There is usually a blister, with a bright, red base, and containing a serous fluid, which is albuminous, occasionally there will be no blister if there has been excessive shock; also, there will be a red line of demarcation between the injured and the uninjured parts, and this, being a vital process, is only developed during life. In *burns* produced *after death* there is no true blister, no red base, and gas only is present in place of the serous fluid.

See also ELECTRICITY (Injuries).

BURSITIS.—Inflammation of a bursa. Acute bursitis ensues from strain or traumatism. It is most common in the bursæ of the patella, those about the hip and over the olecranon, and in small bursæ formed beneath an old BUNION or a CORN (*q. v.*). The affected bursæ may suppurate.

The treatment consists of rest, the application of lead-water and laudanum, hot fomentations, and pressure.

The following is a valuable application:

℞. Glycerin,
Extract of belladonna, } equal parts.

Later, tincture of iodin, blue ointment, or ichthyol may be applied. If pus forms, an incision should be made, and the sac swabbed out with pure carbolic acid.

Chronic bursitis may follow acute bursitis, and presents an accumulation of serous fluid distending the sac. Its most common form is that of "housemaid's knee," and there is little or no pain unless inflammation arises.

Tincture of iodin may be painted twice daily for some weeks over the swelling, or small blisters applied. The mechanic cause of the injury must be avoided. Incision may be made, and a drainage-tube inserted for from 7 to 10 days, or aspiration may be practised. When the bursa becomes converted into a dense fibroid mass, or when so-called melon-seed bodies float in the interior of the bursa, the only treatment is removal by the knife.

BUTYL-CHLORAL HYDRATE.—Croton chloral hydrate. An analogue of chloral, having similar properties, though it is claimed to be less depressing and more analgesic than the latter drug. It is said to be especially valuable in tic douloureux. Dose, 5 to 20 grains in syrup or pill (best given in 5-grain doses) every half hour till 20 grains have been taken or until relief is afforded.

C

CACAO-BUTTER (Oleum Theobromatis).—A fixed oil expressed from the seeds of the chocolate tree (*Theobroma cacao*). It is a yellowish-white solid, of faint odor, bland taste, and neutral reaction. Its action is demulcent, and it does not become rancid on exposure to the air. Its chief use is as a basis for making suppositories.

CACHEXIA.—A term used to designate any morbid tendency, dyscrasia, depraved condition of general nutrition, or impoverishment of the blood, etc. It is applied particularly to scrofulous, syphilitic, or carcinomatous patients. It is characterized by emaciation and a peculiar sallow or muddy complexion. See CARCINOMA, TUBERCULOSIS, SYPHILIS, LYMPHADENOMA, etc.

CACODYLIC ACID.—An organic arsenic compound, which, it is claimed, may be introduced into the body in considerable doses without producing toxic symptoms. Cacodylic acid or *sodium cacodylate* has been used in the treatment of phthisis, various cutaneous disorders, anemia, and chorea. The dose is 1/2 to 1 grain hypodermically, and 3 to 6 grains by the mouth or rectum. Sodium cacodylate contains nearly 50 percent of arsenic. The cacodylate is particularly recommended in obstinate psoriasis, pseudoleukemia, diabetes, anemia, chlorosis, tuberculosis, malarial cachexia, etc. It is said to promote the growth of hair and to increase the menstrual flow. It is much less tonic than the ordinary arsenical preparations and less likely to be accompanied by untoward effects because of the slow liberation of arsenic trioxid in the body. The drug has recently been recommended in syphilis and good results are reported in late as well as early stages of the disease. Dose, 1/2 to 2 grains, hypodermically, or in pills or as an enema.

CACTUS GRANDIFLORUS (Night-blooming Cereus).—A sedative diuretic plant. Its active principle, *cactin*, has been found to have a decided stimulant action upon the heart, the arterial tension and the spinal motor centers. This drug has been employed as a cardiac stimulant in the functional disorders of the heart, also in valvular diseases and in pseudoangina pectoris. It does not prolong the diastole, as digitalis does, and on this account it has been especially recommended in complicated aortic regurgitation. A tincture is prepared, ℥iv of the fresh stems to a pint of strong alcohol, the dose of which is 5 to 10, up to 30 minims, every 4 hours. Dose of cactin, 1/100 to 1/30 of a grain.

CADE OIL (Oleum Cadinum).—A tarry oil from the wood of *Juniperus oxycedrus*. It is similar in action to tar, but has less odor, and is less injurious to the clothing. It is used externally in chronic eczema, psoriasis, pityriasis rubra, lichen, prurigo, and pruritus, also as a parasiticide in favus or tinea.

CAFFEIN.—$C_8H_{10}N_4O_2+H_2O$. The alkaloid derived from the dried seeds of *Coffea arabica*, or the dry leaves of *Thea sinensis*, occurring in colorless, flexible crystals, soluble in 80 parts of water and 33 of alcohol. The caffein of commerce is in reality thein, obtained from old tea leaves; the two are chemically identical. It occurs in long, silky needles, slightly soluble in cold water and alcohol, and having a feebly bitter taste. It contains more nitrogen than almost any other vegetable principle. Caffein is usually employed in medicine as the citrated caffein, prepared by dissolving equal quantities of caffein and citric acid in double the quantity of hot distilled water. Dose, 1 to 5 grains. It is an uncertain mixture. **C. Citrata Effervescens,** effervescent citrated caffein. Dose, 1/2 to 1 1/2 drams in water.

Caffein is a rapidly acting stimulant to the brain and spinal cord, quickens the action of the heart and raises blood pressure, increases the rate of respiration and the secretion of urine. Caffein, thein, guaranin, and theobromin are closely allied chemically and physiologically. Caffein is an ingredient of many proprietary preparations of which acetanilid is part, in which it antagonizes the depressing action of acetanilid on the heart. Its range of usefulness is very extensive. In opium-poisoning especially it is very valuable.

℞. Sodium salicylate, 30 parts
Citrated caffein, 40 parts.
Distilled water, 60 parts.

Or—

℞. Sodium benzoate, gr. xlv
Citrated caffein, gr. xxx
Distilled water, ℥ jss

Ten drops at a dose. Give heated.

In hemicrania or nervous headache:

℞. Citrated caffein, gr. vij
Distilled water, ℥ iij.

Mix and add:

Hydrochloric acid, ♏ ij
Syrup of orange, ℥ ss.

Give a tablespoonful every hour or two, as required.

Or—

℞. Acetanilid, gr. xx
Monobromated camphor, gr. v
Citrated caffein, gr. x

Make 10 pills.

One every 2 hours until relieved.

CAISSON DISEASE.—Also called "*The Bends.*" The symptoms due to increased atmospheric pressure, sometimes occurring in divers, caisson workers, etc. Paraplegia, hemiplegia, anesthesia, or apoplectic attacks are common, but paralysis of the legs is the most frequent symptom, coming

on only after return to the normal atmosphere. The nature of the lesion is obscure. The **leading symptoms,** as given by Parkes are: (1) Unpleasant sensations or severe pains in the ears, which may be materially aggravated if the person happens to be suffering from a cold in the head or sore throat, when pain in the forehead is often marked. (2) Neuralgic pains. (3) A feeling of giddiness, with a tendency to fall. (4) Loss of power in the legs, amounting at times to paralysis. (5) Slight to severe pains in legs, arms, and shoulders. (6) Epistaxis. (7) Itching of skin. (8) Hemoptysis. (9) Epigastric pain, and sometimes nausea and vomiting. (10) Occasionally unconsciousness. There is, of course, a physiological rise in the blood pressure.

The **predisposing causes** are: Too long stay in the compressed air, insufficient ventilation of the compressed air space—the amount of illness varies inversely with the extent of the provision for ventilation, too rapid decompression, fulness of habit, advancing age, overindulgence in alcohol, and organic disease. New hands suffer more than the old.

Treatment.—The affection may be prevented to some extent by avoiding sudden changes in the atmospheric pressure and long-continued work under high pressure. Slow decompression, and a careful selection of the worker will do much to prevent this disease. No worker should be accepted who is suffering from obesity, arteriosclerosis, cardiac weakness, nephritis, anemia or chlorosis, or neurasthenia.

CAJUPUT OIL.—A volatile oil distilled from the leaves of *Melaleuca leucadendron*. It resembles oil of turpentine in its general effects, being irritant externally and producing a sense of warmth internally, with accelerated pulse. It is used with benefit for flatulent colic, dropsy, hysteria, and cutaneous disorders; it also relieves toothache. Dose, 5 to 10 minims.

CALABAR BEAN.—See PHYSOSTIGMA.

CALAGE.—A method of prophylaxis or treatment of sea-sickness by fixation of the viscera by pillows placed between the abdomen and the wall of the cabin and between the back and edge of the berth, the patient lying upon the side. See SEA-SICKNESS.

CALAMUS.—Sweet-flag. The rhizome of *Acorus calamus*. It contains a volatile oil and *acorin*, a bitter nitrogenous principle. The root is an aromatic, stomachic tonic, and a common ingredient of many popular "bitters." Dose, 10 to 20 grains. **C., Fluidextractum.** Dose, 10 to 20 minims.

CALCIUM.—Ca = 40; quantivalence II. A brilliant, silver-white metal, the basis of lime and limestone, characterized by strong affinity for oxygen, and isolated with great difficulty. It is best known in the forms of the oxid, or "quicklime" or "burnt lime," and the carbonate, or chalk. The preparations of lime used in medicine are alkaline and slightly astringent.

Lime has great affinity for water. It is irritant to the skin; more severe on mucous membranes. Chalk possesses the astringent and antacid qualities of lime and is not so irritant. Calcium chlorid is an irritant poison in large quantities. It increases the amount of the urine, and probably the excretion of urea, and is used in pharmacy to abstract water from other substances.

Therapeutics.—Lime may be used as a caustic and depilatory, but is better known as an agent for hastening decomposition, which it does by its affinity for water, the resulting hydrate absorbing many of the products. The chlorinated lime is an excellent antiseptic and disinfectant, and it owes its energy entirely to its power of evolving chlorin. Lime-water is a favorite remedy for vomiting, especially in children, and is added to milk to increase its digestibility. A mixture of milk and lime-water will be retained by the stomach when no other food can be borne. Lime-water is an efficient agent in acid dyspepsia, mucous enteritis, and typhoid fever, as an astringent and antacid. Locally, it is well employed as an enema against thread-worm, as a mouth-wash for aphthæ, and as a lotion for cracked nipples, eczematous eruptions, and many mucous and purulent discharges. For these purposes it may be mixed with oil or glycerin, and if a few drops of carbolic acid are added, the efficacy of the mixture is much increased. The liniment is best known by the name carron oil, from the foundries at Carron, where it was extensively used. It is one of the best applications for burns and scalds, and makes a good dressing for the face in small-pox, and for cases of eczema affecting a large area of the skin. The vapor of slaking lime or lime-water in the form of spray has been usefully employed for inhalation in diphtheria. Lime-water is a good injection into the bladder in vesical calculus, in which its benefit is probably due to its astringent and soothing effects on the inflamed vesical mucous membrane, blunting its sensibility, and preventing the further growth of the stone by neutralizing the free acid of the urine.

As a solvent of false membrane in diphtheria:

℞.	Carbolic acid,	♏ xij
	Glycerin,	ʒ j
	Lime-water, enough to make	ʒ iv.

Apply with an atomizer every hour.

In glandular swellings:

℞.	Calcium chlorid,	ʒ j
	Powdered digitalis,	ʒ ij
	Diluted acetic acid,	♏ xl
	Lard,	ʒ j.

Apply locally.

In struma and phthisis:

℞.	Calcium chlorid,	gr. clx
	Glycerin,	ʒ ij
	Water, enough to make	ʒ viij.

Shake well. Half an ounce in a wineglassful of milk or water immediately after taking food.

An antacid and carminative:

℞.	Lime-water,	ʒ iij
	Prepared chalk,	ʒ ss
	Anise water,	ʒ iij.

Give 2 tablespoonfuls at a dose.

In poisoning by caustic lime the antidotes are: A dilute vegetable acid or lemon-juice or carbonated water freely, followed by demulcents or fixed oils to protect the mucous membranes; opium or alcohol as antagonists against the vital depression. Potassium salts and calcium salts are mutually antagonistic. Poisoning by calcium chlorid is treated with albumin, mucilaginous drinks, oils, milk, flour and water, but no acids.

Incompatible with preparations of lime and chalk are all the acids and metallic salts, especially the sulphates and tartar emetic; and borates, alkaline carbonates, and astringent vegetable infusions are also incompatible with the preparations of lime.

Preparations.—**Calx,** *lime, calcium oxid,* CaO, is lime prepared by burning white marble, oyster-shells, or the purest varieties of native calcium carbonate. Occurs in hard, white masses, gradually resolving to a white powder in the air, odorless, of sharp, caustic taste and alkaline reaction, soluble in 750 of water and 1600 of boiling water, insoluble in alcohol. Not used internally except in solution. **Calcii Carbonas Præcipitatus,** *precipitated calcium carbonate,* $CaCO_3$, a fine impalpable, white powder, odorless and tasteless, insoluble in water or alcohol, but soluble in mineral acids or acetic acid with effervescence. Creta (chalk) is native calcium carbonate. Dose, 5 to 30 grains. **Calcii Chloridum,** *calcium chlorid,* $CaCl_2$, hard, colorless masses, deliquescent, of sharp, saline taste, soluble in 1 1/2 of water and in 8 of alcohol. Dose, 3 to 10 grains in solution. This salt should not be confounded with chlorinated lime. Calcium chlorid has been employed in traumatic hemorrhage, purpura, hemophilia, small-pox and other hemorrhagic diseases. In hemoptysis its action is doubtful; but good results are reported in serous effusions and edema in general. It has long been used in furunculosis but with questionable success. The eruptions that so metimes follow injections of diphtheria antitoxin are said to yield to daily doses of calcium chlorid on the day of injection and the two following days. **Calcii Sulphas Exsiccatus,** *exsiccated calcium sulphate* (*dried gypsum*), contains about 5 percent of water. A fine, white powder, without odor or taste, insoluble in alcohol, soluble in 410 of water at 59° F., in 388 of water at 100° F., and in 451 of water at 212° F. Used in the preparation of calx sulphurata. **Calcii Sulphidum,** *calcium sulphid;* dose, 1/10 to 1/2 of a grain; **Calcii Bromidum,** *calcium bromid,* dose, 15 grains; **Calcii Hypophosphis,** *calcium hypophosphite,* dose, 7 grains. **Calcii Phosphas Præcipitatus,** *precipitated calcium phosphate,* dose, 15 grains. **Liquor Calcis;** *solution of calcium hydroxid, lime-water,* contains not less than 0.14 percent of calcium hydroxid, $Ca(HO)_2$. A clear, colorless liquid, of saline taste and alkaline reaction. Dose, 4 to 8 drams. **Syrupus Calcis,** *syrup of lime, syrup of calcium hydroxid*—contains 6 1/2 percent of lime, and 40 of sugar, the latter aiding the solvent power. Dose, 10 to 60 minims. Is an antidote to poisoning by oxalic acid and phenol. **Linimentum Calcis,** *lime liniment* (*carron oil*), contains equal volumes of lime-water and linseed oil, mixed by agitation. For local use. **Calx Chlorinata,** *chlorinated lime,* dose, 4 grains; and **Calx Sulphurata,** *sulphurated lime,* dose, 1 grain. **Creta Præparata,** *prepared chalk,* $CaCO_3$, is native calcium carbonate, freed from most of its impurities by elutriation; a white, amorphous powder, odorless and tasteless, insoluble in water or alcohol. Dose, 10 to 30 grains. It is a constituent of hydrargyrum cum creta, and also of the following: **Pulvis Cretæ Compositus,** *compound chalk powder,* has of prepared chalk 30, acacia 20, sugar 50 parts. Dose, 5 to 60 grains. **Mistura Cretæ,** *chalk mixture*—has of the preceding 20 parts, cinnamon water 40, water to 100, rubbed together and made fresh as required. Dose, 1 to 8 drams. See LIME.

CALCULUS.—See BLADDER (Stone), GALL-BLADDER (Diseases), KIDNEY (Stone), etc.

CALENDULA (Marigold.)—The flowering plant known as the garden-marigold, *C. officinalis.* **C., Tinct.,** contains 20 percent of the leaves and stems. It has been used exclusively as a local application to wounds, bruises, and ulcers, and has been vaunted as a cure for carcinoma.

CALISAYA.—See CINCHONA.

CALLOSITY.—See CORN.

CALOMEL.—See MERCURY.

CALUMBA.—One of the purest bitters known, derived from the root of a climbing plant, *Jateorrhiza palmata,* native to South Africa and parts of the East Indies. It contains the alkaloid *berberin* and a bitter principle, *calumbin.* The odor of calumba is slightly aromatic. Its action is favorable to mucous surfaces, and it has no astringent effect. Being free from tannic acid, it may be combined with iron. In gastrointestinal atony, especially following fevers, and in convalescent stages of summer complaint and serous diarrheas, it is of service. Dose, 5 to 45 grains. In the foregoing conditions, especially with flatulence, give:

℞. Powdered calumba, Powdered ginger, each, ʒ ss
Senna leaves, ʒ j
Boiling water, O j.
Make into an infusion. Take a wineglassful 3 times a day.

Calumba is an excellent tonic in the hectic fever of phthisis, and is a good vehicle for the administration of acids, alkalies, tonics, aromatics, and mild cathartics.

Preparations.—**C., Fluidextractum.** Dose, 5 to 45 minims. **C., Tinct.,** contains 20 percent of calumba. Dose, 1/2 to 2 drams.

CAMBOGIA.—See GAMBOGE.

CAMMIDGE REACTION.—See PANCREAS (Diseases).

CAMOMILE.—See CHAMOMILE.

CAMP SELECTION AND CAMP HYGIENE.—The "ratio of sickness and death" in the United States army camps of instruction and detention during the summer of 1898 was such as to make the whole nation stand aghast. The losses in battle were as nothing in comparison. Of the 5731 American soldiers who died during, or as a consequence of, the war with Spain, only 454

received death-wounds in battle. All of the remainder, or 5277, expired from disease. It is true that the armies of other nations in former times have also suffered terribly from improper hygienic conditions in camps. In the earlier half of the last century the annual mortality of the British troops in Jamaica was 13 in 100 by the medical returns, but the actual mortality amounted to about 2 percent more, a mortality of which we may give some idea by stating that a soldier by serving 1 year in Jamaica encountered as much risk of life as in 6 such actions as Waterloo. This frightful mortality, however, having been persistently pointed out by the medical officers, led finally to a searching investigation as to its causes. This was followed by greater care in the selection of sites for camps and barracks, a diminution of the evil of overcrowding, more variety in the dietary and better cooking, and a reasonable adaptation of the uniform to the climate, with the result that, at the present time, the mortality of British soldiers stationed in the West Indies is not notably greater than that of those at home stations.

There are two principal reasons for unhealthfulness of camps:

First (and most conspicuous).—The failure on the part of the military authorities to avail themselves of the superior knowledge of the medical staff in determining their location and in supervising the daily life of the soldier in all its details while in camp. The "Sanitary Report on Barracks and Hospitals," published in London just at the time of the outbreak of our Civil War, contains the following with regard to the British Army: "There being no regulations on these subjects, it naturally follows that the degree of respect shown medical opinions on matters affecting the health of the troops, whether concerning personal hygiene or the larger and more difficult subjects of barracks, hospitals, and camps, depends solely on the good sense and capacity of the officer in command, and on the tact and ability of the medical adviser."

Second.—This failure on the part of commanding officers to accord to their medical subordinates the respect to which their knowledge and acquirements entitle them naturally breeds in the latter a feeling of distrust and discouragement which leads them to neglect that careful study of military and camp hygiene that alone can qualify them properly to care for the health of their commands.

Surgeon John S. Billings, U. S. A., in a report similar to the one just alluded to, published at Washington five years later, at the close of the same war, says: "The mortality from disease (excluding epidemics) in the United States army for the last 3 years is probably 50 percent greater than it should be; in other words, it has been increased to that extent by causes that might have been obviated;" and later comments as follows: "As the subject of hygiene is not *officially* and *necessarily* a subject of daily consideration, as it should be, the surgeon does not have the motive to bestow that amount of study and labor upon it which must be given if good results are to be obtained." Surgeon Tripler, in his "Report on the Operations of the Medical Department of the Army of the Potomac," uses the following language: "To superintend the sanitary conditions of the regiment, to call upon the commanding officers to abate nuisances, to take measures for the abatement of disease, were, in many instances, considered impertinent, and the suggestions of the medical officer to these ends were too frequently disregarded and ignored." Treatment of this kind might be quoted indefinitely. It is true that in 1874 a general United States army order was issued that elevated the medical officer of a post from the position of attending surgeon to that of sanitary officer, to whom was assigned the supervision of the hygiene of his post or command. But this never seems to have been taken very seriously, and during the recent war was evidently disregarded.

The first step in reform, then, in matters pertaining to the health of the soldier must be to make the sanitary commander as absolute in his department as the combatant commander is in his—not of subordinate but of coordinate rank. It will be objected that this may lead to occasional conflict of authority. The only time when the combatant commander should be permitted to disregard the representations of the sanitary commander is on the field of battle or on a forced march in a hostile country. At such times, of course, the military exigency overrides all other considerations. The regimental surgeon should have the rank and pay of colonel, not that of major; and so of the other grades. It is necessary, therefore, to urge as strongly as possible the necessity for making hygienic regulations a part of the general routine regulations of the army, and of placing the enforcement of these regulations entirely and unreservedly in the hands of the medical staff, and at the same time to succinctly outline the character of such regulations and the responsibility of the surgeon in relation thereto.

A military surgeon should, in addition to the ordinary medical and surgical curriculum, spend a year in a laboratory of hygiene, making himself thoroughly acquainted with both the chemic and bacteriologic analysis of water, milk, meat, and other foods. He should possess a sufficient knowledge of geology to enable him to judge at a glance of the water-bearing capacities of a formation, and of the character of the water likely to be obtained from a given soil. He should know enough of botany to be able to distinguish poisonous plants, and to determine with a considerable degree of accuracy the nature of a soil from its flora. He should be able to pass such an examination in public health as is required in the English universities, and such as should be required in our own. The Army Medical School at Washington affords an opportunity to such medical officers as desire to avail themselves of its advantages, and can obtain leave of absence for the purpose, to obtain a limited amount of information on these subjects; but as the course covers only 5 months, and embraces instruction in the duties of medical officers in war and peace; military surgery; the care of the wounded in time of war; hospital administration; military hygiene; military medicine; microscopy, sanitary and clinical; pathologic histology, bacteri-

ology and urinology; hospital-corps drill; and first aid to the wounded, it can readily be understood that no very thorough knowledge of the particular branches can be obtained.

In order to refresh the memory on all points connected with the general hygiene of the camp, the medical officers of the United States army should keep constantly by them General Orders No. 117, August 10, 1898; that part of the army regulations that refers to the care of companies; circular No. 1, April 25, 1898; and circular No. 7, September 5, 1898. A man thus instructed and trained will be able to select almost by instinct.

The Proper Site for a Camp.—A camp is the station of an army, with its artillery, baggage, animals, and other accessories, when it has taken the field for purposes of war or for instruction in the art of war. The habitations of a camp are either tents or huts. It is not a fortress or fort or post, and has no permanent erections upon it It may be occupied for a single night, for a period of weeks, or for a season, but the same site is rarely suitable for both the hot and the cold seasons or the dry and the wet seasons. A camp used for a night or two may be called a *flying camp*, and one occupied for several weeks, a *fixed camp*. A permanent camp should not exist. Let it not be supposed, however, that because a camp is to be used only for a brief period it is a matter of indifference what sort of place is chosen for it. A single night in a marsh may prostrate an entire command with malaria, and one drinking of a polluted water is enough to introduce the germ of typhoid or dysentery into the system of many a soldier. "Wood, water, and grass," is the old comprehensive formula of the soldier, aiming purely at convenience. But before all these the sanitarian puts dryness of soil. Better additional labor in carrying water than sleeping on damp ground amid the emanations from fermenting vegetation. A cavalry troop of the National Guard has been known to establish its camp on an oozy flat close to a little stream that carried the entire sewage of a large summer hotel. A hillside with an abundant growth of grass, with several feet of gravel underlying the top layer of humus, and with rock below, constitutes the best location. An old orchard is the ideal site, as the apple will not flourish save on a soil of this general character, while the trees afford a refreshing shade in hot weather. A luxuriant growth of shrubs indicates water close to the surface. The apparent dryness of a sandy surface is often dangerously misleading. The sand may be, and often is, underlaid at no great depth by impermeable clay, which retains the water, thus producing great dampness of the atmosphere. In such localities every deep hollow is likely to contain a stagnant pool. This is the characteristic of the soil at Montauk point, U. S. A., which, while admirably meeting the exigencies that led to its choice as a camp of quarantine and detention for a brief time, was soon found to be unsuited for permanent occupancy as a post. Next to dryness of soil, perhaps even of equal importance, is a sufficient supply of pure, wholesome water for drinking and cooking, within reasonable distance, and, if the encampment is to continue for several days, for bathing as well. The soldier may sleep on damp ground or in an insufficiently ventilated tent, but so long as he has an abundance of pure water to drink he has a fair chance of maintaining his health; but compel him to drink water containing organic pollution, animal or vegetable, and therefore the germs of disease, and no matter how favorable are his hygienic conditions in all other respects, he will inevitably fall sick. Improper food, exposure, overwork, unhealthful emanations, loss of sleep, all combined do not entail one-fourth of the sickness, disability, and mortality in our army that are due to polluted water. Within a few years a division camp of a National Guard was visited by bloody diarrhea. The camp was located on a series of hills, the general conditions were favorable, and customary sanitary precautions were observed. Water in sufficient quantity was distributed over the greater part of the area in iron pipes, supplied by a tank on the summit of the highest elevation. Investigation, however, developed the fact that the water was pumped up to this tank from a small spring, directly above which, and at a distance of not more than 20 feet, stood a privy used by a small settlement of Italian laborers. Bacteriologic examination of the water disclosed the presence of the colon bacillus in great numbers. And yet this site had been determined upon after weeks of mature deliberation, evidently on the grounds of convenience alone. The sanitary commander should, therefore, make, or cause to be made, chemic tests of all the available waters on a proposed camping-ground, and, if time permit, bacteriologic examinations also, in addition to a careful inspection of the several sources and of possible causes of contamination. Those that are found to be fit for use should be carefully guarded before the main body of the troops arrives, in order to prevent their pollution. Such as are unfit for use should be guarded in order to prevent their use. To another detail should be assigned the duty of carrying water to various convenient points of the proposed camp, in order that the men, coming in with parched throats, may quench their thirst before the labor of pitching tents, securing fuel, and building fires is begun. Otherwise they will seek relief at the first roadside brook, regardless of its probable contamination, and dysentery, if not typhoid, will quickly make its appearance. He must not trust a spring or old well, no matter how seductively sparkling the water or how excellent its local reputation. All such water must be tested. The Nessler and permanganate tests can be made so expeditiously that there is absolutely no excuse for neglecting them and thus risking the health of the command.

On the whole, the safest source is the driven well. It would be proper for a brigade to be equipped with the necessary machinery for sinking such wells, and in many soils the operation could be accomplished in a short time and with great ease. Such wells should not be sunk within 200 yards of a privy, barnyard, camp sink, or garbage pit. In a fixed camp the water should be conveyed all over the fields in pipes, as an immense amount of labor is thus saved. For this purpose iron pipes

only should be used. In estimating the amount of water to be furnished, at least 5 gallons a day should be provided for each man.

While a camp should not be located in a forest, yet the close proximity of woods is convenient and useful. In summer their shade is not only grateful but healthful, and in winter they act as a screen from prevailing winds. They may also furnish a ready supply of fuel. When lumber cannot readily be obtained, split logs will answer many useful purposes, as for flooring tents or for building huts. Another point to be kept in view in the selection of a site is the inclination of the surface, as related to the question of drainage. One general comprehensive plan of surface drainage should be determined on in advance, if practicable, as much trouble will thus be avoided. The advice of an engineer officer should, of course, be sought in regard to this.

The final word on the selection of a site is that which has passed into an axiom with experienced campaigners: namely, never to occupy grounds previously used by another corps, as these are sure to be contaminated and to become foci of disease. If it is necessary to use a site near an old camp, select a position to the windward of it.

Camp Hygiene.—As soon as the camp is reached, a police detail should be established. It is astonishing how soon the ground becomes littered—often with scraps of food, which are trodden into the ground and gradually decompose.

The essentials for health in camp are not different from those under other conditions; they are dryness and purity—purity of soil, purity of water, purity of air, purity of food, purity of person, purity of morals.

Dryness.—Not only should a naturally dry soil and location be sought, but its dryness should be maintained and protected. This is to be accomplished by a thorough and scientific system of surface drainage. Every company street should have gutters on both sides, of sufficient depth to carry off storm-water, and into these should empty the smaller drains from the tents or huts, around each of which should be dug a trench 4 inches in depth and 8 inches in width. All hollows should be filled up. Tent flaps should be raised every day, to allow the free passage of air, to dry both the surface and the tent walls, and twice a week, if the weather permits, the tents should be struck, to allow the direct action of the sun's rays. Blankets and underclothing should be freely exposed, both to sun and air. If drenched, either with rain or perspiration, the men should be compelled to put on dry underclothing before going to bed.

Inasmuch as in the driest soils there lurks a certain amount of moisture, the men should not sleep directly on the ground. In fixed camps the tents should always be floored. In flying camps, straw, hay, or cornstalks, or the twigs of trees—especially of evergreens—may be used. The rubber poncho should be thrown over these, or placed on the ground, if nothing else can be obtained. The floors should be of loose boards, elevated a few inches on stringers. These should be taken up twice a week, when the tents are struck, and the ground underneath carefully swept. If straw must be used for a few days, it should be woven into mats, for the sake of neatness. As soon as soiled, it should be burned. With a few pieces of scantling and a strip of unbleached muslin or canvas, the soldier will readily learn to make a cot that will keep him off the ground. Hammocks also serve a good purpose.

The earth should never be excavated under a tent, nor should a burrow be dug in the side of a hill, as the earth, under such circumstances, quickly absorbs, and becomes contaminated with, the effluvia of the body. The men should not wash in or near their tents, but common lavatories should be established, warmed in winter, provided with hot as well as cold water, and carefully drained. Laundries should be established, apart from the lavatories, if possible, although the two may be combined. The mechanic facilities for these purposes should form a part of the army equipment—as much a matter of course as cook-stoves and soup-boilers.

Company streets should be kept as hard and dry as possible. Mud is both unhealthful and depressing. Gravel, ashes, furnace-slag, may be found in many localities, and may be used to face the roads. Corduroy and plank roads may also be laid. At least, there should be board-walks for two abreast to all frequented points. Wet feet are responsible for a vast amount of sickness. In camps of instruction that are used for considerable periods a few asphalted streets, which are constructed with ease and rapidity, would add greatly to comfort, ease of locomotion and transportation, and health.

Purity of the soil may be maintained by the enforcement of severe penalties for the deposit of filth of any kind or of animal or vegetable refuse on the surface. All kitchen garbage should be received in water-tight receptacles, and removed after each meal, either to pits or crematories. A fixed camp should invariably be provided with the latter. A limited amount of refuse can be destroyed in the kitchen fires, but they cannot be depended on for this purpose. Each deposit in a garbage pit should be at once covered out of sight with a layer of quicklime and fresh, dry earth. For this purpose the earth excavated in digging the pit should be protected from the rain. When within 3 feet of the surface, all the remaining earth should be thrown in and the surface covered with quicklime. One of the most powerful agents for the destruction of garbage, when fermenting or putrescent, is bromin. The men should not be allowed to take their rations to their tents, but should have their meals served in a common mess-tent or shed. Otherwise the ground under and around the tents will soon become filthy from refuse food.

Recent investigations confirm the possibility suggested by the illustrious Leidy, that the common house-fly may often be a carrier of contagium. This being admitted, the banishment of this insect from camps becomes of the utmost importance. This may be accomplished by never allowing deposits of horse manure, the acknowl-

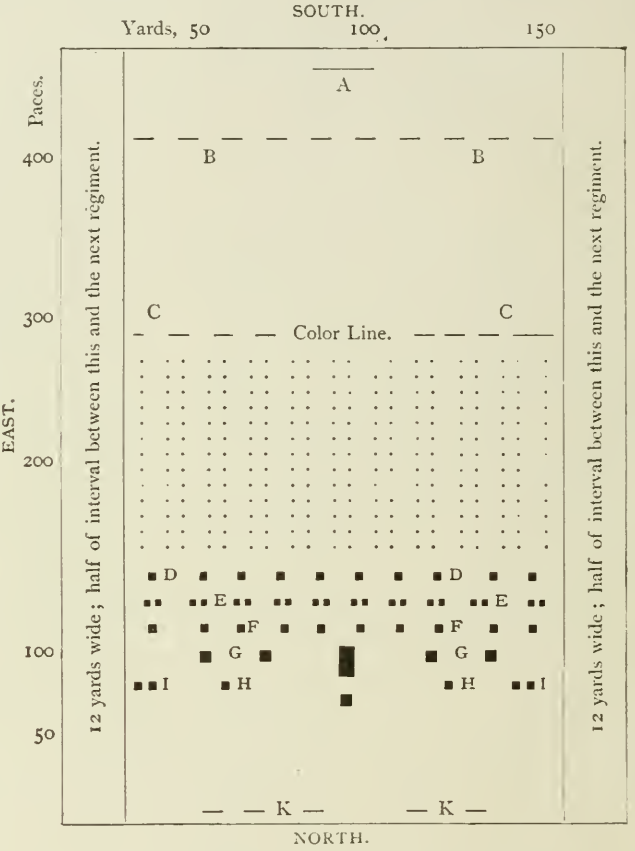
edged breeding-place of the fly, to accumulate in or near camps.

Inasmuch as the complete exclusion of these pests cannot, however, be hoped for, those which still infest the camp should be prevented from gaining access to the sinks. These insects always seek the light, and it will be necessary to build close sheds over the latrines and keep them carefully darkened. The use of mosquito-netting around kitchens and mess-tents would be an additional precaution of value. These expedients are simple, but will likely result in a considerable diminution of typhoid mortality in camps, especially if combined with the free use of clean earth and disinfectants.

Small latrines or sinks are preferable to large. In their construction the effort should be made to secure privacy for each man. This may be accomplished by means of muslin partitions. Urine troughs should be constructed at each latrine, and urination about the tents at night should merit severe punishment. Water-tight iron buckets may be placed at the foot of the company streets during the night, each containing a pint of solution of copperas. Disinfectants should be freely used in sinks and on garbage deposits. It is true that the evacuations of healthy men do not need disinfecting, but 10,000, or even 5000, men never were assembled, even with the strictest examinations, who were all in perfect health. One unhealthy stool will infect a whole latrine. The dangerous cases in a camp are those of walking typhoid and incipient dysentery, not detected by the surgeon. To wait for infection to be discovered before using disinfectants in the sinks is to invite disaster. Economy in disinfectants is not to be recommended. Fortunately, freshly burned quicklime is a cheap and efficient disinfectant. It may be crushed and strewed over the surface, or used in freshly made solution, as milk of lime. A small amount of coal oil poured on the top of this solution in a barrel, however, will at once form a protective film that will preserve its activity for many days. When this cannot be obtained in abundance, the sanitary officer should not hesitate to use any of the other disinfectants (not deodorizers) that the supply table contains—chlorid of lime, carbolic acid, and mercuric chlorid. To this list should be added formalin and bromin. Carcasses of animals should never be buried, but hauled to a distance and burned with an abundance of wood, coal oil, and rosin.

Copperas should be freely strewed on the ground around kitchens, which cannot fail to become foul, and in stables and horse-sheds, or where horses are tethered. All deposits of horse manure should be removed daily and strewed over distant fields.

Purity of water will not avail unless the greatest care is exercised, first, to prevent the supplies selected from becoming polluted, and, secondly, to prevent the men from drinking from any unauthorized source. They should be especially cautioned against drinking while bathing in streams or ponds. If water cannot be obtained that is above suspicion, they should be forbidden, under pain of severe punishment, to drink it unboiled. Boiled water, either plain or as weak tea, should be furnished by the cooks, and canteens should be filled with this in the morning, if on the march from camp to camp.



Purity of air will, of course, be greatly promoted by the foregoing measures for securing dryness and purity of soil. There are, however, two important factors in vitiating the air of a camp that require the greatest vigilance and determination on the part of the sanitary officer for their prevention. They are, first, overcrowding *of* tents; and, second, overcrowding *in* tents. Only the most urgent military necessity should lead to a greater degree of

compression than is indicated by the accompanying diagram for a camp of 600 men.

The depth is specified in paces from the color line, the pace being 28 inches, the average step of the soldier. Ten paces in rear of the color line (C) are the tents of the men, which are ranged in 2 files with a street between, the tents opening on the street. The streets should have a length of 50 paces and a width of 9 yards. The company kitchens (D) are in line parallel to the color line, and 20 paces back of the rear ends of tents. The company officers are quartered on the line (E), 20 paces in rear of the kitchens, and a depth of 15 paces is allowed for their tents, servants' quarters, and kitchens (F). Further to the rear, 20 paces, are the quarters (G) of the field and staff of the command, and behind them, 20 paces, their kitchens (H) and the tents (I) of the noncommissioned staff. Officers' sinks (K) are 100 paces beyond, with regimental wagons, if any, parallel in the interval. The sinks of the men (B) are 150 paces in front of the color line, and the advance guard (A) 50 paces in front of the sinks.

This diagram represents a regulation camp, but the plan is open to some slight criticism from a sanitary standpoint. Thus, if the wind is blowing from the south, the emanations from the men's sinks will be wafted toward the camp. If the camp faces west and east and the wind is from the north or south, this inconvenience will not be experienced; but in the latter position if the wind is from the east, the same difficulty arises. It would seem best to place the men's sinks in the rear, in a line behind the officers' sinks. Thus, a wind blowing from in front would not carry their emanations over the camp, while a rear wind would have very little effect, providing a woods formed the northern background of the camp, and if it did not, the trouble would only exist when the wind happened to be in this particular direction. This arrangement of the sinks would also be advantageous from an economic point of view, as the advance guard could be set back at least 140 paces, thus saving this much space in the extreme length of the camp. The only valid objection to this location of the men's sinks is that in going to them the men would be obliged to pass the kitchens of the officers' tents. This drawback could be avoided by a proper guard service, especially when it is remembered that this guard is necessary to keep the men away from the commissariat, even though the sinks might be in the opposite direction.

From the diagram it will be seen that a camp for a regiment of 600 men should cover a space 174 yards wide by 358 yards (460 paces) deep; giving an area of 62,292 yards, or 104 square yards for each man. The utmost extent of crowding permitted by the regulations consists in reducing the frontage to 124 yards, the depth remaining the same, which gives a superficies a man of 74 yards. The diagram provides for 20 rows of tents and 13 in a row, which would give 260 tents for each regiment, and with 2 men in each tent, accommodation would be had for 520 men, a number rarely, if ever, exceeded in any command. This is the proper proportion; not more than 2 men should occupy each of the ordinary tents, for a greater number will result in overcrowding that must prove detrimental to health. It is the overcrowding in the tents even more than the contraction of the total area of the camp that is to be avoided. There is no greater error than to suppose that because a tent is made of canvas, and not of wood or stone, air can penetrate its walls in sufficient quantity to make overcrowding a matter of little consequence and ventilation unnecessary. Typhus, essentially a disease of overcrowding, is better known by its familiar synonym of camp fever. The tents should be ventilated by holes near the ridges, guarded by flaps that can be looped up or let down at pleasure. In a battalion camp the tents should never be arranged in double line; short, single lines are best. The tents in line should be separated by a space at the very least equal to a diameter and a half of a tent, and the further the lines can be conveniently placed from one another, the better. The sinks, one for each company, should be located at least 150 paces from the tents, and in the rear, for the reasons already given. A deep and narrow trench should be dug for the purpose; and if too wide, it will require more earth to cover the excreta, and will, moreover, expose a greater surface from which the noxious effluvia will be given off than if it is narrow. Care must be had not to locate these sinks over streams of water or in the vicinity of springs or wells. In either case the water will become contaminated and serious disease may result. In cavalry camps care must be taken that the horses are not stabled near the water-supply, for horse refuse will prove almost as dangerous as that from the soldier.

Food.—Without pure, wholesome, digestible food no soldier can be maintained in fighting condition. To this end the food must be furnished pure by the commissary department, and so treated and handled by cooks, stewards, and attendants, in stoves, kitchens, and mess-tents, that it shall be kept clean and pure. Regimental surgeons should inspect all food brought into their camps, and should unhesitatingly condemn any that is found to be unfit for food. Next to the incompetent commissary and the careless cook, the great obstacle in the way of furnishing the soldier with pure food, at least in the summer season and in tropic climates, is the house-fly. Bacteriologists have detected disease germs on its feet and in its tracks. Every effort should, of course, be made to protect food from its visits. But as this is often an impossibility, the danger that it may infect food only emphasizes the importance of the free use of disinfectants in sinks and latrines, and, it may be added, in hospitals.

The necessity for purity of person cannot be too strongly urged upon the soldier by the sanitary officer. The former cannot wash too often or too carefully. Hot water and soap are essential for all surfaces that are hairy or where perspiration collects. A soap that is offensive to parasites is to be preferred. Chafing and other serious discomforts will thus be prevented, as well as the more serious systemic affections that result from

clogging the pores of the skin. Quite as important is frequent washing of clothing. The arduous labors of the soldier provoke constant and profuse perspiration, and as he is often compelled to sleep in the clothes he has worn during the day, these soon become offensive and full of animal poisons. Every opportunity should be afforded, therefore, for this important measure of prophylaxis.

Purity of morals is too often either neglected or sneered at or regarded as impossible of attainment in camp. And yet drunkenness, debauchery, private vice, and profligacy are among the greatest enemies of the soldier's health and efficiency. The soldier will often listen to advice and remonstrances on these subjects from the surgeon when he will turn a deaf ear to the warnings of the chaplain. It therefore becomes the duty of the former to allow no opportunity to pass unimproved of representing to the individual members of his command the frightful consequences that may follow forbidden indulgences.

Just as judicious parents endeavor to preserve their sons from falling into evil courses by making the home pleasant and attractive, so the surgeon, obtaining the cooperation of the general staff, can devise means to make the camp pleasant and attractive. Athletic sports and games of all kinds should be encouraged. Musical members should be sought out and organized into vocal and instrumental clubs. Amateur theatricals, lectures, and concerts, lyceums, debating clubs, and reading clubs should be formed, and in every possible way that mental occupation and excitement which the young soldier craves should be furnished.

CAMPHOR.—$C_{10}H_{16}O$. A solid volatile oil obtained from *Cinnamomum camphora*, a tree indigonous to eastern Asia. It yields *camphoric* and *camphretic acids*, also **C. Cymol** when distilled with zinc chlorid.

Camphor is antispasmodic, anodyne, antiseptic, diaphoretic, a stimulant expectorant, a cerebral excitant, a gastrointestinal irritant, and a rubefacient. It has an acrid, hot taste, and irritates the skin and mucous membranes, in quantity exciting severe gastric inflammation with all the effects of an irritant poison.

Large doses cause gastrointestinal inflammation, depress the heart and lower arterial tension, diminish the reflex function of the spinal cord, produce coldness of the surface, insensibility, coma, convulsions, and, perhaps, death.

Poisoning.—Arterial stimulants, coffee, cold, etc., antagonize its action. Water precipitates it from the alcoholic solution; alkalies and earthy salts precipitate even the small quantity that is soluble in water. Emetics to remove as much as possible. Opium and bromids for the convulsions.

Therapeutics.—Camphor has a reputation for uncertainty of therapeutic action, but is usefully administered in cholera and choleraic diarrhea, summer diarrhea and that of infants, vomiting, gastralgia, cardiac depression, nervousness and nervous headache, nymphomania, capillary bronchitis, typhoid and eruptive fevers, dysmenorrhea, after-pains, chordee, strangury, and catarrhal colds. Locally, it is effective in myalgia, lumbago, toothache, gangrene, and other conditions in which counterirritation or a local anodyne is required. A solution in ether has been found to be a beneficial application in erysipelas.

Monobromated camphor is used as a nerve sedative and hypnotic, but is not particularly efficient. It has been employed with advantage in whooping-cough, neuralgia, chorea, hysteria, delirium tremens, and epilepsy; but it is taken with difficulty, and is very liable to irritate the stomach.

Camphoric acid, in solutions of 0.5 to 6 percent strength, has been used with benefit as a topic agent in cystitis, and in coryza, acute bronchitis, and other affections of the respiratory tract. Internally administered it gives good results as an intestinal disinfectant, and has recently come into prominence as one of the most efficient agents against sweating from various causes, especially the profuse night-sweats of pulmonary tuberculosis. For this purpose it is best administered dry on the tongue, in dose of 10 to 30 grains, not more than 2 hours before the time for the expected sweating to occur—as it is quickly and abundantly eliminated by the urine.

To prevent chordee:

℞. Camphor, gr. xv
Powdered opium, gr. iij.
Make into 7 pills; 2 or 3 to be taken every night at bedtime.

An anaphrodisiac:

℞. Camphor, Extract of lettuce, each, gr. l.
Make into 20 pills; from 4 to 6 to be taken daily.

In spasmodic asthma, vomiting, etc.:

℞. Camphor, gr iij to vij.
Tincture of calumba, Spirit of cinnamon, each, ʒ jss.
Dissolve and add:
Peppermint water, Spice water, each, ʒ v.
Make into a drink. To be taken when the vomiting is troublesome.

In lumbago:

℞. Camphor liniment, ʒ xij
Oil of turpentine, ʒ ij
Pure soft soap, ʒ iv.
Rub the parts well.

Preparations.—**C., Aqua**, consists of camphor 8, alcohol 8, talc 15, distilled water q. s. ad 1000 parts. Dose, 1 to 4 drams. **C., Ceratum**, consists of camphor liniment 1, white wax 3.5, and lard 7 1/2. Used for itching skin-affections. **C., Linimentum**, contains camphor 20, cottonseed oil 80 parts. **C., Monobromated**, $C_{10}H_{15}BrO$, camphor in which 1 atom of hydrogen has been replaced by an atom of bromin. Dose, 1 to 5 grains, in emulsion. **C., Spt.**, contains camphor 10, alcohol 90. Dose, 5 to 20 minims.

Incompatible with *Camphor* preparations are: Butyl-chloral hydrate, chloral hydrate, chromic trioxid, dichloracetic acid, euphorin, hydrochloric acid, menthol, monochloracetic acid, napthol,

phenol, potassium permanganate, pyrocatechin, pyrogallol, resorcin, salol, salicylic acid, thymol, urethane, water; with *Camphora Monobromata* are: Chloral hydrate, euphorin, phenol, pyrocatechin, salol, thymol. With *Spirit of Camphor* are acacia, aqueous fluids, gelatin.

CANALICULUS.—See Lacrimal Disease.

CANCER.—See Carcinoma; Tumors; Breast (Tumors).

CANCRUM ORIS.—See Stomatitis (Gangrenous).

CANITIES.—Poliosis; hoariness; hair-blanching. A premature or senile, partial or universal, decolorization of the hair, the change varying from black or brown through every gradation to the whiteness of wool. This change may be physiologic or pathologic, gradual or rapid, general or confined to localized patches.

CANNABIS INDICA.—Hemp; Indian hemp. The flowering tops of *C. sativa*, of which there are two varieties, *C. indica* and *C. americana*, the former being the more potent and also official. They contain a resin, *cannabin*, and a volatile oil, from which are obtained *cannabene*, $C_{18}H_{20}$, a light hydrocarbon, and *hydrid of cannabene*, a crystalline body. It is an antispasmodic, anesthetic, narcotic, and a powerful aphrodisiac. In large doses it produces mental exaltation, intoxication, and a sensation of double-consciousness. It is a valuable hypnotic in delirium tremens, and is useful for painful affections of the bladder and for functional impotence. It is efficacious in uterine disorders as dysmenorrhea, menorrhagia, chronic metritis, subinvolution. It is also used for nervous headaches. It is highly recommended in whooping-cough and chorea minor. In large doses it diminishes reflex activity in traumatic tetanus and paralysis agitans. In gonorrhea it may lessen the discharge, allay the pain and restlessness, and relieve the chordee. *Bhang*, *siddhi*, *ganjah*, *churrus*, and *hashish* are the various Indian names by which the drug is known.

In sleeplessness:

℞. Chloral, Sodium bromid, each, gr. xx
Fluidextract of belladonna, Fluidextract of cannabis indica, each, ʒ j
Syrup of acacia, ʒ vj.
Give a tablespoonful at a dose.

Habit.—The drug is used extensively by the natives of Egypt and India and is the cause of much crime and insanity. The intoxication it produces is agreeable—mental activity is stimulated, time and space seem markedly extended, sight and hearing are keener, sexual desire and uterine activity are stimulated. Gradually follow anesthesia, diminished reflex activity, sleep or coma. The habitual use of the drug causes mental impairment, sexual impotence, indigestion, anemia.

Poisoning.—Strychnin and faradism are antagonistic, and caustic alkalies are incompatible. The stomach should be evacuated, stimulants given cautiously, and respiration maintained in poisoning by cannabis indica. Lemon-juice is said to be antagonistic in its effects; these effects, even of a large dose, seldom last over 24 hours.

Preparations.—**C. Indica, Ext.** Dose, 1/8 to 3/4 of a grain. **C. Ind., Fluidextract**, an alcoholic preparation. Dose, 1 to 5 minims. **C. Ind., Tinct.**, contains 10 percent of the drug. Dose, 5 to 30 minims.

CANTHARIS (Cantharides).—Spanish fly. The dried body of a species of beetle, *C. vesicatoria* (natural order *Coleoptera*). It contains a powerful poisonous principle, *cantharidin*, $C_{10}H_{12}O_4$. Locally applied, cantharis is a rubefacient and vesicant; internally it is an irritant, causing gastralgia and vomiting. In toxic doses it produces severe gastroenteritis, strangury, and priapism. It is used chiefly as an external counterirritant in the form of blisters. It is used as a uterine stimulant to relieve amenorrhea, and is valuable in small doses in the second stage of desquamative nephritis; in albuminuria, when the kidneys are torpid or relaxed; the tincture is useful in chronic nephritis, particularly from alcoholism; in impotence from sexual excess; in chronic gleet and chronic prostatorrhea; incontinence of urine; and in pyelitis and chronic cystitis. It is serviceable in small doses in psoriasis, eczema, prurigo, and lichen. In alopecia and seborrhea, with other remedies, it is a good agent. Blisters must be very cautiously used in the young, old, and debilitated, and cantharis should never be employed, either externally or internally, in acute nephritis.

The cantharidal blisters require from 6 to 10 hours to draw a blister. When the part is bright red, however, at about the end of 4 or 5 hours, it is best to remove the plaster and apply a flaxseed poultice. See Counterirritation.

Cantharidal pitch is an active rubefacient.

A plaster may thus be prescribed:

℞. Cerate of cantharides, q. s.
Make into a plaster 2 by 3 inches. Apply as directed.

Poisoning by cantharides is generally discovered by finding some of the glistening, iridescent wings and coats in the vomitus, and by the great thirst. The stomach must be washed out, if an instrument is at hand, or an emetic given, as of zinc sulphate, 30 grains in water, or a tablespoonful of mustard in water. Barley-water, white of egg and water, linseed tea, opium or morphin, but no oil, should be given. Stimulants may be necessary.

Preparations.—**C., Ceratum**, cantharides 32, yellow wax 18, resin 18, lard 17, liquid petrolatum 15. **Collodium Cantharidatum**, cantharides 60, flexible collodion 85, chloroform, q. s. **C., Picis, Emplast.**, *warming plaster*, Burgundy pitch 92, cerate of cantharides 8 parts. **C. Tincture**, 10 percent; dose, 1 to 10 minims.

CANTHOPLASTY.—See Eyelids (Deformities).

CAPSICUM (Cayenne Pepper). The fruit of *C. fastigiatum*, native to tropic Africa and America. Its odor and hot taste are due to a volatile oil, *capsicin*, which is irritant to the skin and mucous

membranes. Internally, it is a stomachic tonic, diuretic, and aphrodisiac. It is useful in atonic dyspepsia, flatulent colic, and in intermittent fever; also as a "pick-me-up" for alcoholics.

For alopecia:

℞. Tincture of cantharides, ʒ jss
Tincture of capsicum, ♏ xx
Glycerin, ʒ ss
Odorated spirit, enough to make ʒ vj.

Apply to the head 2 or 3 times daily.

As a stomachic:

℞. Pepsin, gr. viij
Extract of nux vomica, gr. x
Capsicum, gr. v.
Ipecacuanha (powdered), gr. v.

Make into 30 pills. One pill 3 times a day.

Incompatibles are: Alum, ammonia, alkaline carbonates, copper sulphate, ferrous sulphate, galls infusion, lead acetate, mercuric chlorid, silver nitrate, zinc sulphate.

Preparations.—**C., Emplastrum,** prepared from the oleoresin and adhesive plaster. **C., Fluidextractum.** Dose, 1/2 to 2 minims. **C., Oleoresin,** Dose, 1/4 to 1 grain. **C., Tinct.,** contains 5 percent of capsicum. Dose, 5 to 20 minims.

CAPUT SUCCEDANEUM.—An edematous swelling of the skin and subcutaneous tissue, caused by uneven pressure upon the presenting parts during labor. It is so common an accident of all tedious labors that it may almost be considered all physiologic in such cases. Its usual location is over the upper and posterior portion of a parietal bone, less frequently over the occipital bone, still less frequently over the frontal bone, and in breech presentations over the buttocks. These swellings are purely mechanic, being due to an inequality of pressure upon the presenting parts, hence at the point of least resistance a localized edema is produced. It consists in a round, oval, or sometimes elongated swelling, usually 1 to 3 inches in its longest diameter, but at times large enough to greatly disfigure the head. It pits, but does not fluctuate on pressure; it is often purplish, and may even become dotted with gangrenous spots, but usually disappears spontaneously in from 24 to 36 hours.

Diagnosis may be made by the disappearance of the caput succedaneum in from 24 to 36 hours; other tumors found upon the head are persistent: *e. g.*, cephalhematoma.

Hernia Cerebri, or Encephalocele.—In line of the sutures, and pulsates.

Hydromeningocele.—Grows tense with respiration or crying.

Cephalhematocele.—Communicates with the sutures, and is diminished by cutting off blood therefrom.

Angiomata or Erectile Tumors.—Change color on pressure.

Hydrocephalus.—The entire shape of the head is altered.

Wens, or Enlarged Sebaceous Cysts.—Solid, and do not pit.

Hydatid and Simple Cysts.—Like all cysts, fluctuate. Hydatids may be diagnosed by microscope.

Treatment.—The prognosis is always favorable. The tumor usually disappears in a few hours, even the largest persisting for only 2 or 3 days. In rare cases of breech presentation sloughing has been known to follow. In the majority of cases no treatment is needed other than a little vaselin or cold cream. If the skin is broken, dust with subnitrate of bismuth or impalpable boric acid. If the swelling is very great, the child may require feeding with a spoon for several days while the reduction of the swelling may be hastened by the application of cloths dipped in alcohol and water or in a solution of ammonium chlorid.

CARAWAY (Carum).—The seeds of *C. carvi*, indigenous to Europe. Its odor and taste are due to a volatile oil. It is valuable in infantile colic, but is used chiefly as a flavor. **C., Oleum.** Dose, 1 to 5 minims. **C., Infusum.** Dose, 1/2 to 2 ounces.

CARBOLIC ACID.—See PHENOL.

CARBON.—See CHARCOAL.

CARBON DIOXID.—The acid, gaseous product, having the composition of CO_2, commonly known as "carbonic acid gas," or carbonic acid. It is a colorless gas having a specific gravity of 1.52, soluble in cold water, and possessing a pungent smell and an acid taste. Inhaled, it destroys animal life by asphyxiation. In solution it is an excellent refrigerant and stomachic. Its inhalation is fatal in a short time, even when diluted with 95 parts of air. It is a product of respiration. It accumulates in brewers' vats, in old wells, caves, grottoes, and deep valleys, and forms the "chokedamp" of miners. Soda-water is distilled water, carbonated under pressure, the gas escaping when the pressure is removed. Of the natural carbonated mineral waters, Apollinaris water is the best known, and contains 47 cubic inches of carbonic acid to the pint.

Carbonic acid gas is highly antiseptic and preservative. Beef surrounded by this gas will remain fresh and its taste unchanged for 8 days.

Therapeutics.—Carbonic acid has been locally employed as a stimulant in ulcers and as an anesthetic in carcinomata, either by directing a stream of the gas upon the part or by the application of a yeast poultice. The gas has been applied in streams to the eyes, ears, nose, vagina, and rectum, in catarrhal inflammation of these parts, also to the bladder, for irritability of that viscus and its application is beneficial when there is no acute inflammation present. It is injected into the vagina with good results in dysmenorrhea and in many other painful affections of the pelvic viscera, whether neuralgic in character or arising from organic disease. Diluted with 90 to 95 percent of air, its inhalation is serviceable in chronic laryngitis and pharyngitis, also in asthma, chronic bronchitis, and chronic cough.

Carbonated water, or "soda-water," as it is popularly known, is a grateful beverage in warm weather, especially when flavored with certain syrups and fruit-juices. It is a serviceable drink in febrile affections, as it relieves thirst, allays nausea and gastric irritability, and is both diaphor-

etic and diuretic in slight degree. It is an efficient remedy for vomiting, and in the form of iced champagne is one of the numerous agents which have proved efficacious in the vomiting of pregnancy. It forms an excellent vehicle for the administration of saline cathartics, the various carbonates, and piperazin. The free use of carbonated mineral waters is of service in gout, especially when they contain the salts of lithium in solution. At many European spas the course of treatment is largely based on the use of carbonic acid, administered in the forms of baths and inhalations as well as by the ingestion of the waters containing it. Bathing in the natural carbonated waters is sometimes beneficial in catarrh, gout, rheumatism, anemia, amenorrhea, and leukorrhea, the gas acting as a general stimulant of the cutaneous cirulation and promotin g slight diaphoresis.

Treatment of Carbonic Acid Poisoning.—The antagonists are oxygen and stimulants of the peripheral circulation. The prime object of treatment is to oxygenate the blood as quickly as possible. The patient should be brought at once into the open air, and if the respiratory movements have ceased, cold water should be dashed on the face and chest, in order to awaken them by reflex action. If no effect is thereby produced, recourse must be had to artificial respiration, which should be maintained for at least an hour. If the heart does not begin to beat shortly after artificial respiration has been begun, the jugular vein should be opened, with care to prevent the entrance of air, in order to relieve the distention of the right ventricle and prevent the consequent paralysis of the heart. This vein is selected because there are no valves of any importance between it and the heart. A series of sharp, quick blows upon the chest in the cardiac region will sometimes start the heart into action after it has stopped. See Asphyxia, Artificial Respiration, Mineral Waters, Water.

CARBONIC ACID SNOW.—Crystals or snow of carbonic acid are obtained by the evaporation of liquid carbonic acid within a perforated receptacle. This snow, formed at 110° below zero (F.), is then compressed and molded into the desired shape and applied to the diseased area by means of contact under a light pressure. It has been used with success in lupus erythematosus, epithelioma, nævi, warts, and has proved efficient as a local anesthetic.

The compression ice mold used by LeFevre consists of a triple-barreled screw syringe, the two inner tubes are of brass, perforated with fine holes and between the two is a layer of chamois skin. The other tube is of fiber; being a nonconductor it does not become very cold. The syringe is screwed directly to the valve of the tank and the plunger is set so as to hold as much snow as is desired. The rapid evaporation of the liquid carbon dioxid produces such an intense cold that the cylinder is soon filled with snow. This is then compressed into ice, taken out of the mold and applied directly to the part. In the compression the temperature is reduced and the ice becomes hard and dry so it can be fashioned into any shape with a penknife. A cone of the ice about 1/2 inch long will last about 15 minutes in the open air and for about 60 minutes if wrapped in chamois skin.

CARBUNCLE.—Carbuncle is an acute phlegmonous inflammation of the skin and subcutaneous tissue, characterized by multiple foci of necrosis and sloughing of the superimposed integument.

Symptoms.—There is, as a rule, but one lesion present, having for its seat of predilection the neck or back. It begins as a flat, painful infiltration, varying in size from that of a chestnut to that of an orange. The skin is of a violaceous hue, and board-like. At the end of a week or 10 days the overlying integument sloughs at numerous points, exposing to view grayish-yellow necrotic masses, from which a sanious pus exudes. This cribriform appearance is characteristic of carbuncle. Later, the entire superjacent skin becomes gangrenous, and, being thrown off with the necrotic masses, leaves a gaping ulceration, which heals up by granulation, with the production of a permanent scar. The process is usually accompanied by chill, fever, and prostration. In the old and debilitated, fatal septicemia may develop.

Carbuncle occurs usually after the fortieth year. The same predisposing causes are operative as in furuncle: namely, diabetes, general debility, etc. The exciting cause is the introduction into the skin of a pyogenic microorganism. The pathologic process begins in the sebaceous or hair follicles. Suppuration occurs simultaneously in numerous adjacent foci. The skin and subcutaneous tissue are enormously swollen, and have embedded in them the yellowish-white necrotic plugs. The process extends laterally and vertically, and ends in a gangrene of the entire area.

Diagnosis.—In the beginning, only, may furuncle and carbuncle be confounded.

Carbuncle.	Furuncle.
1. Occurs usually in late adult life.	1. Occurs at any age.
2. Favorite situation, neck or back.	2. Indefinite localization.
3. Chestnut- to orange-sized.	3. Pea- to cherry-sized.
4. Surface flat.	4. Surface round or conic.
5. Skin board-like or brawny.	5. Ordinary inflammatory induration.
6. Multiple suppurating openings.	6. Single opening.
7. Terminates in gangrene.	7. Heals after extrusion of "core."
8. Marked constitutional disturbance.	8. As a rule, absent.

The prognosis is always guarded. Carbuncle upon the head or face is more serious than in other localities. In the aged and debilitated and in diabetics and alcoholics the prognosis is grave.

Treatment of carbuncle consists in free crucial incisions under an anesthetic and removing the necrosed tissue by the forceps and scissors, cureting the sinuses or pockets, checking hemorrhage by hot water and pressure, and cauterizing with pure carbolic acid and dressing antiseptically. The sore should be dressed every day by washing with

hydrogen peroxid followed by a solution of bichlorid, and dusting with an antiseptic powder. Tonic treatment, such as quinin, strychnin, milk-punches, nourishing diet, and attention to bowels and kidneys, should be given, and sleep procured by morphin.

If free incisions at right angles are made through the slough into the tissues underneath, hemorrhage is very great, although pain is relieved and the discharge of the slough is hastened. Only the young and robust can withstand this.

By thrusting a stick of fused potassa, caustic potash, or potassa cum calce through the various openings into the slough beneath, the gangrenous mass is converted into a blackish gelatinous material, easily discharged. The use of a cloth wet with vinegar will prevent injury to the adjacent skin. A mixture of olive oil and phenol (40 : 1) or boric acid ointment are good applications after the crucial incisions or the use of a caustic.

Pressure by means of strapping over the swelling to the sound parts around, with an opening at the top for the escape of pus, has been advocated. It hastens the discharge of the slough.

A conservative and efficient treatment consists in the application of Bier's vacuum cups once or twice daily, for from 10 to 15 minutes. Small incisions are made, if necessary, to facilitate aspiration of the pus, and the carbuncle protected with a simple or bichlorid gauze dressing. Not only is the application painless, but the hyperemia promptly relieves pain.

Phenol may be injected into the slough without crucial incisions. Or the following, in dram doses, is injected in different parts of the tumor:

℞. Pure phenol, 1 part
Glycerin and water, each, 5 parts.

Pain may be relieved by extract of belladonna, rubbed up with glycerin and smeared over the part, or applied on the surface of a poultice. A 2 percent solution of cocain may be applied under oiled silk, or ether may be sprayed over the slough.

Fetor may be overcome by the use of corrosive sublimate solution (1:5000), turpentine, terebene, or a solution of chlorinated soda (1 dram to 1 ounce), or Condy's fluid and water. Iodin liniment may be applied around the base, as it gives relief and subdues pain from congestion, particularly after incision of the carbuncle. Five grains of chloral to the ounce of water makes a good lotion at a late stage, and relieves pain. Iron, in 15-minim doses of the tincture, with 2 to 3 grains of quinin, 4 times daily, with saline purges every morning, should be given from the beginning. Calcium sulphid, 1/8 of a grain every 2 hours, influences the process. Arsenic is useful in chronic cases. If great prostration exists give:

℞. Aromatic spirit of ammonia, } each, ʒ ij
Tincture of cinchona, }
Brandy, ʒ iv
Water, ʒ ij.

Two teaspoonfuls every 2 hours.

Staphylococcus vaccines have been used, and in some cases with good results. See Staphylococcus Infections.

CARCINOMA.—A malignant tumor, characterized by a network of connective tissue the areolas of which are filled with cell-masses resembling epithelial cells. Observations have seemed to point to its microorganismal origin and infectious nature, but the negative results of experiments have reduced this view to a mere supposition thus far.

Following is the differential diagnosis between Sarcoma and Carcinoma (Woodhead, modified by Coplin):

	Sarcoma.	Carcinoma.
1. Origin...	Entirely mesoblastic. (Connective-tissue type.)	Epiblastic and hypoblastic. (Epithelial-tissue type.)
2. Stroma..	Intercellular. Rarely forms alveoli.	Vascular connective tissue, which surrounds and forms the walls of the alveoli; these communicate with one another, and contain masses of epithelial cells.
3. Cells.....	Granulation tissue or embryonic connective-tissue cells; shape and size vary.	Epithelial cells contained within alveoli; shape and size vary.
4. Intercellular substance.	May be present.....	Absent, or merely fluid.
5. Vessels..	Embryonic in character. They are in direct contact with, or may be formed by, the special cells, slightly modified, of which the tumor is composed.	Well developed; entirely contained within the connective-tissue stroma, and supported by the walls of the alveoli. Seldom in contact with the cells.
6. Spreads..	*Primarily* and *secondarily* by blood-vessels, rarely by the lymphatics.	*Primarily* by lymphatics, except in the later stages, when it may also spread by blood-vessels, in which case it spreads with very great rapidity. *Secondarily* by blood-vessels.
7. Secondary changes.	Chondroid, osseous, calcific, and pigmentary changes frequent.	Very rare
8. Growth..	Not invariably continuous. Likely to be interrupted.	Rapid. Continuous.
9. Site....	Primarily in deep structures; always from connective tissue.	Primarily in superficial structures or glands; always from epithelium
10. Heredity	Seldom hereditary...	May be hereditary.
11. Capsule .	Primarily, pseudoencapsulated; later, infiltrates the surrounding tissue.	Never encapsulated.
12. Fat	Rarely, if ever, contains fat.	Nearly always contains fat.
13. Age.....	Occurs most frequently before middle life.	Most frequent after middle life.
14. Injury...	Not uncommonly follows injury, such as trauma.	Rarely, a history of trauma, but may follow prolonged irritation. Especially is this true of the superficial forms.

Diagnosis during Operation.—A rapid method requiring only 7 minutes is that of Leitch. A thin piece of the excised tissue is thrown into acetone, then immersed in hot water, surrounded by gum, frozen, cut, and stained with an acetone solution of krystall-violet.

Prophylaxis.—All tumors should, as soon as recognized, receive careful medical examination and generally surgical consultation. Early excision of them in their precancerous condition will prevent the subsequent development of cancer.

Treatment.—Early operation should be insisted upon. After the operation, X-ray treatment combined with open-air treatment has been found valuable to prevent recurrence. In inoperable cases the open-air treatment and the X-rays are markedly beneficial as palliative treatment. Radium may be of value in some cases. Recently it has been claimed that serum of a horse afflicted with the disease is beneficial. Reicher advocates the use of adrenalin injections around the growth.

Local carcinoma is described under the special headings, as Breast, Epithelioma, etc. See Tumors (Classification, Etiology).

CARDAMOM.—The fruit of *Elettaria repens*, cultivated in Malabar. Its properties are due to a volatile oil, $C_{10}H_{16}$. It is an aromatic, carminative stomachic, used as an ingredient of several "bitters." It is useful when combined with purgatives to prevent griping. **C., Tinct.**, 20 percent strength. Dose, 1/2 to 1 1/2 drams. **C., Tinct., Comp.**, cardamon 25, cinnamon 25, caraway 12, cochineal 5, glycerin 50, dilute alcohol, q. s. ad 1000 parts. Dose, 1/2 to 1 1/2 drams.

In atony of the stomach and small intestines:

℞. Dilute nitric acid, ʒ j
Compound tincture of cardamom, enough to make ʒ vj.
A dessertspoonful after each meal.

CARDIALGIA.—A term loosely used as synonym of gastrodynia in general, heartburn, and stomachic pains on the left side. See Gastralgia, Gastric Neuroses, etc.

CARDIANTS.—Remedies affecting the heart. They are either sedatives, stimulants or tonics.

Cardiac Sedatives.—These lessen the force and frequency of the heart's action; the chief are: Aconite, antimony, chloral, cold, digitalis, emetin, hydrocyanic acid, muscarin, ouabain, pilocarpin, potassium salts, senega, saponin, vératrum, and quinin in full doses.

Cardiac Stimulants.—These rapidly increase the force and frequency of the pulse in depressed conditions of the cardiac apparatus; the chief are: Adrenalin, alcohol, ammonia, atropin, aromatic oils, camphor, chloroform, cocain, counterirritation, continuous galvanic current, ether, heat, hydrastin, nitroglycerin, opium and morphin in small doses, orchitic extract, spartein, spermin, turpentine.

Cardiac Tonics.—These, when given in moderate doses, stimulate the cardiac muscle, slowing and strengthening its contractions; the chief are: caffein, cimicifuga, convallaria, digitalis, helleborein, saponin, spartein, squill, strophanthus, strychnin.

Physiologic Action.—Cardiac stimulants increase the force and frequency of the pulse. Alcohol acts largely reflexly, and should be given in small doses, frequently repeated. Ether is next in value, and more rapid, and heat most powerful and available. Ammonia is energetic upon all organs except the heart. Cardiac tonics stimulate the cardiac muscle, slowing and making stronger its contractions.

Digitalis stimulates the vagus end-organs in the heart, and also the cardiac center in the medulla, and has a direct influence on the heart-muscle itself. Strophanthus does not effect the vessels nor raise blood-pressure. Convallaria, erythrophlein, squill, and cimicifuga are safer than digitalis, and acts less powerfully.

Of the cardiac sedatives or depressants, muscarin and pilocarpin stimulate the inhibitory ganglia; aconite relaxes inhibition or stimulates the vagus center; and aconite, hydrocyanic acid, muscarin, pilocarpin, saponin, and veratrum are direct cardiac poisons, depressing the heart-muscle and cardiac motor ganglia. See under the separate headings, Caffein, Digitalis, Strychnin, etc.

CARDIOLYSIS.—An operation for breaking up adhesions between the pericardium and the heart. Through an opening in the pericardium the adhesions are broken with the fingers; or a resection is made of the portions of the ribs and sternum to which the pericardium adheres. The latter method is the less dangerous.

CARDITIS.—See Heart-disease (Organic).

CARGILE MEMBRANE.—Sterilized animal membrane used chiefly in abdominal surgery for the purpose of preventing the reunion of previously adherent peritoneal surfaces. It is also employed to envelop tendons and nerves which have been sutured, and occasionally to protect wounds.

CARIES.—A chronic inflammation of bone with rarefaction or absorption of bony tissue, followed usually by pus formation; molecular death of bone, with the accompanying process, as ulceration. See Bone (Diseases).

CARMINATIVES.—Drugs that aid the expulsion of gas from the stomach and intestines by increasing peristalsis, stimulating the circulation, and relaxing the cardiac and pyloric orifices of the stomach. They also act as diffusible stimulants both of bodily and mental faculties.

They are extensively used in flatulent dyspepsia, especially when associated with heart-disorder or a nervous state. A combination is more successful. With antacids they correct acidity as well, and they are frequently prescribed with purgatives to prevent pain.

The principal carminatives are asafetida, camphor, capsicum, cardamon, chloroform, ether, fennel, ginger, horseradish, mace, mustard, pepper, serpentaria, spirits; oils of anise, of cajuput, of caraway, of cinnamon, of cloves, of coriander, of eucalyptus, of fennel, of peppermint, of spearmint, of nutmeg, of pimento; valerian.

A carminative mixture:

℞. Aromatic spirit of ammonia, ʒ ij
Spirit of ether, ʒ iij
Tincture of orange, enough to make ʒ iij.

Tablespoonful every 3 hours.

CAROTID ANEURYSM.—Aneurysm of the common trunk high in the neck presents the ordinary signs of aneurysm, and in this situation has to be differentiated from (1) simple dilatation of the artery at its bifurcation; (2) enlarged glands; (3) abscess or tumor over the artery; (4) pulsating goiter. In simple dilatation there is no bruit; in enlarged glands and tumors there is also no bruit, and the pulsation is not expansile, and ceases when they are lifted from the vessel; in abscess, in addition to the absence of the preceding signs, there is the history or presence of inflammation; in pulsating goiter the tumor moves up and down with the larynx on deglutition.

The treatment consists in pressure or ligation of the artery below the aneurysm, or if there is no room in this situation, distal ligation.

Aneurysm of the external and internal carotids requires no special mention. Pressure or ligation of the common carotid is the treatment generally indicated. See ANEURYSM.

CAROTID ARTERY.—See ARTERIES (Ligation), NECK (Injuries).

CARPAL BONES, FRACTURE.—The carpal bones are seldom broken, except in crushes in which the fracture is compound and associated with injuries to neighboring bones. Until the advent of the X-ray simple fractures of the carpal bones were usually treated as sprain, weak wrist, rheumatism, etc. Although any of the carpal bones may be involved in a simple fracture, the scaphoid is the one most frequently broken, often being associated with anterior dislocation of the semilunar bone; the proximal fragment passes forward with the semilunar. There is a "history of a fall on the extended hand; localized swelling of the radial half of the wrist joint; acute tenderness in the anatomical snuff-box when the hand is adducted; limitation of extension by muscular spasm, the overcoming of which by force causes unbearable pain. The possibility of the existence of a bipartite scaphoid should be considered in interpreting X-rays of simple fracture of the scaphoid" (Codman and Chase). Crepitus may be obtained in some instances of simple fracture of the carpus. The treatment in compound fractures is disinfection and the application of a straight palmar splint or possibly resection of bone or amputation. In simple fractures deformity, if present, should be reduced by traction and direct pressure, and the wrist immobilized for three or four weeks by a palmar or dorsal splint. If pain and stiffness persist after fracture of the scaphoid, excision of the bone through a dorsal incision may give relief (Stewart).

CARPHOLOGY.—A condition characterized by picking at the bedclothes, searching for or grasping at imaginary objects, and other movements of the hands, occurring in the delirium of the later stages of febrile affections. It is generally regarded as an unfavorable symptom. Floccillation or "floccillatio" was the term formerly used.

CARREL-DAKIN SOLUTION AND TREATMENT OF WOUNDS.—See WOUNDS.

CAR-SICKNESS.—The well-known symptoms induced by riding in railway or street cars. They are more common in women, particularly before the menopause. Riding backward aggravates the symptoms. It is an established fact that the majority of cases are directly due to astigmatism with or without some other form of ametropia or derangement of the ocular muscle-balance; therefore, in every case it is well to correct any such disorder. The proper lenses will afford great relief and in most cases effect a complete cure. It has been suggested that sufferers compelled to take extended journeys should be put under atropin-mydriasis during their trip. For other treatment see SEA-SICKNESS.

CARTILAGE, DISEASES.—Cartilage is entirely destitute of nerves, sensibility, and blood-vessels, being nourished by imbibition from neighboring vessels. All cartilages, except fibrocartilages, are covered with a fibrous membrane, the perichondrium, similar to periosteum. It is never reproduced when destroyed, being replaced by bone or fibrous tissue.

Cartilage being nonvascular, its inflammation is of a modified type. The diseases peculiar to cartilages are:

1. Ossification and necrosis of the ensiform and costal cartilages, with those of the larynx and trachea, from senile changes. Articular cartilages never ossify, but portions of them may necrose and be detached.

2. Ulceration rather than ossification of the cartilages of the epiglottis, ears, eyelids, nose, and Eustachian tube. The diseased action has generally spread by contiguity from adjacent tissue.

3. Chalk stones and deposits of urate of sodium in the cartilages of the external ear.

4. Inflammatory changes in epiphyseal cartilages. These are more general, and chiefly acute. They are important for destruction of this layer of cartilage checks further growth of the end of the bone. Syphilis is the most common cause. Injury, particularly in strumous children, is also a factor.

5. Carcinoma does not primarily attack cartilage. However, the epithelial form frequently extends from mucous or cutaneous surfaces to the subjacent cartilage.

6. Structural changes from disturbed nutrition in the articular and fibrocartilages. Syphilis, tuberculosis, and injury are the most common causes of disease of the articular ends of bone with their cartilage.

7. Cartilaginous tumors, or enchondromata, are innocent, grow slowly, and do not return on removal. Cartilage is frequently attacked by sarcoma. Cartilaginous tumors are generally encapsulated, and are found especially on the phalanges of the fingers and sometimes of the toes, the lower end of the femur, and heads of the tibia and

humerus, and in the parotid gland. When possible they should be removed.

Symptoms.—The spreading of inflammation to the cartilage of a joint cannot be recognized until ulceration has occurred and the bone has been exposed. Painful startings in the joint, greatly aggravated by movement, become prominent symptoms. This spasm occurs just at the commencement of sleep, when, the voluntary muscles relaxing, the sensitive bone-surfaces are drawn into contact, the patient awaking with a cry of pain; as, for instance, the "night-scream" of children with HIP-JOINT DISEASE (*q. v.*).

Treatment.—Rest and extension are primary essentials in treatment. Extension by weights or by splints will prevent the muscular spasm. Opium internally or subcutaneously is frequently necessary. The joint-disease must be treated as a whole.

Articular cartilages, in the aged, undergo fatty degeneration, and sometimes fibroid changes occur. In gout deposits of urate of sodium take place in the cartilage, whence ensue wasting and calcareous degeneration.

Floating cartilages, or loose bodies in the joint, may have a pedicle, or move about in the joint, sometimes blocking it, and may be single, multiple, flat, or ovoid, composed of cartilage, bone, or fibrous tissue, and are most common in adult males.

When locking results from a floating cartilage, forced flexion and sudden extension may relieve the condition. Cure can be obtained only by operation. The body, may be brought where it can be felt, transfixed with a pin or held between the fingers, and excised, under ether or a local anesthetic. See JOINTS (Diseases).

CARUM.—See CARAWAY.

CARUNCLE, LACRIMAL.—A fleshy protuberance upon the conjunctiva near the inner canthus, containing the lacrimal punctum. See LACRIMAL DISEASE.

CARUNCLE, URETHRAL.—A urethral caruncle is a small tumor, rarely larger than a filbert, situated at the external urinary meatus. It is composed of dilated capillaries set in a groundwork of dense connective tissue. It is usually bright red in color and bleeds easily when handled. Intense pain is the most prominent symptom. Contact with urine or with the clothing causes the most agonizing pain. The general health suffers and nervous symptoms develop. If the growth is pedunculated, it may be seized with forceps and twisted off. If it is sessile, its base should be excised and the wound closed by interrupted sutures.

CARYOPHYLLUS, See CLOVES.

CASCARA SAGRADA (Rhamnus Purshiana; Chittem Bark; Sacred Bark).—The bark of a California plant—*Rhamnus purshiana.* Its properties are due to a volatile oil. The fluidextract, made with diluted alcohol, is the official preparation most frequently employed; the dose of which is 10 to 30 minims. It acts as a tonic to the intestine, as well as a laxative, and it is claimed that there is no secondary constipation, such as follows the use of other purges and laxatives. Its bitter taste is its great fault. Two parts of the syrup of orange to one of the cascara will partially overcome this. The aromatic elixir furnishes another good vehicle. Cascara is best given at bedtime. The dose of the extract is 1 to 6 grains, given in pill form. Cascara cordials, or preparations of this drug, are made by manufacturers in almost tasteless form, and are really nonbitter fluidextracts.

℞.	Fluidextract of cascara sagrada,	ʒ j
	Compound syrup of orange,	ʒ ij
	Alcohol,	ʒ j
	Syrup,	ʒ iv
	Cinnamon water, enough to make	ʒ iv.

Give 1 or 2 teaspoonfuls at night.

CASSIA FISTULA (Purging Cassia).—The fruit of a tropic tree of which the pulp is the only valuable part. *Purging cassia* is laxative in doses of 1 to 2 drams, and is a purgative in larger quantities. It is rarely prescribed alone because it causes colic and flatulence. It is an ingredient of the confection of senna. *Cassia cinnamon* is the bark of the shoots of a Chinese tree. It is a constituent of the compound tinctures of cardamom, catechu, and lavender. *Cassia acutifolia* (Alexandria senna) and *Cassia angustifolia* (Indian senna), are shrubs grown in Egypt and India. See SENNA.

CASTOR OIL (Oleum Ricini).—A fixed oil, expressed from seeds of the *Ricinus communis.* It is almost colorless, transparent, viscid, of faint odor, bland or slightly acrid taste, soluble in equal weight of alcohol. Externally, it is bland. Internally, it is nonirritant until it reaches the duodenum, where it is decomposed by the pancreatic juice setting free the ricinoleic acid, which produces a mildly irritant action on the bowel. It is a simple purgative, acting with marked regularity in from 4 to 6 hours, producing liquid stools, with no pain or tenesmus, and is followed by a sedative effect on the intestine. The leaves of the plant have galactagog properties when applied to the breasts.

Castor oil is one of the best simple purgatives, and is used to unload the bowel. In children and the aged and infirm it is often employed. Infants require a proportionately larger dose than adults. In dysentery, 10 to 20 drops of laudanum may be added to counteract pain. If depression exists, 5 drops of turpentine may be added. It is much abused in the puerperal state. Given before breakfast, in 1- to 2-ounce doses, it has been of great service in severe neuralgia. Glycerin increases its purgative power.

Oil of bitter almonds best conceals its nauseous taste. Emulsions are not a success, and it may be administered in capsules. To administer pure, smear the sides of a wineglass with very thick cream, pour in the oil, and cover with more cream. Give a teaspoonful of milk, to be kept in the patient's mouth, and let the whole be taken at one gulp. It may be floated on orange-juice, strong coffee, gruel, wine, sarsaparilla, foaming beer, and soda-water.

CASTRATION.—The excision of one or both testicles. Removal of the ovaries is called oophor-

ectomy, or spaying. Castration is performed for carcinoma, sarcoma, and syphilitic or tubercular conditions of the testicle, and, in the aged, in the treatment of hypertrophied prostate gland. A retained testicle may become sarcomatous and necessitate castration.

After shaving and cleansing the pubes and examining for hernia, an incision is made over the spermatic cord from the external ring to the base of the scrotum. The cord is divided near the ring, the testicle removed, the spermatic artery tied alone, and the entire thickness of the cord is then ligated. Considerable scrotal skin should be removed.

In malignant disease or tubercular infiltration the inguinal canal should be slit up on a director and the cord pulled down as far as possible before it is secured. Silk and chromicized gut are recommended as ligature for the cord. Each vessel should be tied separately as divided. See Testicle.

CASTS.—Masses of fibrous or plastic material that have taken the form of some cavity in which they have been molded. From their source, casts may be classified as bronchial, intestinal, nasal, esophageal, renal, tracheal, urethral, vaginal, etc. Of these, the *renal* casts are the most important, by reason of their significance in diseases of the kidney. Classed according to their constitution, casts are epithelial, fatty, fibrinous, granular, hyaline, mucous, sanguineous, waxy, etc. See Urine (Examination).

CATALEPSY.—A peculiar neurosis characterized by loss of will and muscular rigidity, due to a diseased condition of the central nervous system. It occurs in those of the neurotic diathesis, and usually between the ages of 20 and 30 years. It is commonly associated with hysteria, but may be found in conjunction with tetanus and the various psychoses. It often forms a part of the hypnotic state.

Catalepsy is usually paroxysmal, the onset sudden, commonly with loss of consciousness, and the attack may last for several minutes or hours. Recovery is gradual or sudden.

The peculiar rigidity of catalepsy is characteristic and invariable. Hysteria, with tonic spasm, is distinguished by the local position of the spasm, and by the fact that it does not yield to force. Tetany is likely to be mistaken for catalepsy, but in this the rigidity is fixed and cannot be overcome, and the fingers of the hand are straightened at the middle joint, and their points and that of the thumb brought together.

During an attack, continued external stimulation is necessary. Cold douches and ammonia to the nostril often fail in true catalepsy. A pinch of snuff often succeeds in both the true and the induced catalepsy. Faradization may be effectual. Emetics are useful in arresting an attack. Apomorphin, 1/20 to 1/10 of a grain, hypodermically, may remedy the paroxysmal condition.

In the intervals between attacks iron, valerian, aperients, antispasmodics, and cold baths are most effectual. Moral treatment is indispensable, and removal from home is often necessary. See Coma, Hysteria, Somnambulism.

CATALYTIC ANESTHESIA AND ANALGESIA.—See Anesthetics, Local; Electricity, Anesthesia.

CATAMENIA.—See Menstruation.

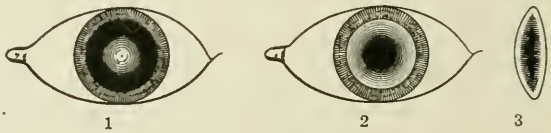
CATAPHORESIS (Ionic Medication).—The introduction of drugs into the system through the skin by means of ointments or solutions applied by the electrode of a battery. See Electricity.

The part affected may be covered with a pad soaked in the desired solution (*e. g.*, of sodium salicylate or potassium iodid in chronic rheumatism and rheumatoid arthritis, or cocain and adrenalin for local anesthesia) and connected with the negative electrode, while on another part of the body, covered with a pad wet with salt solution, is laid the positive electrode. The effects of ionic medication seem encouraging in arthritis deformans and chronic rheumatism. Favorable results are also reported in rodent ulcers, tinea and favus. See Joints, Arthritis Deformans.

CATAPLASM.—See Poultice.

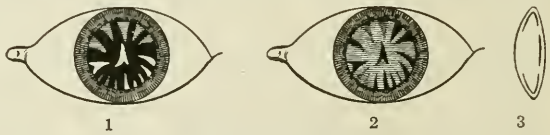
CATARACT.—A pathologic change in the lens or its capsule diminishing its transparency.

Causes.—Traumatic cataract, due to injury of the capsule or lens, needs no explanation, as it is not supposed that the subsequent cicatricial tissue will be transparent. If the lens or capsule is not directly injured by trauma, but is dislocated or its surrounding mediums disturbed, it becomes opaque through altered nutrition, due to the suspension of the exchange of fluid between the lens-structure and the surrounding mediums. Any chemic alteration in the fluid constituents of the body in general may be participated in by the aqueous and vitreous humors and the suspensory ligament, and may endanger the lens: as, for instance, cataract due to diabetes. Inflammations of the uveal tract, myopia, retinitis pigmentosa. detachment of the retina, and glaucoma are causes of cataract. Rickets is an almost constant accompaniment of lamellar cataract. The gouty diathesis is mentioned as a predisposing cause. Heredity



Nuclear Cataract.

1. Section of lens; central position of opacity. 2. Appearance by ophthalmoscope. 3. Appearance by oblique illumination.



Cortical Cataract.

1. Section of lens; opacities beneath the capsule. 2. Opacities as seen by the ophthalmoscope. 3. Opacities as seen by oblique illumination.

is sometimes an etiologic factor. Glass blowers and other workers in great heat and glare are particularly susceptible to cataract. Certain toxic agents, such as naphthalin and ergot, may cause cataract. There is no satisfactory explanation of senile cataract. Old age predisposes to cataract, but whether by weakened nutrition, sclerosis, atheroma of the arteries, or the undue strain on the accommodation in presbyopia, is not known. It has been suggested that as the lens grows by proliferation of the epithelial cells lining the anterior capsule, these cells become more compressed and harder at the nucleus, the oldest part of the lens, and when the normal increase of the nucleus at the expense of the cortical substance ceases, the first step is taken toward cataract formation. The disturbances in nutrition, directly and indirectly brought about by prolonged eye-strain due to uncorrected ametropia, are not only possible, but general causes of cataract.

Varieties and Nomenclature.—Opacities in the capsule are called **capsular** cataract; opacities in the lens-substance are called **lenticular** cataract, and may be **cortical** or **nuclear,** or, if both cortex and nucleus are involved, it is termed **complete** cataract. **Complicated** cataract is one in connection with other eye-diseases. If the diseased lens is adherent to any of the neighboring structures, the condition is known as **cataracta accreta.** A **polar** cataract is one confined to one pole of the lens. In **pyramidal** cataract the opacity is at the anterior pole, and is conoid, the apex extending forward. **Recurrent capsular** or **secondary** cataract is a cataract of the capsule appearing after extraction of the lens. **Diabetic** cataract is associated with diabetes. Probably the most convenient division of cataract is into **senile, juvenile, traumatic,** and **stationary.** An important distinction of cataracts refers to their maturity or ripeness, whence they are classed as **ripe, unripe,** and **overripe** (Morgagnian).

Symptoms and Diagnosis.—Cataract does not cause pain. The symptoms are disturbance of vision and reduction of acuity, which vary according to the kind of cataract and its stage of maturity. Opacities on the pole or on the axis between the two poles may escape the patient's notice, if they are small, dense, and sharply defined; whereas opacities including the entire pupillary area cause great disturbance of vision. Opacities at the periphery, when covered by the iris, as a rule produce no obstruction to sight; but when the pupil is sufficiently dilated, as in a dim light, these opacities become evident; hence such patients see better in a bright light with a contracted pupil. Patients with an opacity in the pupillary area with the periphery remaining clear see better with a dilated pupil: *e. g.*, under a mydriatic or in a dim light. Even a completely opaque lens does not destroy vision. If the retina and nerve are healthy, the patient should be able to tell the direction from which light is projected, and should recognize an ordinary candle-flame at 6 meters. With normal light-perception, the pupil of a cataractous eye should contract distinctly if light is suddenly thrown into it.

Objective Examination.—If the anterior polar region is opaque, the pupil appears grayish-white instead of normal black. It must not be supposed that every grayish discoloration of the pupil is caused by cataract; indeed, in old persons some diffused light is always reflected from even a transparent lens, giving the pupil a grayish color. The general plan in the diagnosis of cataract is to use both oblique illumination and the ophthalmoscopic mirror. With the first, opacities appear grayish against a black background, and with the second, black against a red background. If the cataract is almost complete, the whole pupillary area is grayish under oblique or direct illumination, and black under the transmitted light of the ophthalmoscopic mirror. When a distinct area in the lens appears *gray or white by focal illumination*, and *black* to light thrown through it *by the ophthalmoscope*, an opacity may be assumed. The entire lens can be examined only by complete dilatation of the pupil, and even then the peripheral edges may be hidden.

Cataract is most common in old persons, next in infants, and rarest in middle age.

The **test for maturity** of a cataract is known as the **iris-shadow.** By throwing a strong light obliquely into the pupil, the margin of the pupil is made to throw a shadow upon the opacity. If the lens is completely opaque, the white light reflected from it and the dark brown of the pupillary margin of the iris lie immediately against each other; if, on the contrary, the external cortical layer of the lens is still clear, there will be seen, between the white shadow of the opaque pupillary portion of the lens and the pigmented edge of the iris, a dark ring, which will be wider the less the lens is opaque. The treatment for mature senile cataract is extraction.

An **overripe** cataract becomes smaller and more dense, due either to a diminution in the aqueous constituents, or to the cortex becoming a yellowish, mushy mass of fluid, with a brown nucleus floating in it. This latter condition is known as the **Morgagnian cataract,** and causes the greatest disturbance of vision and difficulty of extraction.

Treatment of Cataract

General Remarks.—The treatment of unripe cataract must be the use of proper reading glasses, protecting the eyes from irritation of any kind, and the maintenance of the general health of the patient. In considering **what cataracts may be operated on,** it is necessary to first determine whether any retinal, choroidal, or nerve-disease coexists, which may be discovered by examining the light-sensation or field of vision.

Stationary cataract, in which the visual acuity is sufficient for the patient's occupation, or in which an artificial pupil will suffice, should not be operated on. If one eye is unaffected and healthy, it is not advisable to operate, for even under the most successful conditions perfect binocular vision cannot be expected, on account of the great optic disparity between the eyes.

Ripe and overripe cataracts are best treated by operation. Unripe cataracts should not be operated on before the completion of the ripening process, or, if operation is demanded, should be

artificially ripened by intracapsular irrigation (McKeown) or by Förster's method, which consists in performing an iridectomy or a paracentesis of the cornea, allowing the escape of aqueous, and irritating the lens by massaging the cornea against it with a strabismus hook or spatula, followed by extraction after reaction has ceased. Bettmann's method consists in "direct trituration" of the lens with a spatula introduced into the anterior chamber after iridectomy. All these operations are attended with more or less danger. In fact, many operators believe it is safer to extract an unripe cataract than to resort to artificial ripening.

The health of the patient and the condition of the eye should be considered before proceeding with any operation. General debility and any inflammatory disease of the eye or appendages are contraindications.

Preparation for Operations.—A gentle purgative should be given the day before the operation. The head should be washed with soap and hot water, and a bandage of sublimate placed over the eye to be operated on. This bandage is removed at the operation, the head enveloped in a cloth wet with sublimate solution, the vicinity of the eye thoroughly scrubbed with a strong sublimate solution, and the eye douched with a mild antiseptic solution. Anesthesia is produced by instilling several drops of a 4 percent solution of cocain in the eye 5 times, at intervals of 2 or 3 minutes. All instruments, sponges, and dressings used should be thoroughly sterilized before the operation.

Choice of Operation.—*Discission* is applicable to the soft cataracts and lamellar cataracts in childhood. The reaction and increase of tension in adult eyes after discission is so great as to be dangerous, although discission has been successfully used before extraction of the lenses of highly myopic eyes. However, in this case an early iridectomy and extraction is performed.

Extraction without iridectomy is a beautiful operation, and often gives ideal results. Many reliable operators advise it, but only an expert should perform it, and only upon selected and trained patients. The tendency to prolapse of the iris and secondary capsular cataract is greater than in the combined operation.

Extraction with iridectomy is the safest of all cataract extractions. It is absolutely demanded in complicated or difficult cases. The so-called "mutilation" of the iris is slight, and the cosmetic disadvantage is hardly noticeable, and is much more than offset by the safety and good results. Prolapse of the iris is infrequent. With careful irrigation of the anterior chamber, the dangers of secondary cataract are greatly reduced.

Discission is the operation most used in lamellar cataract and in all soft cataracts without hard nuclei. The necessary instruments are a lid-speculum, fixation forceps, and a discission knife-needle or Bowman's stop-needle. The pupil should be dilated to the utmost. The needle is entered perpendicularly to the under and outer side of the center of the cornea. The capsule is pierced near its anterior pole, and is divided up and down by a vertical sweep of the handle, taking care not to penetrate deeply into the lens. If necessary, the vertical incision in the capsule may be enlarged transversely; the needle is then withdrawn in the same direction as it was entered, avoiding, as much as possible, escape of the aqueous. While the lens is undergoing absorption, the pupil must be kept dilated with atropin. If the swelling is too intense and iritis ensues, the swollen mass should be let out by simple linear extraction. If absorption is obstructed, simple release of the aqueous by paracentesis and repeated discissions are necessary. Inflammatory symptoms are met in the usual way.

Extraction with Iridectomy.—The lids are fixed by a lid-speculum or by the fingers of an assistant, and the conjunctiva is firmly held with fixation forceps at a point centrally below the margin of the cornea. A Graefe knife is entered at the corneal margin, just above its horizontal diameter, and is passed through the anterior chamber in front of the pupil, making counterpuncture at a point exactly opposite. With the cutting-edge upward, the knife is gently sawed to and fro, until the upper two-fifths of the cornea is opened at the scleral border. The operation is then momentarily suspended, and the patient is directed to look downward and to keep the eye quiet while closed iris-forceps are introduced through the center of the incision. The iris is grasped at its pupillary border, slowly withdrawn, and the portion to be removed is excised by iris-scissors, the blades of which are held in the plane of the vertical meridian. The anterior capsule of the lens is then opened by a cystotome, which is introduced into the wound to the edge of the iris, with its cutting-point directed upward; it is then partly revolved, turning the point backward toward the capsule, over which it is drawn in a horizontal and vertical direction, or around the circumference of the pupil; another quarter revolution of the handle is made, and the instrument is withdrawn with its point downward.

The delivery of the lens is then effected by gentle pressure and massage with a lens-spoon until it is extruded through the corneal incision. Counterpressure may be made with one spoon on the inferior portion of the cornea, while another spoon presses on the sclera above the incision. The anterior chamber is freed from blood, and the remaining cortical fragments are expelled by stroking the cornea with a spoon or by the gentle injection of sterilized water or a weak antiseptic solution. Care must be taken that the iris is not engaged in the wound, and if it cannot be successfully pushed back into the anterior chamber, it should be excised.

If the vitreous presents at the corneal wound before the lens is delivered, the speculum must be withdrawn, and the lens removed by means of a wire loop, a spoon, or a special lens-extractor. In cases in which, for any reason, prolapse of the vitreous is anticipated, the **Kalt suture** is sometimes employed. A fine suture is introduced into the substance of the cornea, not penetrating it, below the line of expected section, and brought out and carried over into the tissues beyond the limbus. After extraction, this suture may be

tightened. The Kalt suture has not found general favor.

Extraction without Iridectomy is suitable for cases in which the operator is skilled by long experience, and in which a smooth and complete delivery of the lens may be anticipated in a healthy, calm, and intelligent patient. A Graefe knife is introduced near the horizontal diameter of the cornea at its junction with the sclera, and a flap made by transfixion, as before, including about five-twelfths of the corneoscleral margin. The capsule is divided as in the preceding operation, or rather more extensively if a Knapp knife, especially designed for this purpose, is used. The lens is expelled by slow, steady, continuous pressure with a spoon on the lower part of the cornea. The rest of the operation and the complications are treated as in extraction with iridectomy.

Extraction of the Lens in its Capsule.—This opeeation, proposed by Pagenstecher and especially advocated in all cases by Smith in India, consists in scooping out the lens, after the iridectomy, while making pressure on the cornea. The obvious advantages are offset by the danger of prolapse of the vitreous.

After-treatment consists in removing all shreds from the corneal wound, cleansing the eye, and after simple extraction instilling a drop of eserin, to prevent prolapse of the iris. If much cortical substance remains in the wound, it may be removed by gentle massage of the cornea, or by careful irrigation of the anterior chamber with a special syringe. Lippincott has devised a most convenient apparatus for this purpose. The eyelids are closed with adhesive strips. A light absorbent bandage, consisting of a little absorbent cotton and thin material, like tarlatan, is applied over both eyes, not to exert pressure, but to keep the eyes closed, at rest, and moderately warm. The dressings may be protected by a pasteboard shield. The patient is kept quiet in bed, and, unless there are active signs of infection, the bandage is not opened until about 48 hours after the operation. If there are no signs of inflammation then, the eye is cleansed twice daily, and at the end of a week the bandages may be omitted altogether, and dark glasses worn to protect the eye from strong light. After removing the bandage, atropin may be instilled daily, to keep the ciliary muscle and iris completely at rest. Strong convex lenses may be ordered after several weeks, and the patient allowed to begin the use of the eyes. Under ordinary circumstances the correcting lens for distance is about +S. 10, and about +S. 13 or 14 for reading. Some astigmatism is usually present, and should be corrected; this, however, gradually diminishes, and a reexamination of the refraction is soon necessary. Any inflammation secondary to cataract operations should be treated on the general principles heretofore discussed.

Secondary cataract is due to the opacity of the remaining capsule of the lense, with or without any remaining lens-substance, cataract-débris, or inflammatory exudate. The treatment of an opaque capsule in a pupillary space consists of discission by a needle or a Graefe's knife (**capsulotomy**), or, if the capsule is tough, by dilaceration with 2 needles. Care should be taken not to exert too much pressure and dragging on the ciliary body. Some operators divide the capsule with a pair of fine scissors-forceps, and others extract the capsule through an opening in the cornea near the scleral margin (**capsulectomy**). Small hooks are also used for tearing an opening in an opaque capsule, or drawing it out of the corneal wound.

CATARRH.—Inflammation of any mucous membrane, but especially that of the nose. See RHINITIS.

CATATONIA.—See KATATONIA.

CATECHU.—See GAMBIR.

CATGUT.—A full discussion of the preparation of catgut is given under LIGATURE and ABDOMINAL SECTION (*q. v.*).

CATHARTICS (Purgatives).—Agents that increase or hasten the intestinal evacuations. According to their respective degrees and direction of action they are subdivided into several groups, as follows (Potter):

Laxatives, including those that excite moderate peristalsis and produce softened stools without irritation. Sulphur is the typical laxative. The others are magnesia, cassia, manna, figs, prunes, tamarinds, honey, cascara sagrada, physostigma, ergot, belladonna, stramonium, hyoscyamus, almond oil, olive oil, soap, taraxacum, glycerin, oatmeal, bran biscuit, brown bread.

Simple purgatives, that increase peristalsis actively, and stimulate the secretions of the intestinal glands, producing one or more copious and semifluid stools with some irritation and griping. Senna is the type of this group. The others are aloes, rhubarb, castor oil, rhamnus frangula, oxgall, calomel, small doses of drastics, salines, or cholagogs.

Drastic purgatives, that act still more intensely, producing violent peristalsis and watery stools, with much griping pain, tenesmus, and borborygmi. They irritate the intestinal mucous membrane, cause exosmosis of serum from its vessels, and in large doses set up inflammation and symptoms of irritant poisoning. Jalap is a typical drastic. The others are gamboge, colocynth, elaterium, scammony, croton oil, cathartic acid (hypodermically).

Saline Purgatives.—This group comprises the neutral salts of metals of the alkalies or alkaline earths. They stimulate the intestinal glands to increased secretion, and by their low diffusibility impede reabsorption, causing an accumulation of fluid in the intestinal tract that, partly from the effect of gravity and partly by gentle stimulation of peristalsis excited by distention, reaches the rectum and produces a copious evacuation. Magnesium sulphate and sodium sulphate are the typical salines. They should be given in plenty of water and during active movement (as in walking) in order to produce their best effects. The other saline purgatives are magnesium citrate, potassium sulphate, potassium tartrate, potassium bitartrate, sodium phosphate, sodium chlorid, potassium and sodium tartrate, manganese sulphate.

Hydragog purgatives, including the most active of the drastic and saline groups, are those that re-

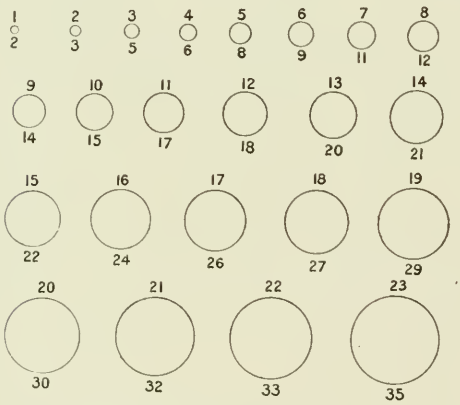
move a large quantity of water from the vessels. Elaterium is a typical hydragog. The others are gamboge, potassium bitartrate, croton oil, salines in large doses.

Cholagog Purgatives.—Those agents which stimulate the flow of bile and produce free purgation at the same time, the stools being green-colored (or "bilious"), and liquid. Podophyllin is the type of this group. The others are mercurials, aloes, rhubarb, euonymin, iridin.

CATHETER.—A tube-like instrument for evacuating the liquid contents of a cavity, usually the bladder.

Urethral catheters are generally made of soft rubber, woven silk, silver metal or celluloid. The last are usually 11 inches in length and of equal thickness throughout. Two rings are on each side of the mouth, indicating the direction of the beak to be in a plane parallel with that of their openings. The sizes are shown in the diagram.

The flexible catheters of woven silk are of the same thickness throughout, highly flexible when warm, stiffening with the cold, and they thus can be given any curve. The French flexible catheters taper for the last 3 inches, becoming very fine and pliant near the beak. The beak often ends in a small swelling or "olive," hence the term "olivary." The elbowed catheter, made of flexible material, is bent 1/2 of an inch behind the beak, to an angle of 45 degrees with the stem. See Bougie.



The Sizes of Catheters.
The upper number indicates that of the American system; the lower, that of the French.

Passing a Catheter.—General: 1. See if the instrument is clean, perfectly smooth, not defective in any part, and pervious.

2. Warm and oil the instrument—a cold catheter is unpleasant and tends to produce spasm, and an unoiled catheter does not pass easily along the urethra. Carbolized oil or vaselin may be used.

3. The patient should occupy the recumbent position, especially if passing for the first time is practised.

4. Pass the instrument with greatest gentleness and use no force.

Difficulties met with in passing an instrument are:

1. The point may catch in a lacuna or fold of mucous membrane. This is best avoided by keeping the point on the floor of the urethra, especially at first.

2. It may hitch where the urethra passes through the triangular ligament. Should it do so, withdraw it a little and direct the point against the roof of the urethra.

3. It may enter a false passage. This may be known by (*a*) the handle being deflected from the middle line, (*b*) by the catheter being felt out of the right passage by the finger in the rectum, (*c*) by free bleeding if the false passage is recent, (*d*) by no urine escaping, and (*e*) by the point not moving freely, as it does when in the bladder.

Formation of a false passage may be avoided by using no force, and entering an old one may be avoided by using a silver catheter and directing its point along the wall of the urethra opposite the false passage.

Female catheters are best in the simplest forms and when they are most effectually cleansed. They generally consist of a tube slightly curved near the beak, 6 or 7 inches in length and of the diameter of a No. 12 American male catheter, perforated with 5 or 6 small openings on either side near its extremity.

The instrument should never be introduced by touch alone; but always by sight. The labia minora should be separated, and the vestibule cleansed with absorbent cotton saturated with an antiseptic solution. The instrument, preferably of glass, should be perfectly smooth, with no rough or cutting edges. It should be boiled, kept in an antiseptic solution, and previous to use should be washed with sterile water. It is then lubricated and passed upward and backward by very gentle pressure and without using any force.

For **retention in the bladder** the best form of instrument is a short, slightly curved, vulcanite tube, terminating in a perforated olive-shaped bulb, to prevent its escape after its introduction. Rubber tubing will convey the urine into a distant vessel.

Aseptic Catheterism.—Moullin ("Lancet," September 10, 1898) says of aseptic catheterism that it is one of the problems of modern surgery. He has been called upon to deal with it especially in cases in which there has been a large amount of residual urine. The following are the essential features of Moullin's instructions: All instruments must be disinfected first by boiling. The hands, the prepuce, and the skin of the penis must be cleansed as thoroughly with soap and water as if a surgical operation were to be performed, and then sponged over with a solution of corrosive sublimate, 1 : 5000. The glands of the meatus require especial care. An irrigating catheter is then introduced into the fossa navicularis, and this part of the canal is thoroughly washed out from behind with boric acid. The catheter is then pushed on into the deep part and the process repeated. Finally, Melchior's double catheter is introduced and the urine drawn off. In this way it is possi-

ble to obtain a very high degree of asepticity. When catheters must be passed at frequent intervals, the disinfection of the hands, penis, and front part of the urethra will manifestly never be carried out each time. At the best it will only be done night and morning, and often one has to be content if it is done thoroughly once a day. But catheters can be kept clean. Those as smooth and polished on the inner surface as they are on the outer will stand boiling day after day (if they are kept straight while in the boiling water and drained afterward) and continued immersion in boric acid, without injury. Each patient is provided with 2 glass catheter cases. One of these is filled with boric acid lotion for instruments that have been used; the other, provided with a rubber cork as well as a metal cap, is dry and aseptic. These cases are so arranged that they may be hung up in the patient's wardrobe, out of sight and away from dust. No catheter is used more than once a day. As soon as a catheter is withdrawn from the urethra, it is dropped into the case filled with boric acid solution and left there. Once a day all the catheters are taken out, boiled for 5 minutes, and placed in the dry case until required. The plan works fairly well with an intelligent private patient who can be made to understand the necessity of observing strict precautions. Unfortunately, patients are not all intelligent, and in the case of a hospital out-patient so complicated a plan is out of the question. The best that can be done is to start such people as well as possible and hope that by degrees they will acquire a certain amount of immunity against the toxins they are bound to absorb. There is a little evidence to show that a certain degree of immunity may be acquired.

CATOPTRIC TEST.—By placing the source of artificial light (a candle) at an angle, and putting the surgeon's eye in the path of the equivalent or reflecting angle, by looking through a strong convex lens, if the patient's crystalline lens is transparent and in position, the 3 images of the flame are seen: One on the patient's cornea, upright; the second on the anterior surface of the lens, upright and smaller; the third on the posterior surface of the lens, very small and inverted. If the patient's lens is absent, only the first upright corneal image will be seen. In accommodation the first and second images approach, thus showing bulging of the anterior portion of the lens in this act. If only a posterior polar opacity exists, only the third inverted image will be obscured. If the opacity extends anteriorly, then both the second and third images will be invisible.

CAUL.—A child is said to be *born with a caul* when part or all of the fetal membranes remain unruptured and are carried out in advance of the head. This condition is usually due to abnormal thickness of the membranes. It occurs most frequently in premature births and when the child is undersized. In a case of this kind the membranes must be immediately removed, else the child will be asphyxiated. See Amnion.

CAUSALGIA.—Neuralgia with burning pain, often of the foot; sometimes with a local glossiness of the skin due to impairment of the normal nerve-stimulus of the part. See Neuralgia.

CAUSTICS (Escharotics).—Agents that disorganize or destroy living tissue. They are chiefly used in surgery to destroy unhealthy growths. They act usually in one of four modes: viz., (1) By abstracting the water of the tissue. Such caustics are mineral acids, glacial acetic acid, carbolic acid, arsenic trioxid, chromic trioxid, antimony chlorid, caustic potash, caustic soda, lime. (2) By combining with the albumin of the part. Such caustics are dried alum, silver nitrate, copper sulphate, mercuric chlorid, mercurie oxid, mercuric nitrate, zinc sulphate, zinc chlorid. (3) By corrosive deoxidation: examples, chromic trioxid and bromin. (4) By converting the tissues into carbon or gaseous bodies; such are the cautery, moxa, and boiling water.

CAUTERY.—Primarily, the term was applied to caustics, but more frequently now to the platinum wire heated by an electric current, or to the hot iron, for counterirritation, removal of tissue, etc.

The actual cautery is used for its counterirritant, destructive, and hemostatic action. It may be applied either in a simple or a complicated manner, as by the heating of any metallic or nondestructible substance to the required temperature by fire, or by the use of some of the more elaborate chemic or electric apparatus. The common method of its application is by irons of various shapes heated to a red or white heat in a charcoal furnace. A gas cautery has been introduced, by which a jet of burning gas may be directed to the desired spot. The galvanocautery, owing to the variety and delicacy of its means of application, offers to the surgeon a means of dealing with many conditions that could not be attempted with the more primitive instrument. The electric current may be obtained either from the chemic or the storage battery. For the general use of the surgeon Paquelin has introduced a cautery in which the heat is maintained by throwing the vapor of some hydrocarbon (as benzin) upon spongy platinum that has been previously heated. This ingenious apparatus forms a compact, convenient, and easily regulated means of cauterizing, and has almost superseded the use of the galvanic cautery in general surgery. The temperature at which a cautery should be used depends altogether upon the object in view. If used for its counterirritant and destructive effect, it is best employed at a high temperature, as from a bright red to a white heat; if for its hemostatic action, the cautery should not exceed a dull, cherry-red; otherwise the blood-vessels will be seared through so rapidly that a very imperfect clot will be formed, and bleeding will recur. Care should be exercised in the use of the cautery never to employ it when the temperature is below a dull red heat, as the tissues will adhere to the iron, and on its withdrawal a portion of the burned part will be removed, causing unnecessary pain.

CELIAC AFFECTION.—A chronic intestinal disorder most common in children between the ages of 1 and 5, characterized by the occurrence of pale, loose stools, not unlike gruel or oatmeal por-

ridge; they are bulky, not watery, yeasty, frothy, and extremely offensive, and there are anemia and debility without much emaciation. The exhaustion may be aggravated by intercurrent attacks of watery diarrhea, and death may supervene. It is also called *diarrhea alba* or *diarrhea chylosa.* It is due probably to a temporary suspension of the pancreatic function. See DIARRHEA (Infantile).

CELIOTOMY.—Surgical opening of the abdominal cavity. See ABDOMINAL SECTION.

CELLULITIS.—Inflammation of cellular or loose connective tissue, chiefly subcutaneous, but also of that between muscles and viscera, or surrounding various organs. It is characterized by the same spreading and atonic character as erysipelas, and is circumscribed or diffuse. It is most virulent from septic poison, such as that of a venomous serpent. In surgical operations upon women or after parturition it may arise in the pelvic cellular tissue. It is common after scalp-wounds. The swelling is marked early by branching lines of lymphangitis. At first it is edematous, and soon becomes brawny, the skin being mottled, with no definite limit to the redness. Pain is tensive and great, and the absorbent glands and vessels are often inflamed. Later the skin becomes dark, and unless relieved by intervention, may slough. Constitutional symptoms are grave. The diagnosis is simple unless the inflammation is deep-seated.

The disease consists in an active cell-proliferation and increase. It is often mild in degree, and the lymphatics may dispose of the poison and suppuration fail to occur. When pus forms, the condition is known as diffuse cellulitis, and is essentially the same as phlegmonous erysipelas.

Treatment.—At once antisepticize and drain any existing wound. Lead-water and laudanum, ichthyol, iodin, or blue ointment should be applied to the inflamed area. The bowels should be opened by doses of calomel or by salines, and stimulants, nourishing diet, quinin, iron, and strychnin should be given. Incisions, each 2 to 3 inches long, should be made near each other. Hydrogen peroxid may be used in spray by an atomizer, and mercuric chlorid solution as a wash. If sloughs form, employ antiseptic poultices to facilitate removal, and excise spots of gangrene as well. The dressings should be changed often, and when healing, the wound treated as an open wound. See SUPPURATION.

CENTRIFUGE.—See URINE (Examination).

CEPHAELIN.—An alkaloid derived from ipecacuanha root. The hydrochlorid is readily soluble in water. Its properties are similar to those of ipecac. As an emetic it is more energetic though slower in its action than ipecac and less depressing. Dose, 1/12 to 1/6 of a grain.

CEPHALALGIA.—See HEADACHE.

CERATES (Cerata).—Unctuous preparations similar to ointments, but of a much finer consistence. They all contain wax (cera), and do not melt at temperatures below 104° F. They are intended for external use, and are generally spread on lint before being applied. There are 6 official cerates, including ceratum itself.

TITLE.	COMPOSITION.
Ceratum (Simple Cerate).	White wax, 300 gm.; white petrolatum, 200 gm.; benzoated lard, 500 gm.
Ceratum Camphoræ...	Camphor liniment, 100 gm.; white wax, 350 gm.; white petrolatum, 150 gm.; benzoated lard, 400 gm.
Ceratum Cantharidis (Blistering Cerate).	Cantharides, 320 gm.; liquid petrolatum, 150 gm.; yellow wax, 180 gm.; rosin, 180 gm.; lard, 170 gm.
Ceratum Plumbi Subacetatis.	Solution of lead subacetate, 20 gm.; wool-fat, 20 gm.; paraffin, 20 gm.; white petrolatum, 38 gm.; camphor, 2 gm.
Ceratum Resinæ (Basilicon Ointment).	Rosin, 350 gm.; yellow wax, 150 gm.; lard, 500 gm.
Ceratum Resinæ Compositum (Deshler's Salve).	Rosin, 225 gm.; yellow wax, 225 gm.; prepared suet, 300 gm.; turpentine, 115 gm.; linseed oil, 135 gm.; to make 1000 gm.

CEREBELLUM, DISEASES.—The cerebellum lies below the cerebrum. It is liable to the same diseases as the brain, such as abscess, hemorrhages, various forms of degeneration, tumors, etc. The symptoms are vertigo, disorders of equilibrium, uncertainty of gait, pain in the head, more particularly at the back, vomiting, hemiplegia, and visual disturbances. Symptoms may be entirely latent and cause no very obvious distress, and sensation is not directly affected in cerebellar disease.

Cerebellar abscess, although very infrequent, is more common in children, and usually is a result of suppuration or inflammation of the mastoid cells. In many instances it is associated with thrombosis of the lateral sinus. Location of a cerebellar abscess is difficult. Severe occipital pain, persistent vomiting, and retraction of the head are suggestive of its presence. Examination by exploration should never be made until the existence of a temporosphenoid abscess has been excluded. No abscess being found in the anterior operation, either between the dura and the bone or in the substance of the brain, and no evidence existing of thrombosis, the lateral lobe of the cerebellum is to be explored after the periosteum and the muscular attachments have been separated from the occipital bone beneath the superior curved line. In many cases sinus thrombosis exists as well, and there is considerable danger of overlooking one if the other is found.

Tumors of the cerebellum usually cause tonic rigidity of the muscles of the back of the neck, with retraction of the head, often with flexion of the forearms and extension of the lower extremities. A cerebellar tumor may be removed without certain early fatal termination, and even after a number of cerebellar cysts have been evacuated, with immediate and permanent benefit.

Cerebellar hemorrhage is a rare accident. The most constant symptoms are vomiting, paralysis, headache, vertigo, and perhaps priapism. The headaches are usually occipital, generally preceding the onset of the more serious symptoms by a few days or several weeks, and even 2 months. Unconsciousness is an inconstant condition.

CEREBRAL DISEASE.—See BRAIN (Inflammation, Tumors, etc.).

CEREBRAL LOCALIZATION.—For topical diagnosis of cerebral lesions, see BRAIN (Injuries).

CEREBRIN.—See BRAIN EXTRACT.

CEREBRININ.—See BRAIN EXTRACT.

CEREBRITIS.—See BRAIN (Inflammation).

CEREBROSPINAL MENINGITIS. Synonyms.—Cerebrospinal fever, spotted fever, malignant purpuric fever; petechial fever.

Definition.—An infectious disease, sporadic and epidemic, due to microorganismal infection, and characterized by intense pains in the back of neck, head, and extremities, often giving rise to a position of opisthotonos, and by an irregular fever of several weeks' duration.

Varieties and Etiology.—(1) Abortive, (2) intermittent, (3) malignant or fulminant.

The term cerebrospinal meningitis is descriptive of a certain pathologic anatomy found in the central nervous system, and represents no etiologic entity. It may be caused by any of the pathogenic organisms; it may be caused by the tubercle bacillus; it may appear as a manifestation of syphilis. There is wide difference of opinion as to the relative frequency of occurrence of these various causes. There are probably marked variations according to locality. In Dunn's experience the order of frequency is as follows:

1. Tubercular Meningitis.
2. Epidemic Meningitis (Diplococcus Intracellularis).
3. Pneumococcus Meningitis.
4. Streptococcus Meningitis.
5. Influenza Meningitis.
6. Staphylococcus Meningitis.
7. Other forms.

The disease does not seem to be directly contagious, but the infectious agent appears to arise in localities where the necessary conditions for its development prevail and to be carried through the air for considerable distances. It most commonly occurs in young children in certain localities where there is overcrowding, bad food, and poorly drained soil. Fatigue, cold, moisture, and exposure are predisposing causes.

DIPLOCOCCUS INTRACELLULARIS MENINGITIDIS.—(*Weichselbaum.*)

Pathology.—The membranes of the brain and spinal cord are reddened and highly congested in the early stages. Later necrosis sets in, and the exudation of lymph becomes purulent, especially at the base of the brain. The cranial nerve-sheaths may be thus involved, giving rise to disturbance in the parts to which they are distributed. The blood-vessels of the brain and the venous sinuses are highly congested. The meninges of the spinal cord also share in the inflammatory process, and are greatly congested posteriorly. The exudate early becomes purulent, and may occupy a large portion of the spinal canal. Pressure-symptoms arise from this irritating fluid, and local palsies or convulsions ensue. The liver, kidneys, stomach, and intestines are congested. If the fever has been protracted, nephritis may arise.

Symptoms and Clinical Course.—The symptoms depend upon the area most affected. If the meninges of the brain are diseased, there are delirium, stupor, paralysis of ocular muscles, disturbed vision, deafness, and semiconsciousness. If the meninges of the cord are the seat, there will be opisthotonos, hyperesthesia, paresthesia, rigidity and tremor of the extremities, localized spasms of the muscles, which, if irritated, often cause a general convulsion.

The onset is characterized by anorexia, malaise, pain in the back of neck, head, and down the spine, slight rise of temperature, chill, or convulsion. Vomiting comes on early, and the pain in the back and head increases. The temperature is not usually high—about 102°—very irregular, and without the diurnal variation so common in typhoid fever. The pulse is full and strong. Intolerance to light and sound is a prominent feature. The skin becomes hypersensitive and a petechial rash appears, hence the synonym—spotted fever. Trophic changes may occur and herpes is common. This is generally a leukocytosis. To test for the distinctive **Kernig's sign,** the patient lies with the thighs flexed upon the abdomen and the legs flexed upon the thighs; if meningitis is present extension of the legs is impossible, being prevented by the contraction of the hamstrings. Recently, two new signs have been observed: **Mac-Ewen's sign,** in which a change in the percussion note is found over the lateral ventricles, due to increased intraventricular pressure; and **Brudzinski's sign,** in which the patient flexes and everts the arms and legs when an attempt is made to flex the head on the chest.

KERNIG'S SIGN. Proper method, *i. e.*, preliminary flexion of thighs on abdomen followed by attempted extension of leg on thigh.—(*Greene.*)

KERNIG'S SIGN. Improper method lacking the essential preliminary flexion of thighs on abdomen.—(*Greene. After Sahli-Wiener.*)

Delirium is present usually from the onset, and may be so prominent as to give rise to maniacal outbreaks. The urine is high-colored, scanty, and may contain albumin. Late in the disease it may be passed involuntarily. Occasionally, the joints may be swollen.

Abortive Variety.—The onset is rapid, and runs a course of only a few days' duration.

The intermittent variety is characterized by an

irregular fever with marked remissions, and with intermissions every day or two.

Malignant or Fulminant Variety.—The onset is more sudden, with chill, high fever, convulsions, opisthotonos. Full, slow (50 to 60) pulse, disturbed and labored respirations, delirium, coma, and death within a few days.

Complications and Sequels.—Pneumonia, pleurisy, endocarditis, facial and ocular palsies, otitis media, deafness, arthritis, aphasia, and mental impairment.

Diagnosis.—Pneumonia may be differentiated by the respiratory symptoms and the physical signs; scarlet fever by redness of the fauces and the early appearance of the rash; typhoid fever by the more gradual onset, less severe and not so continuous nervous symptoms, and the intestinal symptoms. It may also be confused with rheumatism and influenza. Lumbar puncture is a valuable aid in rapid diagnosis.

Prognosis.—The mortality is from 20 to 75 per cent. Children under 2 years of age nearly always perish.

In fatal cases death usually occurs the first week, though it may occur (generally from exhaustion or complications) after weeks of suffering. In those who recover the course is 2 to 3 or 4 weeks, with a gradual decline of the fever and a slow and protracted convalescence.

Treatment.—The treatment of cerebrospinal meningitis is divided into two classes: (1) *Specific treatment*, directed toward combating the specific cause of the disease; (2) *general symptomatic treatment*, directed toward combating the morbid changes and their symptomatic manifestations. The general symptomatic treatment of cerebrospinal meningitis contains nothing new, and will not be discussed. It is in specific treatment that the most notable advance has been made.

From time to time, various methods of specific treatment have been advocated in cerebrospinal meningitis. The most notable of these methods are: (1) Lumbar puncture, (2) diphtheria antitoxin, (3) vaccine therapy, (4) leukocyte extract, (5) urotropin, (6) serum therapy.

There have appeared in medical literature favorable reports from the use of each of these methods of treatment, but only one method, serum therapy, has given positive and unquestionable proof of efficacy, and in only one form of cerebrospinal meningitis, the so-called epidemic form, caused by the *diplococcus intracellularis* of Weichselbaum. It is possible that the other specific methods of treatment may have some value in certain etiologic forms of cerebrospinal meningitis other than the epidemic, or in certain particular conditions arising in the epidemic form. Such value remains to be proved. It is a fact that tuberculous meningitis, pneumococcus meningitis, and streptococcus meningitis are practically invariably fatal forms, as far as our present evidence shows. One or two cases of apparent recovery from tuberculous meningitis have been reported, and in these cases early lumbar puncture was performed. In all of these fatal forms, the diagnosis having been established, such methods as treatment by serum therapy, vaccine therapy, leukocyte extract, or urotropin, are at least not contraindicated, and their value has not been finally disproved. In pneumococcus and streptococcus infections, serum therapy with subcutaneous injections of the serum has not proved of notable value, but serum therapy with intradural injections, such as is used in epidemic meningitis, has been used in very few cases as yet. The known value of vaccine therapy in staphylococcus infections, would point to that method of specific treatment as the most promising in cerebrospinal meningitis due to that organism. Diphtheria antitoxin has received fair trial in epidemic meningitis, and its value has been disproved. In general, these various specific treatments may be tried in the forms of cerebrospinal meningitis which are as yet unconquered.

The Serum Treatment of Epidemic Cerebrospinal Meningitis. Evidence of its Value.—The term epidemic cerebrospinal meningitis refers to that form caused by the meningococcus or diplococcus intracellularis of Weichselbaum. The name of the disease is derived from the tendency to occur in epidemics, although the disease is not exclusively epidemic in its occurrence, but may be found practically at any time and is constantly present in many localities. It is frequently referred to as "spotted fever." The pathology of this disease has been thoroughly elucidated through the work of Councilman and others, and the recognition of its specific character has led to

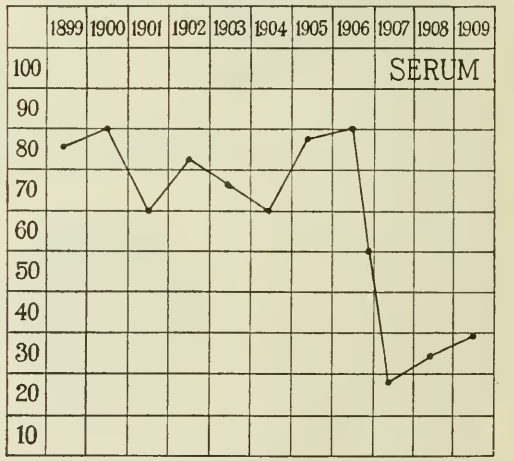


Chart Showing Death-rate from Cerebrospinal Meningitis at the Children's Hospital, Boston, from 1899 to 1909.

the successive trials of various methods of specific treatment, some of which have been retained as of possible contributing usefulness, and one of which has been almost universally adopted as of the highest efficacy.

It is possible to throw some light on the comparative value of these various methods of treatment by comparison of the mortality figures of various years at the Children's Hospital in Boston. While the average number of cases treated each year

varies, the average yearly number treated for the last ten years is twenty. Up to 1903, the treatment was symptomatic, no specific measures being employed.

In 1903, 1904, and 1905 lumbar puncture was employed as a routine therapeutic measure, and was often frequently repeated. In 1906, diphtheria antitoxin by subcutaneous injection was used as routine treatment; and in 1907, vaccine therapy. Each year is regarded as beginning on November 1 of the preceding calendar year, as serum therapy was begun as the routine treatment in November, 1907. There was no notable variation in the type of the disease from year to year. The figures are shown in the accompanying chart.

Serum therapy is now recognized by the majority of authorities as an effective specific method of treating epidemic meningitis. Thanks to the work of Flexner, the proof of the value of this treatment has been placed beyond the possibility of reasonable doubt.

Beginning in 1906, epidemic meningitis in various parts of the world began to be treated with the serum of animals inoculated with the diplococcus intracellularis. The results obtained by European observers are of value chiefly as confirmatory evidence, when considered in connection with the results obtained in this country and in England, with the antiserum prepared by Flexner at the Rockefeller Institute for Medical Research.

For proof of the value of the Flexner antiserum the reader is referred to the various publications of Dr. Flexner and his associates, and the reports of the various investigators who have been using the serum. Through a careful method of distribution, Flexner has been able to collect an overwhelming set of statistics, based on carefully studied cases properly proved to be true epidemic meningitis, which show a reduction in the average mortality of the disease under the use of the serum from 75 percent to 25 percent.

Flexner's conclusions are now based on more than 600 cases. The conclusions drawn by Flexner and Jobling from their former analysis of 400 cases are as follows: "It is our belief that the analysis of histories of cases of epidemic meningitis which have been presented in this article furnish convincing proof that the antimeningitis serum when used by the subdural method of injection, in suitable doses and at proper intervals, is capable of reducing the period of illness; of preventing, in large measure, the chronic lesions and types of the infection; of bringing about complete restoration of health, in all but a very small number of the recovered, thus lessening the serious, deforming, and permanent consequences of meningitis; and of greatly diminishing the fatalities due to the disease."

What Antimeningitis Serum Is.—Antimeningitis serum, like diphtheria antitoxin and other immune sera, is horse serum. The horses are treated with successive inoculations of preparations of the diplococcus intracellularis, until, as shown by experiment, their blood serum contains the maximum amount of immune body. The antimeningitis serum is not primarily an antitoxin, although it contains a small amount of specific antitoxin with neutralizing power. It differs from diphtheria and tetanus antitoxins, in that it is bactericidal rather than antitoxic in its nature. Although the theory of its action is not entirely clear, it is evident that its chief action is exerted upon the diplococci themselves. It appears to injure them in such a way as to cause restraint of multiplication, with rapid death and disintegration, while at the same time phagocytosis is greatly increased and within the phagocytes the toxin is broken up and rendered harmless. Concentration is a necessary factor in its good effects.

How Antimeningitis Serum is Obtained.—While in the experimental stage, the serum was made only at the Rockefeller Institute for Medical Research, Dr. Flexner having wisely elected to keep the use and distribution of the serum under his personal supervision, in order that the reports upon which the evidence of its value rests might be unquestionable. Now that the value of serum therapy is proven, the Rockefeller Institute has given up its preparation, leaving it to the manufacturing chemists and local health boards.

Technic for the Administration of Antimeningitis Serum.—The antimeningitis serum is injected directly into the spinal canal. Experimental evidence showed that concentration was one of the most important factors in its efficacy, and led Flexner and his associates to waste no time with subcutaneous injections. All the clinical evidence goes to show that the subcutaneous injection of the serum is practically of no value in comparison with subdural injection.

The technic is that of ordinary lumbar puncture. If the lumbar puncture is undertaken for the purpose of administering antimeningitis serum, or to relieve excessive intradural pressure in chronic cases, as much fluid should be allowed to escape as will run freely. It is of little use to continue the withdrawal after the fluid is running no faster than four drops to the minute. If the lumbar puncture is undertaken for diagnosis only, not more than 5 c.c. should be withdrawn.

When serum is to be administered, the sterile syringe should be filled with whatever dose of serum is to be given, which has previously been warmed to about blood temperature. The needle remains in place. After the air is expelled from the syringe, the latter is connected with the needle, and the serum is injected through the same needle by which the spinal fluid has escaped. The injection should be made slowly, so as to consume about the same amount of time as that taken by the fluid in escaping. During the injection the patient should be closely observed, particularly as to respiration, pulse and color. Signs of dangerous raising of the intradural pressure are very rare, but are occasionally seen, and should be watched for. These signs are, in order, disturbed or stertorous respiration, cyanosis, cold sweat, and failing pulse. When they appear, the serum should be allowed to run out again through the needle until the symptoms have disappeared. It is a good habit, after finishing the injection of serum, to hold the needle and syringe in place for three or four minutes

before withdrawing the needle. This does away with the necessity of making a second puncture in case pressure symptoms appear. No fatal case has yet been reported from the raising of intradural pressure in giving antimeningitis serum.

Indications for the Administration of Antimeningitis Serum.—In considering this division of the subject, a distinction must be drawn between those cases in which the diagnosis of epidemic cerebrospinal meningitis has been established by the finding of the diplococcus intracellularis in the fluid obtained by diagnostic lumbar puncture, and those cases in which the diagnosis is suspected upon clinical grounds alone. In the former class of cases, the *antimeningitis serum is positively indicated in every case*, except those cases which have advanced so far into the chronic stage, that the meningococci can no longer be found in the cerebrospinal fluid.

In the latter class of cases, the early administration of the antiserum in epidemic meningitis is so important, that no time should be lost in confirming the diagnosis by lumbar puncture. In every case in which any form of meningitis is suspected, when meningitis cannot be excluded by fully explaining the symptoms suggesting meningitis by some other diagnosis, lumbar puncture should be performed at once. If the serum is at hand, the physician should be prepared to give the serum *at the time of this first lumbar puncture*, without waiting for the result of the bacteriologic examination of the cerebrospinal fluid, under the following indications: If the fluid obtained is clear, like distilled water, no serum should be injected at the first lumbar puncture, and the serum is not indicated except in those rare cases in which meningococci are found in clear fluid. Clear fluid means either tubercular meningitis, or no meningitis. If the fluid is bloodstained, the serum should be given at the first lumbar puncture only if the case is a rapid or severe one, and strongly suggestive of meningitis. Bloodstained fluid throws no light on the diagnosis until examined bacteriologically. If the fluid is cloudy, with a cloudiness varying from a slightly opalescent to a distinctly purulent character, serum should be given at the *first* lumbar puncture without waiting for the bacteriologic examination. Cloudy fluid means that some form of cerebrospinal meningitis is actually present. It may be any etiologic form, but the chances are somewhat in favor of its being the epidemic form, and the advantages to be derived from its early use are great enough to warrant the serum being given at once. There is little or no harm in wasting one dose of serum on one of the other forms of meningitis, the dose not being repeated unless the spinal fluid shows that the meningitis is caused by the diplococcus intracellularis. It must be remembered that the serum is of no value against any of the other forms.

If the serum is not at hand, the lumbar puncture should be diagnostic only, and should be made as early as possible, in order that the diagnosis may be established before the serum is sent for, yet without undue loss of time.

Size of the Dose.—In the early days of the use of the serum, such questions as the proper size of the dose, and the frequency of its administration were entirely unsettled. The earlier work with the serum was more or less experimental. It was soon recognized that on theoretical grounds the larger the dose, the better would be the probable result, and in practice this rule has turned out to be true. On the other hand, the contraindication for large doses was the risk of producing serious disturbance by a sudden raising of the intradural pressure. So great did this risk appear, that the first rule was to give an amount of serum no larger than the quantity of cerebrospinal fluid withdrawn by lumbar puncture. This rule has since been modified, and the various observers are in agreement in the view that at least 30 c.c. is required to produce a good reaction, and that this amount may usually be given with safety, even when smaller amounts of cerebrospinal fluid are obtained. The exceptions are found in very young babies, and in a few other cases in which only a small amount of cerebrospinal fluid can be obtained, and in which, on attempting the injection of a full dose, after a certain point further injection appears to encounter an abnormal resistance. This last point of resistance can only be judged fully by practice.

In all cases it is absolutely essential to withdraw as much cerebrospinal fluid as can possibly be obtained before injecting the serum. After the withdrawal of the cerebrospinal fluid, if the quantity withdrawn is 30 c.c. or under, the routine dose should be 30 c.c. except in case of the exceptions mentioned above. If the quantity withdrawn is more than 30 c.c., the quantity of serum injected should be equal to the quantity of cerebrospinal fluid withdrawn. In very severe or fulminant cases, especially in adults, in which the quantity of fluid withdrawn is between 30 c.c. and 45 c.c., 45 c.c. should be given, provided that no sensation of abnormal resistance is encountered.

Frequency of Administration.—In connection with this point, in spite of the fact that single doses of the serum are frequently followed by a very marked favorable reaction, which fact might suggest that the most favorable times for repeating the dose were only when the limit of improvement from a previous dose had been reached, observers are now agreed that it is better to repeat the injections a number of times at the outset in all cases without reference to the reaction, and that by so doing the improvement is more likely to be permanent, the course of the disease is more likely to be short, and that the liability to relapse is greatly lessened. As a routine, in every case, the injections should be repeated daily so long as diplococci are found in the cerebrospinal fluid, no matter how many doses must be given. In cases in which diplococci disappear early from the cerebrospinal fluid, the injections should be repeated daily for four doses. This number four is an arbitrary one, but is based on the experience of a number of observers and, although undoubtedly in some cases fewer might suffice, yet, as one can never know beforehand, four may be considered the safest number to be used in this class of cases to insure

obtaining the most permanent improvement and the greatest freedom from relapse. Very severe or fulminant cases should be very closely watched and the physician should stand by ready to give a second injection the moment the period of initial improvement shows any tendency to cease; and if they cannot be so watched, or if there is no period of improvement, the injection should be repeated in 12 hours instead of 24.

The Treatment of Relapses.—In one form of relapse the patients have not become entirely free from symptoms and fever, although they have shown marked improvement before they began to get worse again. The treatment of this form of relapse will be described under prolonged cases, but if the relapse begins while one is waiting 3 or 4 days, treatment should be begun at once. In another form of relapse, a true relapse, the patient has been without fever or important symptoms, when he becomes worse, either by rise of temperature, a recurrence of symptoms, or both. Cases in which a rise of temperature is the only manifestation are not nearly so serious as those in which there is a recurrence of any affection of the mental condition. The latter is quite serious, especially if there is no fever or reappearance of diplococci, and may be the precursor of the unfavorable chronic stage.

The treatment of a true relapse is the same as that of the form described under prolonged cases—immediate lumbar puncture and injection of full doses of serum, the injections to be repeated as long as diplococci or symptoms persist; or in the absence of such persistence, until four full doses have been given; or, in the presence of continued symptoms, until the chronic stage is established.

Too much stress cannot be laid upon the necessity of giving several repeated full doses rather than a single one, or smaller ones at all times when the injection of serum is indicated. The cases in Dunn's series in which single doses were given in relapses did not do as well as those in which the relapses were combated by repeated full doses.

The Treatment of Prolonged, Chronic, and Resistant Cases.—A prolonged case is one in which recovery is delayed, with persistence of symptoms. If diplococci persist in the cerebrospinal fluid, daily injections should be continued, until they have disappeared. If diplococci have disappeared, but active symptoms persist after the initial four doses, it is best to wait 3 or 4 days, and then repeat the treatment with four injections, and continue this procedure of occasional repeated daily doses until symptoms have disappeared, or until the chronic stage has become established.

In the chronic stage the consciousness remains affected, but the temperature is normal and the patient's condition remains indefinitely stationary, while no diplococci are found in the cerebrospinal fluid. In this stage the serum has appeared to be powerless. It is as well, however, even in this stage, to perform occasional lumbar puncture, to know if by any chance diplococci have appeared in the cerebrospinal fluid, where there would be some hope of good effect from several successive doses. At these times an occasional dose of serum should be given, though little good is to be expected from its use if diplococci are absent.

It is a probability that in some chronic cases there is a condition of chronic hydrocephalus, and it is a question whether this may not be largely responsible for the patient's condition. This would be shown by the fact that at lumbar puncture a considerable amount of fluid is obtained under considerable pressure. When this is the case, it is suggested that the older treatment by repeated lumbar puncture, without the injection of serum, should be tried.

Resistant cases are distinguished from the prolonged cases described above, in that while the prolonged cases show some good effect from the serum, though later they may remain stationary, resistant cases are those in which the course of the disease appears to be entirely uninfluenced by the serum. In one class of resistant cases, there is some obstacle to proper administration, such as inability to obtain sufficient cerebrospinal fluid to permit the injecting of serum without pressure symptoms. Under such circumstances, if the first lumbar puncture has given a dry tap, and the diagnosis has failed of being established by bacteriologic examination, it is better to inject serum into the canal with great caution, watching for the manifestations of pressure symptoms. If the diagnosis has been established by a previous lumbar puncture, but later lumbar punctures obtain either a dry tap or a very small amount of fluid, the physician had better give serum, but be ready to desist at any moment if pressure symptoms intervene.

In another form of resistant case, no obstacle to the successful administration of the serum is encountered, but no improvement follows in the clinical symptoms. Here there are two classes which call for different treatment. In one class, while there is no improvement in the clinical symptoms, the organisms found in the spinal fluid show the usual effects of the serum treatment, viz., a progressive diminution, and an eventual disappearance. In this class of cases there is evidence suggesting that the failure of the treatment is due to some anatomic change, such as the closure of the foramen of Magendie, which prevents the serum reaching the diplococci developing in the ventricles. In these cases the injection of the serum directly into the cerebral ventricles has been suggested. In a resistant case, growing progressively worse, or failing to improve, in spite of the routine serum treatment, this procedure is worthy of trial.

In the other class of resistant cases the diplococci in the spinal fluid show no effect from the serum. These cases can only be explained on the ground that there may be subspecies or strains of the diplococcus intracellularis which resist the serum. In these rare cases, nothing is to be gained by giving the serum subcutaneously. Vaccine therapy should be tried with homologous vaccine, and the routine serum treatment should be continued in spite of its apparent failure, as these cases sometimes yield after a time.

Summary of the Serum Treatment of Epidemic Cerebrospinal Meningitis

1. Perform lumbar puncture, prepared to give the serum, as soon as meningitis is suspected. If the fluid is cloudy, give the first full dose of serum at once, without waiting for the bacterial examination, although further doses are only to be given in case the diplococcus intracellularis is found in the cerebrospinal fluid. The serum is of no value in other forms of meningitis.

2. At every dose give as much as possible. Always withdraw as much cerebrospinal fluid as possible. Give 30 c.c. in all cases in which the amount of fluid withdrawn is 30 c.c. or less, unless a distinctly abnormal sense of resistance is encountered after as much has been injected as has been withdrawn. In all cases in which the amount of fluid withdrawn is more than 30 c.c. give as much serum as the quantity withdrawn. In very severe or fulminating cases, in which the amount withdrawn is between 30 c.c. and 45 c.c., give 45 c.c. unless abnormal resistance is encountered.

3. In very severe or fulminating cases, repeat within 24 hours as soon as the patient begins to get worse again, or at 12-hour intervals.

4. In average cases, repeat daily, until four full doses have been given in all cases.

5. If diplococci persist after four full doses have been given, continue the injections until they have disappeared.

6. If subjective symptoms, any impairment of the mental condition or fever persist, after diplococci have disappeared, or after four full doses have been given without progressive improvement, wait four days if the condition of the patient is stationary. At the end of four days, or at any time if the patient's condition is getting worse, repeat the treatment with four daily full doses, and continue as if this were the original attack.

7. When a relapse occurs, either by reappearance of diplococci in the cerebrospinal fluid or by a reappearance of symptoms, give four daily full doses and continue treatment as if this were the original attack.

8. Treatment along these lines should be continued until the patient is symptom-free, without diplococci in the fluid, or until the chronic stage is established.

9. In the chronic stage, watch for possible reappearance of diplococci by doing occasional lumbar punctures. If diplococci reappear, resume treatment with the serum as outlined above. In chronic cases with excessive cerebrospinal fluid under marked pressure, try daily lumbar puncture without the injection of the serum.

The Effect of Serum Therapy in Epidemic Cerebrospinal Meningitis

The three principal effects of the use of the serum seem to be: First, to produce a fall of temperature; second, to produce a rapid improvement in the patient's general condition, accompanied by a more or less marked relief of certain symptoms, and, third, to cut short the course of the disease. The effect on the mortality has been mentioned above. For the details the reader is referred to the published reports of Flexner and others.

The most striking effect on the temperature is a permanent critical fall following the first dose of serum. This phenomenon was never observed in epidemic meningitis before the use of serum therapy. With serum treatment, particularly when the serum is used early in the course of the disease, such a crisis is striking in some cases, the temperature falling at once to normal, or nearly normal, and showing no further tendency to rise. Other cases show a similar critical fall of temperature, which is, however, not permanent, the temperature rising again and finally coming down by lysis. Another effect is seen in a rapid permanent lysis which is very striking in cases in which there has been a consistent high temperature up to the time when the first dose of serum was given. A similar lysis, but not permanent, the temperature going up again, occurs at times, as does a temporary sharp fall of temperature, not to the normal and not permanent; in these the temperature rises again, to come down by lysis later in the course of the disease. There is no immediate effect on the temperature noted in some cases.

The effect on the symptoms and general condition is the most striking phenomenon observed with the use of the serum. In some cases there occurs a permanent return to consciousness, a disappearance of mental dulness, a disappearance of delirium, and a disappearance of headache, hyperesthesia, tenderness of the neck or vomiting. These symptoms are often relieved completely within 24 hours after the first injection, the patient changing in the most remarkable way from a serious condition of coma to a favorable condition or normal mental activity.

At other times the improvement in this set of symptoms occurs more slowly, and at still other times, particularly in the late chronic cases, no such effect is noted. The rigidity of the neck and Kernig's sign are usually much more persistent, so that at times patients remain for some time normal in every way, even playing, while these signs persist.

As to the cutting short of the disease, the average length of time which patients remain under treatment at the Children's Hospital is but a small fraction of the time which patients who recovered remained under treatment at the hospital in previous years.

Another notable effect of the serum is seen in the successive examinations of the cerebrospinal fluid during the period of its use. This effect is most striking in early cases, in which the cerebrospinal fluid contains large numbers of diplococci. In such a case a great many intracellular diplococci are observed in the fluid withdrawn by the first lumbar puncture. Twenty-four hours after the first injection the fluid presents a strikingly different picture. The whole number of organisms seen is much smaller, but the chief change is that the majority are intracellular, only rare extracellular forms being seen. The third lumbar puncture shows still fewer diplococci, and those only intracellular. In the fourth fluid, after three

doses, there are frequently no diplococci to be found, or, at most, very rare intracellular forms.

The completeness of recovery is another noteworthy point. Permanent sequels, such as deafness, blindness, paralysis, or idiocy, are rarely observed under serum therapy.

The results of the use of the serum appear to depend chiefly on how early it is first used. The earlier it is employed the more marked are its effects. We may conclude that the prospects of aborting or rapidly cutting short epidemic cerebrospinal meningitis are better the earlier in the disease the serum is given, and that the antiserum usually has no effect in the late chronic stage. There are cases which prove exceptions to this rule, as in some cases in which the serum is used comparatively early the patients die. Most of these are cases of the very rapid, fulminant type, in which death occurs within 12 or 24 hours of the administration of the first injection. In these, death occurs before the serum has time to produce its effect. Some of these fatal cases in which the serum is used early are of one of the resistant types described above.

On the other hand some patients in the late chronic stage begin to improve immediately after one dose of serum and make a rapid convalescence. This would show that there is always some hope of a good result so long as diplococci are present. In most cases the serum causes a cessation of the active process, and the resulting course of the disease depends mainly on the extent of tissue damage which has already been done.

CEREBRUM.—See Brain.

CERIUM OXALATE.—Consists chiefly of a mixture of the oxalates of cerium, didymium and lanthanum, and other rare earths of this group. It occurs as a fine, white powder, odorless and tasteless, permanent in the air, insoluble in water, alcohol or ether. Dose, 1/2 to 5 grains in pill or powder.

It is a gastric sedative, and is considered to be particularly useful in vomiting of reflex origin, especially in the vomiting of pregnancy, but it often fails, probably because not given in sufficient doses. To be effective, at least 4 or 5 grains should be given 3 times a day, and no results promised until after it has been used several days. It is also recommended in the vomiting of phthisis and bronchitis, cough with vomiting, chorea, and diarrhea.

CERUMEN, IMPACTED.—See Ear (Diseases).

CERVICAL RIB.—Cervical rib springs from the anterior transverse process of the seventh cervical vertebra. It is bilateral in about two-thirds of the cases; rarely a second cervical rib may arise from the sixth cervical vertebra. The anterior extremity is usually free, but it may unite with the first rib or with even the sternum. The brachial plexus and subclavian artery pass over it, and with the growth of the rib or its ossification these structures are compressed, causing pain, weakness of the arm, trophic troubles, or even obliteration of the pulse and gangrene. There is no edema of the arm, because the subclavian vein lies in front of the middle scalene muscle and escapes pressure. The rib forms a prominence in the neck, which has been mistaken for aneurysm, because it pushes the subclavian artery forward and upward. The X-ray will dispel all doubt. If there are pressure symptoms, the rib may be removed through a transverse incision after separating the nerves and vessels (Stewart).

CERVIX UTERI, AFFECTIONS.

Laceration

Injury of the cervix uteri is of very frequent occurrence. A large proportion of women have the cervix more or less extensively lacerated during their first confinement.

There are several varieties of lacerated cervix: (1) Through the anterior lip; (2) through the posterior lip; (3) single lateral tear; (4) bilateral tear; (5) stellate tear; and (6) the incomplete tear. In the last condition the muscular structure and the mucous membrane lining the cervical canal are torn, but the vaginal mucous membrane remains intact. The most frequent of these varieties are the *unilateral* and *bilateral* tears.

Symptoms.—The symptoms of laceration of the cervix are by no means diagnostic. There are usually leukorrhea and menorrhagia. These symptoms are not due to the laceration itself, but to the cervical catarrh and subinvolution that accompany it. Pain in the pelvis and extending down the leg is a not unusual symptom. Various reflex nervous disturbances may be present.

The diagnosis of laceration of the cervix is made not by the symptoms, but by the physical signs. Inspection will reveal the site of the tear; the two lips of the cervix are everted; the external os is patulous; and the whole area of the tear is red and eroded. The condition is most marked in the complete bilateral tear.

By palpation is detected the angles of the laceration; plugs of indurated, cicatricial tissue may be felt here and there; and frequently small shot-like cysts, embedded in the mucous membrane, are noticed. The cervix loses its conic shape and becomes broader and flatter.

Treatment.—This consists in repair of the torn surfaces by a plastic operation. The operation is called **trachelorrhaphy,** and consists in denuding the torn edges and bringing them together with sutures. The best time for the operation is about a week after the menstrual period. The steps of the operation are as follows:

1. The patient is anesthetized and placed in the lithotomy position.

2. The physician's hands, instruments, and the field of operation are sterilized in the usual manner.

3. The anterior lip of the cervix is seized with a double tenaculum and drawn down to the vulva; the posterior lip is seized in a similar manner, and the two surfaces are separated.

4. Beginning upon the posterior lip, the areas to be denuded are marked out with the point of a sharp knife.

5. These areas are denuded with scissors, care being taken to preserve strips of mucous membrane in the center for the formation of a new cervical canal.

6. Sutures of silkworm gut are introduced, begin-

ning at the angle of the tear, entering the mucous membrane on the vaginal aspect of the cervix, and emerging at the edge of the mucous membrane that is to form the new cervical canal.

7. Three or four of these sutures are introduced on each side, the denuded edges are brought together, and the sutures are shotted.

8. A douche of sterile water is given and a light gauze tampon is introduced into the vagina.

The patient remains in bed for 2 or 3 weeks; the tampon is removed at the end of 24 hours, and the sutures are removed at the end of 2 weeks. If the laceration is of long standing, the cervix is likely to be hypertrophied, indurated, and cystic. congested. The characteristic discharge may be seen escaping from the cervical canal.

Treatment.—In every case a thorough examination is necessary in order, if possible, to detect the cause of the condition. If this is found and removed, the cervical catarrh will probably disappear spontaneously. Improvement of the general health will frequently relieve the symptoms and lessen the leukorrhea. Preparations containing iron, such as Blaud's pill, Basham's mixture, and the four chlorids, are particularly beneficial. Exercise and attention to the diet and to the condition of the bowels are also necessary. Should the condition persist after the foregoing line of

Denudation of Lacerated Cervix. Sutures Introduced. Sutures Tied.

(Repair of lacerated cervix.—(*Montgomery.*)

Under these circumstances preparatory treatment should be instituted, for the purpose of bringing the cervix to as nearly a normal condition as possible. This consists in the administration of copious douches of hot water, regulation of the bowels, scarification and puncture of the cervix, local applications, and tampons. If after 2 or 3 weeks of this treatment the induration and cystic degeneration have not disappeared, the case is not suitable for trachelorrhaphy, and in such case the cervix should be amputated.

Endocervicitis

Inflammation of the mucous membrane of the cervical canal. Cervical endometritis is a very common affection, and in greater or less degree may be found in the majority of women.

Causes.—The affection is usually a secondary one, being dependent upon some local or general condition. The various displacements of the uterus are a common cause. Laceration of the cervix is almost always accompanied by cervical catarrh. Gonorrhea causes a most intractable form of the disease. Improper hygienic conditions, impaired health, and the scrofulous and tubercular diatheses are predisposing factors.

Symptoms.—The most important symptom is leukorrhea. The character of the discharge is almost diagnostic. It is thick, opaque, and tenacious, and is discharged in the form of strings or shreds. Associated with this there may be other symptoms, such as headache, backache, and pain in the pelvis. Inspection of the cervix will reveal a patulous condition of the external os, while the mucous membrane surrounding it will be red and

treatment, local treatment will become necessary. This consists in the administration of hot vaginal douches; in the use of glycerin tampons; in the application of tincture of iodin to the cervix; and in application to the cervical canal. The vaginal douches should be given 2 or 3 times daily by means of a fountain syringe; they should consist of large quantities of hot water—a gallon or more—at a temperature of about 110° F. Glycerin tampons may be inserted against the cervix twice a week; they should remain 12 hours, their removal being followed by a vaginal douche. Applications of tincture of iodin may be made to the cervix and vaginal vaults every 5 or 6 days. Finally, applications may be made directly to the cervical mucous membrane. These may be made by means of an applicator, or, better, with a long glass pipet. The pipet is filled, its point is introduced as far as the internal os, and the solution is expressed as the pipet is slowly withdrawn. The best solutions for application to the cervical canal are chlorid of zinc or nitrate of silver (2 grains to 1 fluidounce), pure carbolic acid, and Churchill's tincture of iodin, or argyrol (20 to 40 percent solution). After the application a cotton pledget saturated with boroglycerid or a 15 to 25 percent solution of ichthyol in glycerin should be placed against the cervix.

Polypi

These are usually mucous in character, and are the result of degeneration of the cervical glands. The symptoms are not characteristic; they are usually attended by more or less menorrhagia and leukorrhea. Inspection will sometimes reveal the

growth protruding from the cervix. Pedunculated growths should be twisted or cut away; the sessile varieties should be excised.

Hypertrophic Elongation

This consists of a hypertrophy and an elongation of the infravaginal cervix. The condition is most frequently found in virgins, and it is probably congenital in origin. The hypertrophy may be so pronounced that the cervix projects from the vulva.

Treatment consists in amputation of the cervix.

Carcinoma

Cancer of the cervix uteri occurs more frequently than cancer in any other part of the body. It appears in two forms: 1. Squamous-cell (*epithelioma*) when springing from the vaginal portion of the cervix; 2. cylindric-cell (*adenocarcinoma*) when attacking the cervical canal.

Causes.—The exciting cause of cancer of the cervix is unknown. Laceration and erosion are predisposing causes, for cancer of the cervix is rarely found except in women who have borne children. It occurs most frequently between the ages of thirty-five and fifty.

Symptoms.—The classic symptoms are *hemorrhage*, *discharge*, and *pain*.

Hemorrhage is usually the first symptom. It may appear as a slight menorrhagia or there may be bleeding between the periods. This is excited or aggravated by exertion of any kind. A long walk, straining at stool, or coitus may be followed by slight hemorrhage. Ofttimes, after the patient has passed the menopause, there will occur more or less regular bleeding, so that she may suppose menstruation has returned. As the disease progresses the hemorrhage becomes more pronounced, until finally the patient bleeds almost continuously. **Leukorrheal discharge** is another important symptom. In some cases it may appear before the hemorrhage. At first it presents the characteristics of an ordinary leukorrhea, but later it becomes blood-stained and mixed with particles of the ulcerating cancerous mass. It has an extremely offensive odor. It is irritating to the skin, and frequently causes pruritus and even excoriation of the vulva and inner parts of the thighs. **Pain** is not a prominent symptom early in the disease. It may be absent throughout the entire course of the disease. It is usually felt in the back, and is referred down the legs. The disease may extend to the bladder and rectum; it may involve the pelvic nerves and ureters. This will cause such symptoms as vesical irritability and constipation, intense pelvic pain, and finally uremia. As the disease progresses the general health fails; the patient loses weight and strength; becomes anemic; and finally presents the typical picture of a cancerous cachexia.

Diagnosis.—This usually depends upon the physical signs, with perhaps a microscopic examination of a portion of the diseased cervix. In the first stage the cervix is hard and nodular; the mucous membrane seems to be immovably fixed upon the underlying tissue. In other cases a small ulcerated area may be the only evidence of the disease. As the disease progresses the nodular growths break-down; the entire cervix becomes ulcerated; or large cauliflower-like masses may fill the upper part of the vagina. The tissues are exceedingly friable, and bleeding occurs at the slightest touch. Since the successful treatment of cancer of the cervix depends upon its early recognition, unnatural bleeding in a woman past the age of 30 should be viewed with the greatest suspicion, and unless a satisfactory cause can be assigned for it, microscopic examination of the cervix and endometrium should be made without delay. In all cases in which there is the least doubt the microscope should be used.

Prognosis.—The prognosis is unfavorable unless radical operation is performed. The duration of the disease is from a few months to about 3 years.

Treatment.—This is either radical or palliative. Radical treatment, which consists in complete hysterectomy, should be attempted in all cases in which the disease has not extended to inaccessible organs. Thus, it would be contraindicated when the bladder or the rectum was involved, when the vagina was extensively infiltrated, or when the disease had extended to the broad ligaments and cellular tissue of the pelvis. Palliative treatment consists in relieving the pain, hemorrhage, and discharge. The pain is best relieved by morphin, taken internally or given hypodermically. The hemorrhage and discharge are best relieved by removing as much as possible of the cancerous tissue with scissors and a sharp curet. This is done in the following manner: The patient is anesthetized and placed in the lithotomy position. All accessible diseased tissue is removed with scissors or with a sharp curet. Hemorrhage is controlled and tissue not accessible to the knife is further destroyed by the use of the actual cautery. The vagina is douched with sterile water and packed with iodoform gauze, which is removed at the end of 48 hours. Douches of potassium permanganate or creolin are given daily. Relief afforded by the foregoing treatment is prompt and usually continues for some months. The progress of the disease is also arrested for a short time.

CERVIX UTERI, AMPUTATION.—According to the extent of disease or hypertrophy of the cervical mucous membrane, the double or the single flap (Schroeder's) method is preferred. In the former operation, after an incision is made into each angle anterior and posterior cervical and vaginal flaps are formed by the removal of a wedge-shaped piece from each lip. Chromic catgut is used for suturing. Two sutures introduced into each lip and two or more lateral sutures bring the surfaces in apposition. In the latter operation indicated in the more serious cases, instead of a cervical flap a transverse incision is made into the lip from within outward at the level of the lateral incision, extending half through the lip; then a vertical incision is made to the junction of the vaginal and cervical mucous membranes. The end of each flap is brought in apposition to the cervical mucous membrane by sutures, and lateral sutures are introduced.

CESAREAN SECTION.—Delivery of the child through an incision in the abdominal and uterine wall.

Indications.—There are certain conditions under which Cesarean section is absolutely called for. These are extreme degrees of contracted pelvis, when the true conjugate is below 7 cm.; obstruction of the pelvic canal by a tumor—large, bony growths of the pelvis, or fibroid or cystic tumors of the uterus and ovaries, respectively; extreme atresia of the vagina or cervix, and rupture of the uterus. When surgical interference becomes necessary in pelves with a conjugate between 7 cm. and 8 cm., craniotomy is ordinarily advised. The present low mortality of Cesarean section, under favorable circumstances, makes it advisable. The question should be left to the patient and her husband or friends to decide. Craniotomy is rarely ever justifiable upon a living, healthy child.

Varieties.—There are 2 varieties of Cesarean section: one is the so-called *Sänger operation,* in which, after the extraction of the child, the uterine incision is closely approximated and the uterus allowed to remain—*laparohysterotomy;* the other is the *Porro operation,* which is essentially a supravaginal amputation of the uterus—*laparohysterectomy.*

Laparohysterotomy is indicated when the condition that necessitates the interference can be removed at the time of operation. Thus, if Cesarean section is demanded on account of an ovarian cyst, the uterus should be allowed to remain, as the cyst can easily be removed and subsequent difficulty avoided.

Although still valuable as a life-saving procedure when haste and the minimal amount of shock are demanded, the Porro operation has been largely superseded by the more correct surgical method of abdominal hysterectomy proper.

Abdominal hysterectomy is indicated when the operation is performed for pelvic deformity or contraction; for extreme atresia of the cervix or vagina; for large fibroid tumors of the uterus, and for extensive rupture of the uterus. If the uterus fails to contract and hemorrhage is profuse, or if there is reason to believe that the patient is septic, the uterus should be removed. The advantages of abdominal hysterectomy are that it lessens the chances of puerperal infection; that it eliminates the possibility of postpartum hemorrhage; that it prevents the formation of adhesions between the uterus and anterior abdominal wall; that it prevents the formation of fistulæ between the uterine cavity and abdominal wall; that it prevents rupture of the uterus in a subsequent pregnancy, and that it prevents the necessity of a repeated Cesarean section.

Technic.—When an absolute indication for Cesarean section exists, it should be performed about 2 weeks before term. When the patient is not seen until labor, it should be performed as quickly as possible. The prognosis is always graver if the patient is allowed to exhaust herself by futile attempts at spontaneous delivery.

The steps of the operation are as follows:

1. The patient is thoroughly prepared for the operation, anesthetized, and placed upon the table.

2. A long median incision is made, extending from about 2 inches above the umbilicus almost to the symphysis pubis.

3. The fundus of the uterus is lifted out of the abdominal cavity, and warm sterile towels are placed about it to protect the intestines and peritoneal cavity.

4. An assistant grasps the abdominal walls and lower uterine segment, and compresses them to avoid hemorrhage when the uterus is incised.

5. An incision about 5 inches in length is made through the anterior wall of the uterus, and the child, placenta, and membranes are extracted.

If it is purposed to perform the Porro operation, the remaining steps are the same as in an ordinary hysterectomy. If the Sänger operation is decided upon:

6. The cervical canal is dilated with the fingers from above downward, and the end of a good-sized strip of gauze is passed through the cervix into the vagina; the remainder is packed firmly into the uterine cavity.

7. The uterine incision is closed by 3 sets of sutures—1 set of interrupted, medium-sized, silk sutures, which are placed about 3/4 of an inch apart and go down to, but not through, the mucous membrane; another continuous suture of catgut, which is buried in the uterine wall; and a superficial Lembert suture of fine silk, which closes the edges of the peritoneum and thus prevents leakage into the peritoneal cavity. Then, if desirable, with the consent of the patient the Fallopian tubes may be ligated and divided. The remainder of the operation consists in freeing the peritoneal cavity of blood and serum by careful sponging and in closing the abdominal wound with four planes of sutures. The after-treatment is the same as for an ordinary laparotomy.

Prognosis.—The maternal mortality from Cesarean section is yearly decreasing. Cases that are operated upon before the onset of labor, under favorable circumstances should have a mortality of not more than 5 percent. In the hands of experienced operators the Porro operation should give the best results, although statistics show that the Sänger method has a lower mortality.

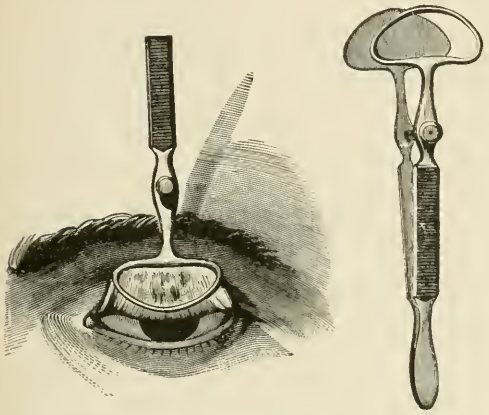
CESAREAN SECTION, VAGINAL.—Delivery of the fetus by forceps or version through an incision in the anterior cervical wall extending beyond the internal os into the lower uterine segment. Introduced in 1896, this operation is still in its experimental stage. It is contraindicated in a markedly contracted pelvis with a true conjugate of 8 cm. Its chief indication is in eclampsia when rapid dilatation is contraindicated and quick delivery is demanded. It is also indicated in cardiac disease and stenosis of the cervix.

CHAFING.—See Erythema Intertrigo.

CHALAZION.—A small tumor arising from an inflammation or closure of a duct of a Meibomian gland. It is the size and shape of a split pea, the convex side being toward the skin. It usually points toward the palpebral conjunctiva. It may be distinguished from hordeolum by its location,

chronic course, and noninflammatory symptoms. The conjunctiva is often red and spongy-looking, especially directly over the tumor. The skin over the tumor is freely movable, and is normal in appearance.

Treatment consists in excising and cureting the tumor, under cocain, using a special forceps. In excising through the conjunctiva, the scarification following an extensive excision may cause entropion, and a simple incision should be made in the direction of the gland, and curetting alone should be resorted to. In excising through the lid, an incision parallel to the edge of the lid is made over



Excision of Chalazion. Desmarres' Forceps.

the chalazion, its capsule is opened, and the whole mass excised and the cavity cureted. Suture of the wound is optional.

CHALICOSIS.—Marble-cutter's phthisis; phthisis due to the inhalation of marble-dust. See Tuberculosis.

CHALK.—Prepared chalk is native calcium carbonate, a white, amorphous powder, odorless and tasteless, insoluble in water and alcohol. Dose, 5 grains to 1 dram. It is used with mercury in compound chalk powder, in chalk-mixture, and in troches.

It is much used as an antacid, as a tooth-powder, and as a dusting-powder in erythematous eczema and intertrigo, and for chafing of the genitalia and buttocks of young children.

In simple diarrhea of children:

℞. Tincture of krameria, Camphorated tincture of opium, each. ℥ j.
Chalk-mixture, enough to make ℥ j.

A teaspoonful every 2 hours to a child of 5 years.

See Calcium.

CHAMOMILE.—There are no official preparations. The flower-heads contain a volatile oil, a camphor, and a bitter principle, but no alkaloid. An infusion (4 drams to 1 pint of water) may be given in doses of from 1 to 2 ounces. Chamomile is a bitter tonic, improving the appetite and aiding the digestion. In large doses the warm infusion is an emetic, perhaps diaphoretic. Chamomile is popular in domestic practice for infants' complaints, and externally as a fomentation to relieve pain, as in colic. The oil is useful in reflex cough, pulmonary catarrh, acute dyspepsia, diarrhea of children, spasmodic asthma, whooping-cough, colic, and in the spasmodic and pseudoneuralgic affections of hysteric women. In poisoning from strychnin it may be employed to allay reflex excitability.

The German chamomile is official in the U.S.P. as "**Matricaria,**" and is the "chamomilla" of homeopathy.

CHANCRE.—See Syphilis.

CHANCROID.—A sore (soft chancre) developed upon the genitals as a result of contagion and probably caused by the bacillus of Ducrey. It is distinguished from true or hard chancre partly by the absence of induration, but chiefly by the absence of subsequent constitutional symptoms and by the fact that the period of incubation is much shorter; the one is always less than a week, and generally less than 3 days; the other is always more than 3 weeks, and is often as much as 5.

Soft chancre never occurs except upon the genitals, and is probably due to infection from retained and decomposing purulent discharge. The intensely irritating character this possesses may be judged by the fact that soft chancre occurring on a mucous surface is almost sure to infect the opposite side, and if the secretion is pent up, as in the case of phimosis, is almost certain to become phagedenic. It can be inoculated times without number without conferring the least degree of immunity. It is never followed by any other results than those which are so common after all foul and sloughing sores on parts that are never kept at rest, and constitutional treatment is of little or no avail for it.

Symptoms and Causes.—The favorite situation is on the mucous surface of the prepuce or just behind the corona. A small red papule is the first sign; by the third or fourth day this has become a pustule with a bright areola, and in 24 hours more it breaks, leaving a sore with angry base and edges. In some few cases this heals without any further ulceration; probably the infection has never really penetrated into the submucous tissue. More frequently it continues to spread; the edges are sharply cut, perhaps undermined; round them is a bright red rim of inflammation; the base is grayish or yellow, covered with a slough; and the whole thickness of the mucous membrane is destroyed. The sore is usually circular in shape and very tender. On the glans it may be perfectly soft, without sign of induration; but when it is upon the skin, the base is often infiltrated to such an extent that it is nearly as hard as true infecting chancre. The margin, however, is different; in a soft sore the edge of the induration is ill-defined; it shades off imperceptibly into the healthy tissues around, and no limit can be made out; but, at the same time, it must be recollected that this is equally true of a

hard chancre when it is inflamed; and that, owing to the extreme mobility of the skin upon the penis, any sore with a hardened base felt in the longitudinal direction and lifted up from the tissues beneath appears exceedingly well defined. The secretion, at first, is thin and watery, with a few shreds and sloughs, detached from the surface, floating in it; later, when granulations form, it consists of ordinary pus, such as comes from any other sore.

If, owing to phimosis or balanitis, the secretion is retained under the prepuce, so that it decomposes, the ulceration is more severe, and may become phagedenic. The sore increases in all directions; the opposite surface of the prepuce is attacked; the skin on the outside is reddened; the whole of the end of the penis becomes swollen; and if relief is not speedily given, the skin sloughs, ulcerating through from beneath, and the end of the glans protrudes through a ragged opening on the dorsum. In the worst cases the destruction is even greater; the whole of the skin covering the end may perish, the glans be in great measure destroyed, and the urethra laid open.

The inguinal glands that lie parallel to Poupart's ligament are always more or less inflamed. In the milder cases they are simply enlarged, swollen, and tender; their outline is indistinct, and if several on the same side are attacked, they cannot be isolated from one another. In the more severe cases suppuration occurs, generally commencing in the loose cellular tissue around (periadenitis), so that when the bubo is opened, the glands are seen projecting into the cavity, surrounded and bathed with pus. Sometimes, however, it appears to begin in the interior of the gland, and occasionally in both places at the same time. It is said that when this happens the pus from the interior of the gland is infective, while that from the tissues around is not. Phagedenic and serpiginous buboes are met with exceptionally in very severe cases of syphilis combined with soft sores, or when the patient's health is utterly broken down. No constitutional symptoms ever follow a true soft sore, and the inflammation of the lymphatic gland is merely due to the absorption of pyogenic organisms, assisted by the retention of decomposing secretion or other injurious influences (Moullin).

Diagnosis.—Herpes præputialis presents the greatest difficulty. This very peculiar affection may occur after each attempt at coitus; it has even been known to follow nocturnal emissions; and though it may be more severe and more common in those who have suffered from syphilis, it is certainly met in those who are perfectly free from the disease. If there is only one vesicle, or two, perhaps, and the case is not seen until the epidermis is broken, there is no means of forming a diagnosis. If, owing to the enlargement and swelling of the prepuce, the existence of a sore is doubtful, circumcision must be performed; the need for this increases with the amount of redness and inflammation. The coexistence of syphilitic infection cannot be affirmed or excluded until the period of incubation (6 weeks at least) is past. See Syphilis.

Chancre	Chancroid
First lesion of a constitutional disease, viz., syphilis.	A local disease.
Due to syphilitic infection.	Due to contact with secretion from chancroid.
Generally a venereal infection.	Always a venereal infection.
May occur anywhere on the body.	Nearly always on genitals.
Period of incubation never so short as ten days.	Period of incubation always less than ten days (generally about three).
Generally single.	Generally multiple.
Not autoinoculable.	Autoinoculable.
Secretion slight.	Secretion profuse and purulent.
Slightly or not at all painful.	Generally painful.
As a rule only occurs once in any patient.	May reoccur in same patient.
Buboes are painless and seldom suppurate.	Buboes are painful and usually suppurate.

Treatment.—Local chancre spreads because of the poisonous character of its discharge. A single application of the acid nitrate of mercury leaves, as soon as the slough separates, a healthy granulating surface. So severe a measure as this, however, is rarely necessary, unless the sore is phagedenic and it is imperative to stop the progress at once. Ordinarily speaking, if the surface is well cleansed with an antiseptic wash and dried, and then dusted over with iodoform, night and morning, the character of the secretion changes immediately. Phagedena should be treated, as already mentioned, by the use of prolonged warm baths. Mercury is not required unless the healing of the chancre is unaccountably delayed or there is suggestion of syphilis.

CHANGE OF LIFE.—See Menopause.

CHARBON.—See Anthrax.

CHARCOAL.—Two forms of carbon are official: **Carbo Animalis**, *Animal Charcoal*—prepared from bone, occurring in dull black fragments or powder, odorless and nearly tasteless, insoluble in water or alcohol. **Carbo Ligni**, *Charcoal*—prepared from soft wood, and very finely powdered; is black, shining, brittle, inodorous, tasteless and insoluble. Dose, 10 to 20 grains. Charcoal is largely used as an absorbent for foul gases, as a deodorant and disinfectant. It is used in hyperacidity and flatulent distention, in chronic gastric catarrh, cancer, intestinal dyspepsia, and diarrhea. As a tooth-powder it is not so useful as chalk. It may be mixed with flaxseed for use as a disinfecting poultice to sloughing sores.

For flatulent dyspepsia:

℞. Powdered light charcoal, Heavy magnesia, } each, ʒ ij
Salicylate of bismuth, gr. lxx.

Divide into 24 powders. One before meals.

Preparation.—**Carbo animalis purificatus**, purified animal charcoal.

CHARCOT'S DISEASE.—Also called Charcot's joint, tabetic arthropathy, and neuropathic arthritis. This is a condition found in locomotor ataxia, and is anatomically identical with rheumatic gout. It is due to trophic disturbance, and is an inflammation of the bone and structures in and around a joint. The knee is the most often attacked. There is no constitutional involvement, and the disease begins acutely, often as a sudden effusion, which disappears after a time. The bones and cartilages are rapidly destroyed, the joint grates, and the softening and relaxation allow great range of movement, with ensuing deformity.

An apparatus to sustain the joint is necessary in the treatment of Charcot's disease, and resection may be necessary. Cotton-wool, covered with light and well-adjusted bandages, should be applied. Strips of buckskin covered with mercurial and ammoniacum plaster, and carefully applied, are useful for any stage. Remedies for the central nervous lesion must be employed as in ordinary locomotor ataxia, benefit being sometimes derived from silver nitrate, potassium, iodid, mercury, and codliver oil. Monobromated camphor is of value for the "lightning pains." Benign cases may altogether subside. See JOINTS (Diseases), AMYOTROPHIC LATERAL SCLEROSIS, LOCOMOTOR ATAXIA, etc.

CHARTÆ (Papers) consist of strips of paper medicated by impregnation of its fibers with medicinal substances or by being coated therewith. There is only one official paper, Charta Sinapis, which is made with sized paper, and is intended for external application as a vesicant or counterirritant.

Charta Sinapis.—black mustard, 100 gm.; rubber, 10 gm.; petroleum benzin, carbon disulphid, of each q. s. Before it is applied to the skin, mustard paper should be dipped in warm water for about fifteen seconds.

CHAUFFEUR'S FRACTURE.—This is a fracture of the forearm caused by a blow from the crank handle of a motor being suddenly thrown backward during the operation of cranking. It is practically a Colles' fracture. In favorable cases the displacement is slight, and the permanent result good; in severe cases the deformity is that of a typical Colles' fracture, and the treatment is that of the latter injury. See FOREARM (Fractures).

CHELOID.—SEE KELOID.

CHEST, DISEASES.—Diseases of the chest may be divided into certain groups, viz.:

1. Diseases of the walls or extending inward from them.
2. Diseases of the respiratory apparatus contained within the chest-walls: viz., pleuræ, trachea, main bronchi, and lungs.
3. Diseases connected with the circulatory system: viz., pericardium, heart, and great vessels within the chest, both arteries and veins.
4. Diseases originating in the mediastinal cellular tissue.
5. Diseases of the absorbent vessels or glands within the chest, of the thoracic duct, and of the thymus gland or its remains.
6. Diseases of the esophagus.
7. Diseases of any of the important nerves traversing the chest.
8. Diseases of the diaphragm.
9. Diseases encroaching upon the thoracic cavity from the abdomen or from the neck.

The particular diseases comprehended within most of the groups are very numerous, and are considered elsewhere under their separate headings. They may be mere functional disorders, to which the heart is especially prone, or organic diseases, common, and ranking high as causes of death. They may be either local or general. Physical examination constitutes an essential part of clinical investigation of the chest and its contents. It comprises inspection, palpation, percussion, auscultation, measurement, succussion, and the use of special instruments.

CHEST, EXAMINATION.—For the purpose of applying **physical methods of diagnosis** to determine the objective symptoms (physical signs) of diseases, the chest may be conveniently divided into 3 general regions—*anterior*, *posterior*, and *lateral*.

The anterior region is subdivided into the clavicular, supraclavicular, infraclavicular, mammary, inframammary, upper sternal, and lower sternal regions.

The posterior region is subdivided into the scapular, infrascapular (subscapular), and interscapular regions.

The lateral region is subdivided into the axillary and infraaxillary regions.

Boundaries of the Anterior Region

The clavicular region is that portion of chest covered by the clavicle.

The supraclavicular region is that portion of the chest situated above the clavicle. It contains the apex of each lung, with portions of the subclavian and carotid arteries and the subclavian and jugular veins.

The infraclavicular region has for its boundaries the clavicle above, the lower border of the third rib below, the edge of the sternum inside, and externally a line drawn *vertically* from the junction of the middle and outer third of the clavicle. This region contains the upper lobe of the lung and the main bronchi; on the right side, the superior vena cava and a portion of the arch of the aorta; and on the left side, a portion of the pulmonary artery. The clavicle usually corresponds with the first rib.

The mammary region is bounded above by the lower border of the third rib, below by the upper margin of the sixth rib, inside by the edge of the sternum, and externally by a vertical line drawn through the middle and outer third of the clavicle.

The contents on the right side are the right lung, the right portion of the diaphragm, a portion of the right auricle, a portion of the right ventricle; and on the left side, the lung and a small part of the right ventricle.

The nipple in the male is placed, in the majority of cases, between the fourth and fifth ribs, and in the center of the mammary region. A line drawn vertically through the nipple is termed the *mammillary line*. As this line is usually carried upward

to the center of the clavicle, it is also called the *midclavicular line.*

The inframammary region is bounded above by the sixth rib, below by the margin of the false ribs, inside by the sternum, and outside by the vertical mammillary line. It contains, on the right side, the liver, with a portion of the lung on deep inspiration; on the left side, the left lobe of the liver, the stomach, and a portion of the spleen.

The upper sternal region is that portion of the chest that extends from the suprasternal notch to the junction of the third costal cartilage with the sternum. It contains the ascending arch of the aorta, portions of the superior vena cava, the innominate veins, the subclavian arteries, the esophagus, and the trachea.

The lower sternal region is that portion of the chest that extends downward from the junction of the third costal cartilage with the sternum. It contains portions of the lung, right and left ventricles, liver, and stomach.

The *parasternal line* is a vertical line drawn midway between the edge of the sternum and the mammillary line.

Boundaries of the Posterior Region

The scapular region is that portion of the chest within the dimensions of the scapula. It contains on each side the greater portion of the lung.

The **infrascapular (subscapular) region** is bounded above by a horizontal line drawn across the inferior angles of the scapulæ; below by the twelfth rib; inside by the spinous processes of the vertebræ (*vertebral line*); and outside by the posterior border of the lower axillary region. It contains a portion of lungs on each side; on the right side a portion of liver and kidney; and on the left side a portion of intestine, spleen, kidney, and descending aorta.

The interscapular region is the space between the inner margin of the scapula and the spines of the dorsal vertebræ (*vertebral line*) from the second to the sixth. This region contains portions of lung, bronchi, esophagus, and descending aorta. The inferior angle of the scapula usually rests on the seventh rib.

The *scapular line* is a vertical line drawn through the center of the inferior angle of the scapula, while the arms hang by the side. It extends downward to a transverse line drawn through the inferior angles of the scapulæ.

The *vertebral line* is a vertical line drawn on each side of the spines of the vertebræ.

Boundaries of the Lateral Region

The axillary region is the space bounded above by a transverse line continuous with the lower border of the mammary region (sixth rib); in front by the external border of the mammary and inframammary regions; and behind by a line drawn vertically downward from the uppermost portion of the internal border of the scapula. This region corresponds to the upper lobes of the lungs and main bronchi.

The infraaxillary region is bounded above by the axillary region; anteriorly by the inframammary region; posteriorly by the infrascapular region; and below by the edges of the false ribs. This region contains the lower edge of the lung on each side. On the right is the liver and on the left the stomach and spleen.

The physical methods of diagnosis employed in obtaining the objective symptoms (physical signs) of disease of the chest are (1) inspection, (2) palpation, (3) percussion, (4) auscultation, (5) mensuration, (6) succussion.

Inspection

By inspection are recognized the changes in size, form, and symmetry of the chest, movement of muscular walls, with regard to rhythm, frequency,

1. Normal Chest. 2. Pigeon Breast. 3. Rickets. 4. Emphysema.—(*Greene after Gee.*)

and force. Special features to be noted are the apex beat, epigastric pulsation, and abnormal localized enlargements (aneurysm, gumma) and pulsations.

In applying this method of diagnosis the patient should be in a good light, either standing or in sitting posture.

Phthisical Chest.—Small in dimensions; the thorax is long and flat; the ribs oblique; the angles of the scapulæ project, giving the appearance of wings; the spaces above the clavicle are depressed; the divergence of the costal margin from the sternum forms an acute angle.

Rachitic Chest (Pigeon-breast).—The sternum is very prominent; the sides of the chest are flattened; there are often "beads" or nodules along the sternal ends of the ribs.

Emphysematous Chest.—Barrel-shaped; the thorax is short, with the anteroposterior diameter as long as the transverse; the ribs are at right angles to the sternum. The respiratory movements are diminished and the chest moves up and down as if in one solid piece.

Palpation

This method is employed by placing the hand upon and feeling the external surface of the chest. It detects tenderness, edema, *vocal or tactile fremitus,* and the amount of expansion. The back of the finger-tips is frequently more sensitive than the palmar surface, and comparisons should be made at times during examinations. Fremitus is produced by the vibration of the air below the vocal cords, beginning in the bronchi, thence to lungs, and finally communicated to the cutaneous surface of the chest.

The tactile fremitus (vocal fremitus) is greater in thin chest-walls, and is *increased* in abnormal consolidation of the lungs, such as is found in pneumonia and tuberculosis; and is *diminished* when there are thick chest-walls and when the pleura is separated from the chest by a liquid, as in pleurisy. The upper portions of the chest yield a stronger tactile fremitus than the lower, and the right apex vibrates more than the left. It is best developed when the patient produces deep intonations of the words "ninety-nine." In determining the modifications of tactile fremitus (vocal fremitus) on each side of the chest it is essential that the corresponding parts be compared. As before stated, often the dorsal surface of finger-tips detects more quickly these modifications than the palmar surface.

Percussion

This physical method of diagnosis is employed by striking the chest gently with finger-tips, or by means of a percussion hammer (plexor) with a piece of ivory (pleximeter) interposed. The patient is preferably examined in the standing position.

Immediate percussion is performed by simply striking the chest without an interposing substance.

Mediate percussion is performed when the finger or pleximeter is interposed.

The stroke is made by the middle finger or by the index- and middle fingers combined. The interposing finger or pleximeter must be pressed down firmly on the surface so as to yield a clear note. The method should be employed systematically on the two sides of the chest in corresponding locations, without moving promiscuously from one to the other position.

The percussion-note or sound possesses certain acoustic properties, as *intensity, pitch, duration*; and *quality*.

Intensity means the loudness of the sound, and depends upon the force of the blow, the thickness of the muscular walls, and the amount of air in the lung tissue. The intensity of the percussion-note is very great when there is tympany.

Pitch may be either high or low. The pitch of the percussion-note is always high over solid mediums, as over consolidation of lung tissue. Increased volume gives a low pitched note, while a diminished volume gives a high pitch. The pitch is normally higher over the apex of the right lung than over the left apex. A forcible expiration lessens resonance and lowers the pitch over the lungs.

Duration depends upon the pitch. If the pitch is high, the duration is short.

Quality in sound is that element by which one sound is distinguished from another. The quality of the note elicited by percussing over healthy lung tissue is called normal vesicular resonance, or pulmonary resonance.

A *resonant* sound indicates the presence of air; *dulness* indicates a more dense medium. Normal pulmonary resonance on the right side extends from 1/2 of an inch to 1 inch above the clavicle downward to the upper boarder of the sixth rib in front, and to a line draw through the tenth spinous process posteriorly. Normally, the right apex is somewhat less resonant than the left, both posteriorly and anteriorly, just as the right apex yields a stronger tactile fremitus and, on auscultation, slightly increased vocal resonance and bronchovesicular breathing.

On the left side pulmonary resonance extends from 1/2 of an inch above the clavicle downward within the mammillary line to the third rib; outside the mammillary line to the tenth rib, and posteriorly to a line drawn through the tenth spinous process.

Hyperresonance is observed in cavities, emphysema, pneumothorax, and excessive distention of stomach or colon. Hyperresonance is also present over a portion of the lung above the line of pleural effusion, and above the line of consolidation in a lung during the initial stage of pneumonia. In these conditions it is spoken of as *Skoda's resonance.*

Tympany (or tympanitic resonance) is a hollow or drum-like sound elicited by percussion over a large cavity filled with air, as in a dilated stomach or intestine.

Cracked-pot resonance is a modified tympany detected over a cavity or in pneumothorax.

Dulness or flatness is the opposite of resonance, hyperresonance, or tympanitic resonance, and is elicited by percussion over a medium more dense than the normal lung. It is also present in congested or consolidated lungs.

Percussion over the heart gives rise to dulness. Percussion over the region of the right lobe of the liver gives rise to flatness, because the medium is very dense. The quality of a note over a medium more dense than the normal lung will therefore give rise to dulness or flatness of the percussion-note, and there will be a corresponding high pitch, of short duration. If the medium is filled with gas, as in distended stomach, the quality of the percussion-note will give rise to tympany, which is of low pitch, great intensity, and prolonged duration.

Auscultation

The act of listening to sounds, especially over regions of the chest or the abdomen. When the ear is applied directly to the bare surface, it is termed *immediate auscultation;* and when the sound is conveyed through a stethoscope, it is termed *mediate auscultation.*

This physical method of diagnosis detects: (1) *vocal resonance;* (2) *adventitious sounds* (*râles* and *pleuritic friction sounds*).

Rules to be Observed.—As in percussion, the methodic way should be employed, by comparing the sound over the corresponding positions of the chest both during inspiration and expiration, after coughing, and while the patient repeats the words "ninety-nine." It is very essential that the patient remain as motionless as possible while the examination is being made. The examiner's body should not be bent at more than a right angle, for if the head is too low, the position is uncomfortable and the sounds are not distinct.

Auscultation of the Respiration

Normal respiration (respiratory murmur) is termed vesicular breathing or bronchial breathing, according to the area of lung to which the method

of auscultation is applied. Normally, vesicular breathing is best heard under the left clavicle, while normal bronchial breathing is heard over the region of the larynx and trachea, and to a less extent at bases of the lungs posteriorly. The respiratory murmur is made up of the two breath-sounds—inspiration and expiration. It is also termed vesicular or bronchovesicular breathing. The normal respiratory murmur is produced by the movement of the air within the bronchial tubes and air vesicles. It is characterized by a soft or breezy sound during inspiration and a rather short high-pitched sound during expiration. The expiratory breath-sound normally is not more than one-third so long as the inspiratory breath-sound.

The respiratory murmur may be modified in *intensity*, *rhythm*, and *quality*.

Modifications of Normal Respiratory (Vesicular) Murmur (Loomis).—

In **intensity** the respiratory murmur may be: (1) Exaggerated or increased. (2) Diminished or feeble. (3) Absent or suppressed.

In **rhythm** the respiratory murmur may be: (1) Interrupted. (2) Interval between inspiration and expiration prolonged (3) Expiration be prolonged.

In **quality** the respiratory murmur may be: (1) Bronchovesicular. Expiration slightly prolonged and high-pitched. (2) Bronchial, termed bronchial respiration. (3) Cavernous, termed cavernous respiration. (4) Amphoric, termed amphoric respiration.

Modification of Intensity of Respiratory Murmur. Puerile Respiration.—Heard over the lungs of children. In this variety of breathing the inspiration is loud, the expiration high pitched and prolonged.

Exaggerated Respiration.—In this variety the inspiration is soft or blowing, while the expiration is louder but not harsher than normal. In *health* it may occur after forcible breathing. In *disease*

TABLE OF BREATH-SOUNDS IN HEALTH AND DISEASE

(*Altered and enlarged from J. K. Fowler*)

Variety of Breathing.	Period.	Pitch.	Quality.	Interval.	Duration.	Intensity.	Where Heard.	Condition in which Heard.
Vesicular....	1. Inspiration.	Low.....	Vesicular...	None.....	.....	Variable....	Over the lungs, in health.	In health.
	2. Expiration.	Lower.....	Blowing....	.....	Shorter than inspiration or absent.	Faint or absent.		
Bronchial....	1. Inspiration.	High.....	Tracheal....	Distinct..	.....	Variable....	In *health*, over the seventh cervical spine. In *disease* over areas of consolidation.	In health; pulmonary tuberculosis, lobar pneumonia, large pleuritic effusions, thoracic aneurysm, mediastinal tumors.
	2. Expiration.	Higher.....	Tracheal....	.....	Equal to or longer than inspiration.	Greater.....		
Bronchovesicular.	1. Inspiration.	Higher than in vesicular breathing.	More or less tracheal.	Slight....	.....	Variable....	In *health, ant.*, over sternal portion of infraclavic. region; *post.*, upper part of interscapular region. In *disease*, over slight consolidation.	In health; pneumonia, pulmonary tuberculosis.
	2. Expiration.	Higher than in vesicular breathing.	More or less tracheal.	.....	About equal to inspiration.	Greater.		
Amphoric ...	1 Inspiration.	Low.....	Hollow and metallic.	Distinct..	.....	Variable....	Over a large cavity communicating with an open bronchus.	Pulmonary tuberculosis.
	2. Expiration.	Lower.....	Both characters more marked.	.....	Longer than inspiration.	Greater.....		
Cavernous...	1. Inspiration.	Low.....	Blowing and hollow.	Distinct..	.....	Variable....	Over a cavity communicating with an open bronchus.	Pulmonary tuberculosis.
	2. Expiration.	Lower.....	Both characters more marked.	.....	Longer than inspiration.	Greater.....		
Tubular.....	1. Inspiration.	Higher than in bronchial breathing.	Laryngeal or whiffing.	Distinct..	.....	Variable....	Over consolidated areas.	Lobar pneumonia, pulmonary tuberculosis.
	2. Expiration.	Higher.....	Laryngeal or whiffing.	.....	Equal to or longer than inspiration.	Greater.		

during vicarious breathing, or over healthy lung when the opposite one is affected.

Weak or feeble Respiration.—Inspiratory and expiratory breath-sounds weak. In *health* it may occur in persons with thick chest-walls, and in *disease* during the course of exhaustive disease—pleurisy, pleurodynia, incipient phthisis, pulmonary edema.

Modification of Rhythm of Respiratory Murmur.—Asthmatic respiration, that resembles bronchial breathing, but the expiration prolonged and wheezing.

Emphysematous Respiration.—The inspiratory and expiratory sounds are very feeble, and the expiration is prolonged, almost inaudible.

Cogged-wheel or Jerky Respiration.—A series of sounds jerky in character, most marked during inspiration. It occurs in asthma, first stage of pleurisy, pleurodynia, and incipient phthisis.

Modification of Quality of Respiratory Murmur.—Bronchovesicular Breathing. Inspiration diminished, expiration prolonged and heightened in pitch. It is heard normally over the right apex, and over areas of beginning infiltration or solidification, in early pulmonary tuberculosis.

Bronchial (or Tubular) Respiration.—Both inspiration and expiration are harsh and have a high-pitched (tubular) character. Bronchial breathing is heard in lobar pneumonia, phthisis, a lung that is doing vicarious work, as in pleurisy, tumor of the lung, syphilis, and hemorrhagic infarct of lung.

Cavernous Respiration.—Inspiration is low pitched and blowing in character. Expiration is power pitched than inspiration, and has a puffing or blowing sound.

Amphoric respiration is similar to the sound proeuced by blowing gently over the mouth of an dmpty bottle. It is present in phthisical cavity, pneumothorax with patulous opening, localized consolidation near a large bronchus.

Auscultation of the Voice

The patient should say "ninety-nine" continually during the examination.

Vocal Resonance.—Transmission of the vibrations of the voice to the ear during auscultation. Normal vocal resonance varies according to the position of the lung to which the ear or stethoscope is applied.

Vocal resonance is increased in *health* over the apex of the right lung. It is increased in *disease* in phthisical or pneumonic consolidation.

Vocal resonance is diminished in thick chest-walls, pleural effusions, emphysema, pulmonary edema.

Bronchophony.—Exaggerated vocal resonance. It is a special objective symptom of phthisis. It is heard normally over the thyroid cartilage. In conditions giving rise to bronchophony a thrill or fremitus is conveyed to the ear.

Pectoriloquy.—A complete transmission of the whispered words to the ear, the sound seeming to be produced at the spot where the ear or stethoscope is applied.

Pectoriloquy is heard over phthisical cavities, and in pneumothorax when the lung is patulous.

Egophony.—A modification of the vocal resonance, in which the voice has a nasal trembling sound like the bleating of a sheep. It is heard at the upper border of dulness in pleural effusions, most marked posteriorly at the inferior angle of scapula.

Adventitious Sounds During Auscultation

Adventitious sounds include (1) râles or rhonchi, (2) metallic tinkling, (3) pleuritic friction sound.

Râles, or Rhonchi.—These sounds are called adventitious, because they do not occur in health. A râle may, then, be spoken of as a *new sound* produced in the trachea, bronchi, bronchioles, airvesicles, or in phthisical cavities, and heard during either inspiration or expiration.

- Râles
  - Dry râles
    - Sonorous râles.
    - Sibilant râles.
  - Moist râles
    - Crepitant râles.
    - Subcrepitant râles.
    - Gurgling râles
      - Large or cavernous râle.
      - Small or mucous râle.

Dry râles are probably due to the vibrations of particles of viscid mucus in the air tubes as the air is inhaled or expelled. They are abundant in bronchitis and asthma, and may often pass away temporarily after coughing.

Sonorous râles are low-pitched, snoring sounds, and may be heard during inspiration, expiration, or both. The seat is in the larger bronchial tubes.

Sibilant râles are high pitched, musical, or whistling in character. They may also be heard during inspiration, expiration, or both.

Dry râles are abundant in bronchitis and asthma. Dry râles may often pass away temporarily after coughing.

Moist Râles.—These are due to the presence of fluid, generally having a more liquid character than in the case of dry râles. They are probably produced by the passage of air through blood, mucus, serum, or pus.

Crepitant Râles.—These are the finest râles heard, and only occur at the end of inspiration. Crepitant râles, when present, usually occur in great numbers. The sound is short and has a clicking character. It may be compared to the sound produced by fine hail as it strikes against the window-pane. It also resembles the sound produced by rolling the hair between the finger-tips.

The crepitant râle is considered pathognomonic of the first stage of pneumonia, when it is heard posteriorly over the base of the lungs. It is sometimes present in pulmonary engorgement, during the course of adynamic fevers, and in edema of the lungs. The crepitant râle may pass away temporarily after coughing.

Subcrepitant Râles.—These are moist râles produced in the finer bronchioles, usually of the same size and comparatively few in number. They are very likely produced by breaking of air bubbles as they are forced through liquid in the tubes. They are found in capillary bronchitis, pulmonary edema, and hypostatic congestion of lung;

when present at the apex of the lung, they often indicate incipient phthisis. The subcrepitant râle is heard during both inspiration and expiration.

Gurgling Râles (Large or Cavernous Râles).—These are large, bubbling sounds, produced in phthisical cavities. They also occur in the trachea, and in this location just before a fatal termination are popularly known as the "death rattle." They are heard in both inspiration and expiration.

Gurgling Râles (Small or Mucous Râles).—Smaller, bubbling râles, produced in the trachea and larger bronchi. This râle may pass away temporarily after coughing, and is heard during both inspiration and expiration. The mucous râle is present in bronchitis during the stage of secretion, in bronchial hemorrhage, and in phthisis. See RÂLES (Table).

Metallic tinkling is a bell-like sound heard in cases of pneumothorax or phthisical cavities, and is caused by the dropping of a liquid through the space inclosed in tense walls.

The succussion splash is the sound produced in pneumohydrothorax when the patient is suddenly shaken.

Pleuritic Friction Sounds.—Râles are produced within the bronchi or lungs, while friction sounds occur in the pleura. In health the two surfaces of the pleura are bathed in a natural secretion and the parts glide over each other without producing any sound; but in disease of the part they become agglutinated or roughened, giving rise to pleuritic friction sounds, having a grating, rubbing, grazing, creaking, or crackling character, and are pathognomonic of pleurisy.

They are heard during both inspiration and expiration, and do not pass away after coughing. The creaking or crackling pleuritic friction is often mistaken for a crepitant râle, and Tyson gives the following distinguishing characteristics: The friction sound does not pass away after coughing, while the crepitant râle may do so; the friction sound is more superficial and localized, while the crepitant râle is deep and more diffuse; the friction sound has a to-and-fro movement during inspiration and expiration, while the crepitant râle is only heard at the end of inspiration; pleuritic friction sounds are generally heard in the axilla or side of the chest, while the crepitant râle is most frequently posterior—often at the base of the lung.

Mensuration

Mensuration is that physical method of diagnosis by which comparisons are made of the two sides of the chest. It is usually determined by making circular measurements around the chest, selecting two bony prominences, one anterior the other posterior: as, for instance, the spinous process behind and the median line in front, on a level with the sixth costosternal articulation. The estimate may be made by means of a steel measure or by bending two strips of sheet lead (one on each side) around the body and drawing the outline on a sheet of paper. Quain's stethometer may also be used. The average circular dimension of the chest at the sixth costosternal articulation is 32 1/2 inches (Loomis). In right-handed individuals the right side of the chest is 1/2 of an inch larger than the left.

The left side of the chest may be increased in dimensions from congenital heart-disease, left-sided pleurisy or emphysema, or cardiac hypertrophy.

Succussion

This method is practised by suddenly shaking the patient and auscultating the chest, when, if fluid is present, as in pneumohydrothorax, a splashing sound is heard. Amphoric respiration is usually present.

Roentgenography

The discovery of the X-ray has added one more to our methods of examining the chest and thoracic organs. Up to the present time its chief value in the chest has been found in the localization of aneurysms, suspected but not demonstrable by ordinary methods of examination. Displacements of the heart may be studied by means of a roentgenogram. On the other hand, interpretation of the shadows obtained in different pathologic conditions—solidification, serous and purulent effusion, carcinoma and sarcoma—even by an expert is too uncertain for any reliance on roentgenography as a means of differential diagnosis. See ROENTGEN RAYS.

Association of the Physical Signs (DaCosta).

As many of the signs elicited by the various methods of physical diagnosis depend on the same physical conditions, they may be studied in groups. The following will usually be found to be associated:

PERCUSSION.	AUSCULTATION OF RESPIRATION.	AUSCULTATION OF VOICE.	VOCAL FREMITUS.	PHYSICAL CONDITIONS.
Clear	Vesicular murmur or its modification.	Normal vocal resonance.	Unimpaired	Lung tissue healthy or nearly so; at any rate, no increased density from deposits, etc.
Dull	Bronchial or harsh respiration.	Bronchophony	Increased	Solidification of pulmonary structure.
	Absent respiration.	Absent voice	Diminished or absent.	Effusion into pleural sac.
Tympanitic	Cavernous or feeble, according to cause.	Uncertain; cavernous or diminished.	Uncertain; chiefly diminished.	Increased quantity of air within the chest, due to a cavity or to overdistention of the air-cells.
Amphoric or metallic	Amphoric or metallic.	Amphoric or metallic.	Mostly diminished.	Large cavity with elastic walls.
Cracked-metal sound	Cavernous respiration.	Cavernous respiration.	Uncertain	Generally a cavity communicating with a bronchial tube.

CHEST, PAIN.—Chest pains may be due to:

Intercostal neuralgia, in which there is tenderness at points only. For neuralgia, strap the chest and give arsenic, with an occasional mercurial purge. Quinin acts best after mercury.

Rheumatism of the fascia, the whole region being tender.

Neuritis, in which there is circumscribed linear tenderness—neuroma.

Acute pleurisy, with chill, fever, and friction sound. Dry pleurisy; very common; the patient is relieved so surely by adhesive straps that the relief confirms the diagnosis.

Aneurysm, which, however, may not cause pain, even if large.

Ataxia and other spinal disease.

Bronchitic pain; calls for strapping and opium.

Myalgia; relieved by straps.

Mitral Disease; rarely painful. *Aortic disease;* generally painful.

Dyspepsia; diffusible, radiating pains.

Herpes zoster; pain may precede eruption for days.

Angina pectoris.—The pain begins in the precordia and radiates down the left arm, rarely the right, or both arms. Pain is intense, agonizing, so that the patient remains immovable while it lasts, and is accompanied by fear of impending death. Amyl nitrite or nitroglycerin relieves, and may sometimes avert an attack.

Pseudoangina, occurring in women; not relieved by nitrites, but instantly by chloroform.

Phthisis. Syphilis. Gout. Carcinoma.

CHEST, WOUNDS AND INJURIES.—Injuries may be classified as those of (1) the chest-walls; (2) the lungs; (3) the pleura; (4) the heart; (5) the thoracic duct; (6) the blood-vessels; (7) any combination of these.

The character of injuries will be in accordance with the wounds, which are divided into (1) incised; (2) lacerated; (3) gunshot; (4) contused; (5) punctured—(*a*) penetrating, (*b*) nonpenetrating; (6) nail wounds; (7) infected; (8) noninfected.

Wounds of the chest-walls are not generally serious, but when the thoracic viscera are involved, grave consequences often follow. Fractures and dislocations of the ribs or sternum, contusions of the wall of the thorax, and wounds involving the nerves, muscles, or vessels, may occur with or without injury to the subjacent viscera. In some cases it may be seen at once whether they have escaped or not; in others it is a matter of the greatest difficulty; but if there is the least doubt, the case should be treated as if the graver injury were present, and no attempt must ever be made, by probing or otherwise, to prove or disprove it. The finger may be used to explore for foreign bodies, or to ascertain the depth and extent of a penetrated wound, not to find out whether it penetrates or not. The deeper structures do not always escape when the external injury is apparently slight; the pleura may be bruised and become inflamed; there may be a contusion of the lung, with hemorrhage into the substance, causing pneumonia and even traumatic gangrene; or, without the pulmonary pleura being torn, the air vesicles may be ruptured and the air forced into the cellular tissue of the lung until it appears at the root of the neck (*interstitial emphysema*); and in young patients particularly, when the ribs are still elastic and the wall of the chest can yield without breaking, the lung and pleura may be lacerated, so as to cause pneumothorax or hemothorax, without external injury of any kind; even the pericardium and the heart may be crushed and torn.

Diagnosis.—In ordinary falls or blows an examination should be made to determine the existence or nonexistence of **fracture of the ribs.** For this purpose pressure and counterpressure exerted on the sternum and the vertebral column respectively will elicit pain at the seat of the fracture, should a fracture exist. Otherwise, the pain, if complained of, would be situated at the points of contact with the fingers used by the surgeon for the examination.

The injuries to the chest calling for special attention are those accompanied by **dyspnea.** A careful count of the number of respirations each minute will enable the physician to determine to some extent the involvement of lung tissue, while percussion, auscultation, and palpation may be practised with profit.

Railroad accidents are frequently attended by injuries to the respiratory organs and to the nervous system. The **stethoscope** may be employed over the apices of the lung.

The most frequent result of traumatism of the tissue is **emphysema,** a condition arising from the failure of the bronchi and lobules of the lungs to dispose of the air inspired, so that it is disseminated into the parenchymatous structure of the lungs. The presence of the residual air is a means of keeping up the equilibrium, but when thin partitions allow of the escape of air into the surrounding tissue, emphysema ensues.

Empyema, a collection of pus in the pleural cavity, frequently results from severe contusions and incised or lacerated wounds of the chest. The most frequent cause of empyema is tuberculosis, but the cases arising from injuries are many, and should be taken into account in making a diagnosis.

Hemoptysis indicates serious traumatism to the lung tissue. Blood may become extravasated in the thoracic cavity, in which case the condition known as **hemothorax** exists. This should be carefully eliminated in making a diagnosis.

Treatment.—In cases of fractures of the ribs or other serious injury of the chest, fixation is demanded. Adhesive strips may be stretched along the side of the chest including the line of any fractured rib. The whole chest, on one side may be rendered immovable by a broad piece of moleskin plaster that extends from the sternum to the spinous processes of the vertebræ. Rest is thus secured to the injured side, and repair takes place. The respiration is confined to the sound side of the chest.

In cases of **hematemesis** a resort to the following prescription may be advantageous:

℞. Fluidextract of ergot, ℥ j
Tincture of digitalis, ℥ j.
Take a teaspoonful every half hour until relieved.

Hypodermic injections of ergotin, morphin, nitroglycerin, and atropin are beneficial.

The **shock** from many injuries necessitates the use of strychnin, 1/30 of a grain, hypodermically. Of unquestioned value are also the following drugs: Aromatic spirit of ammonia, Hoffmann's anodyne, camphor water, carbonate of ammonium.

Turpentine is an excellent styptic, antiseptic, and anodyne whether applied externally or given internally.

Operative measures may be demanded in cases of empyema, hydrothorax, hemothorax, pneumothorax, or emphysema; or simply to arrest hemorrhage from incised, lacerated, or contused wounds.

Of great import is the **exploration of the thoracic cavity** for bleeding vessels. This may be done through a so-called "*trap-door*," which may be made in the chest-walls. Observations of great consequence may be made in injuries inflicted upon the heart, lungs, and blood-vessels, in which lesions may be repaired immediately after an injury. Observation of the pericardium may be made and even the heart may be seen to beat.

Injuries to the chest from **falls upon sharp objects**—*e. g.*, picket-fences—may be associated with **hernia of the lung or pleura.**

Hernia of the diaphragm may also result from the protrusion of the stomach or other viscera of the abdominal cavity through the stab wound involving the diaphragm.

Treatment consists in the prompt resort to the thorough exploration of the opening in the diaphragm and in the reduction of the hernia, with subsequent closure of the rent or wound in the diaphragm. The aperture in the diaphragm should be enlarged when the reduction calls for this procedure. It is very probable that the stomach may pass up when empty and require the use of the stomach-pump to evacuate its contents, in order to facilitate the descent into the abdominal cavity from the thoracic cavity. The most marked symptoms calling for this evacuation would be the continued tympanites upon auscultation above the eighth rib in front, and the absence of this behind, should the stomach have gone in front of the lungs; while at the same time the reverse might occur in cases in which the stomach had been pressed into the pleural cavity posteriorly, or when the viscus was in the posterior mediastinum.

The nausea and retching would be a prominent symptom, and, later, stercoraceous vomiting and singultus, and a sufficient reason for resorting to the stomach-pump before an operation was indicated. This reduction in size might cause a spontaneous reduction of the hernia.

Injuries to the thoracic duct may occur without the adjoining blood-vessels and nerves suffering, as shown in the report of a case by H. W. Lyne, of Richmond, Va. Recovery was complete, although a knife-blade had severed the walls of the thoracic duct by a longitudinal incision; it may be inferred that spontaneous cicatrization occurred, and no operation was thought necessary to suture the walls of the duct. The chyle was not examined microscopically, but was observed during the first dressings to be flowing through the external wound, situated near the upper border of the clavicle and near the sternal articulation. The interesting feature of the case was the complete cessation of the flow of chyle after the wound was packed with gauze on the basis of a tampon. The usual surgical dressings were afterward applied, and the man was examined 2 years afterward and found to be in perfect health. W. W. Keen has reported a somewhat similar case. A neoplasm of the thorax or any compression may cause rupture of the thoracic duct, and such injuries are likely to result in death, unless the flow of chyle can be stopped. The chyle is a necessary element of nutrition, and any great amount lost will cause death.

The chyle is emptied by the thoracic duct into the left subclavian vein at its union with the internal jugular vein, but there is no history on record of the rupture of the thoracic duct at this distal connection, when pressure is from within the chest-walls.

One of the most serious consequences of violence to the walls of the thorax is **rupture of the lungs.** A fall upon some solid body or the pressure of some heavy weight while the lungs are greatly distended by closure of the glottis induces rupture of the pulmonary tissue, with all the serious results of pneumothorax and hemoptysis. This may occur even without an abrasion upon the surface of the chest, and the history of such an accident is the only explanation of the grave condition within the thorax. A forcible impression upon the walls of the chest may fracture the sternum or ribs and drive either inward so as to lacerate the lungs or the heart, leading to immediate or remote serious effects.

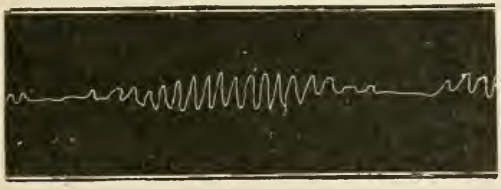
One of the grave consequences of an opening through the chest-walls is the protrusion of a portion of the lung, constituting a **pulmonary hernia.** If this should occur under the observation of a surgeon, he would find little difficulty in returning it and retaining it within by a compress. Hernia of the lung tissue through a stab wound of the intercostal spaces calls for immediate attention. The lung tissue itself may become gradually disintegrated, when it is necessary to ligate externally and to sever the mortified tissue. When the structure and vitality of the lung tissue is capable of restoration, an effort may be made to widen the aperture so as to replace the segment that appears externally.

The heart has also been sutured in case of penetrating wound.

The diagnosis, symptoms, and treatment of injuries of the special thoracic viscera are further discussed under their separate headings. See Empyema, Heart, Lungs, Pleura, Pleurisy, Ribs, etc.

CHEYNE-STOKES BREATHING OR RESPIRATION.—An undulating type of breathing. The respirations gradually become more frequent and deeper, until a certain point is reached, when they slowly become more shallow and less frequent, until the person seems to have finally stopped breathing. After a pause as long as half a minute respiration again begins very slowly, gradually increasing in depth and frequency. It ordinarily accompanies the coma of organic disease of the brain, apoplexy, tumor, uremia, opium poisoning,

myocardial degeneration and meningitis. It may also be observed in diabetes and various acute infections, such as cerebrospinal fever, septicemia, typhoid, pneumonia and the exanthemata. In normal children it may occur during sleep. It is usually a precursor of death.



Tracing of Cheyne-Stokes Breathing.

CHICKEN-POX.—See Varicella.

CHIGOE.—See Bites and Stings.

CHILBLAIN.—See Frost-bite.

CHILL.—A chill consists in a sensation of cold and of shivering, coming on within a few hours after exposure to cold or wet, but is frequently the initial symptom of grave acute disorders, such as pneumonia. It is a prominent symptom of various forms of malarial fever. Chills appear in typhoid fever sometimes with its onset, and occasionally at intervals throughout the course of the disease, and may be followed by sweats. They also occur in this disease with the advent of complications, such as pleurisy, pneumonia, otitis media, periostitis, etc.; with active antipyretic treatment by coal-tar remedies; and occasionally during defervescence, without any relation to any complication or sequel, when they are probably due to septic infection. They may even be a result of constipation (Herringham). Throughout the latter half of the attack chills may occur with marked severity.

Treatment.—Artificial warmth in all its multifarious forms—hot-water bottles and bags, blankets, hot air, hot drinks, etc.—is to be employed. In the malarial fevers quinin or some preparation of cinchona, preceded by an active cathartic, is indicated. See Rigor.

CHILL, POSTPARTUM.—A feeling of chilliness, or even a well-marked rigor, may occur shortly after the birth of the child. This is not significant of any beginning pathologic condition, and usually subsides spontaneously in a few moments.

CHILLS AND FEVER.—See Malarial Fevers.

CHIMAPHILA (Pipsissewa).—The leaves of an evergreen containing tannic acid and employed in atonic renal conditions, being probably the most active of the group including buchu, uva ursi, pareira, and scoparius. It is an agreeable tonic, excites the appetite, and promotes digestion. It is a good diuretic in dropsy, and is efficient in several forms of kidney disease with albuminuria, and in chronic catarrhal affections of the urinary passages, as hematuria, ischuria, dysuria, and gonorrhea. It is believed to check the secretion of uric acid, and externally has been applied to ulcers with benefit. The fluidextract is the official preparation, and is given in the dose of 10 minims to 1 dram.

CHINAPHENIN.—Phenetidin quinin carbolic acid ester. It combines the properties of quinin with those of phenacetin and is said to be free from any tendency to produce cinchonism. It is recommended in influenza, neuralgia, spasmodic and febrile conditions. Dose, 5 to 10 grains.

CHINOSOL.—Normal oxychinolin sulphate. A nontoxic antiseptic as powerful as mercuric chlorid and considerably stronger than phenol. As a germicide it is weaker than phenol and far weaker than mercuric chlorid. Dose, internally, 5 grains; as an antiseptic it is generally used in solution of 1 to 1000; as a nasal or vaginal douche 1 to 5000; as an eye wash 1 to 8000; with gradual increase of the strength of the solution.

CHIRATA.—The entire plant, *Swertia chirayita*. It resembles gentian in its therapeutic properties. It is a bitter tonic, possessing distinct influence over the liver, and is devoid of tannic acid, and, therefore, may be used with preparations of iron. In indigestion, with loss of appetite, when the liver is torpid and constipation present, it is useful. Dose of the powdered plant, 10 to 20 grains. C. **Fluidextractum.** Dose, 10 to 20 minims.

CHIRO-POMPHOLYX.—Dysidrosis; pompholyx; an ill-defined, inflammatory skin-disease, confined to the hands and feet, and characterized by the development of peculiar vesicles or blebs, arranged in groups. They are deeply seated and are distributed chiefly on the soles and palms and on the sides of the fingers. Itching, burning, pain, and stiffness are present. The disease is common in neurotic women in the prime of life; it is almost invariably recurrent, and is rare in winter.

CHLOASMA.—Chloasma is characterized by yellowish, brownish, or blackish pigmentation of the skin, occurring in variously sized and shaped patches or as a diffuse discoloration.

Symptoms.—The patches may be of any size, from that of a coin to that of the palm of the hand or larger. They are irregular or rounded, with fairly defined borders. They are usually fawn-colored, yellowish, brownish, or blackish (melanoderma). In the diffuse form the color merges imperceptibly into the surrounding skin.

The affection is most frequently seen upon the face.

Etiology.—There are 2 varieties: (1) idiopathic chloasma, due to external causes; (2) symptomatic chloasma, due to internal causes.

Under **idiopathic chloasma** may be included all the pigmentations that result from the use of local irritants, such as sinapisms, blisters, scratching, pressure, friction, solar rays, etc.

Symptomatic chloasma occurs in the pigmentation seen in association with visceral and general diseases, such as uterine disease and pregnancy, Addison's disease, tuberculosis, cancer, malaria, etc. In these cases the pigmentation is usually diffuse, and may involve large areas of cutaneous surface.

Chloasma Uterinum.—This is most commonly seen during pregnancy, although it is often observed in pathologic conditions of the uterus and the ovaries. The patches are yellowish or brownish in color and are usually located around the forehead and eyelids.

In **Addison's disease** the pigmentation is of a

brownish, olive-greenish, or bronze tint. The prelonged administration of silver may produce a permanent bluish-gray or slate-colored discoloration of the skin (argyria).

In rare cases a diffuse brownish pigmentation results from the long-continued use of arsenic.

Pathology.—The only change is an increased deposition of pigment in the mucous layer of the epidermis. It is not improbable that pathologic conditions of the sympathetic nervous system play an important rôle in symptomatic chloasma. Thus, in pigmentation resulting from affections of the abdominal viscera the solar plexus is probably implicated.

Diagnosis.—Chloasma may be distinguished from tinea versicolor by the presence of the former upon the face, the paucity of patches, the absence of furfuraceous scaling and of a fungous parasite.

The prognosis depends upon the removability of the cause. Local applications have, as a rule, but a temporary influence.

Treatment.—If the pigmentation is due to a systemic cause, this should, naturally, be treated.

Locally, the same measures are employed as in the treatment of Freckles. Duhring recommends:

℞. Mercuric chlorid, gr. vj
Compound tincture of benzoin, ʒ jss
Almond emulsion, ʒ iij.
Apply night and morning.

Or the following ointment may be employed:

℞. Ammoniated mercury, } each, ʒ ss
Borax, }
Oil of rosemary, ♏ x
Vaselin, ʒ j.

CHLORAL HYDRATE (Chloral).—$C_2HCl_3O + H_2O$. A crystalline solid composed of trichloraldehyd (chloral) with 1 molecule of water. It occurs in colorless, transparent, rhomboid crystals, slowly volatilizing when exposed to the air; of aromatic, penetrating, and slightly acrid odor, bitterish, caustic taste, and neutral reaction. It is freely soluble in water, alcohol, ether, chloroform, oils, etc., and liquefies when triturated with about an equal quantity of camphor, menthol, thymol, or carbolic acid. Its aqueous solution becomes acid, but the alcoholic solution remains neutral.

The dose varies much with individual susceptibility and with the presence or absence of cardiac and pulmonary disease. Death has been caused in several instances by 30 grains, in one case by 10 grains, and in another 7 1/2 grains produced alarming symptoms—all in adults. On the other hand, recovery has occurred after the ingestion of an ounce; several hundred grains have been taken at a time in more than one instance without fatal results; and when tolerance has been established by habitual use, 2 to 3 drams are frequently taken without poisonous symptoms. An average dose for a healthy adult is 15 grains; for a child, 1 grain for each year of age up to 6 grains. It is best given in syrup of tolu or in peppermint water.

Incompatible with *Hydrated Chloral* are: Acetanilid, alcohol, alkalies, ammonium salts, benzamid, borax, borneol, camphor, camphora monobromata, diuretin, euphorin, exalgin, glycerin (with heat), lead acetate, menthol, mercuric nitrate, mercuric oxid, methacetin, phenacetin, phenol, piperazin, potassium cyanid, potassium permanganate, potassium iodid, pyrocatechin, quinin sulphate, saligenin, salocoll, salol, sodium phosphate, thymol, urea, urethane. *Physiologically incompatible* are: Ammonium chlorid, atropin, brucin, caffein, cocain, codein, digitalis, phenol, physostigmin, picrotoxin, strychnin, thebain.

Caution is necessary when prescribing this drug in combination with alcoholic preparations, as the chloral is then very likely to separate as an alcoholate, especially if the bromids of potassium or sodium are used in the same mixture and if the solutions are at all concentrated. In this way great danger is incurred of giving a heavy overdose, as the alcoholate floats on the surface of the mixture, and the entire chloral contained therein may be taken at a single dose.

Chloral is a powerful hypnotic, an antispasmodic, an antiseptic, indirectly an anesthetic, and especially a depressant of the cerebral, medullary, and spinal centers and of the cardiac muscle. It is more hypnotic than chloroform, but less of an anesthetic. Applied to the skin or mucous membranes a 1 percent solution (5 grains to 1 ounce) is antiseptic, but strong solutions are irritant, and if taken internally, may excite gastritis, with nausea and vomiting.

Therapeutics.—Chloral must be used cautiously when weak or fatty heart, atheromatous vessels, or advanced pulmonary disease exists. It is very useful when combined with potassium bromid, and it is by far the best hypnotic in acute mania and delirium tremens. With potassium iodid it is of service in bronchial asthma, and in the nervous dyspepsia of neurotic persons, characterized by pain in the cardiac region of the stomach. It is very serviceable in fevers, when high temperature exists with excitement, restlessness, and a sthenic condition, as it lowers temperature and prevents the coagulation of fibrin. In the algid stage of cholera and in violent cases of cholera morbus it has been injected hypodermically in 15-grain doses, with extraordinary efficacy. In seasickness small doses (5 grains) 2 or 3 times a day are generally very efficient. In obstetrics it is used to relieve suffering, relax the os uteri, palliate convulsions, and relieve after-pains. In neuralgia it may be trituated with camphor and applied over the course of the affected nerve, and the same preparation is efficiently employed as a local application for toothache and earache.

Chloral is well borne by children, and is an excellent remedy for infantile convulsions and colic, chorea, whooping-cough, laryngismus stridulus, and the first stage of diphtheria, but it should not be used when the first sound of the heart becomes dull and weak. In these affections it may be given with paregoric, as its combination with opium enhances its value and guards the patient against its dangers. Its hypnotic power in adults is much increased by the conjoint administration of laudanum or morphin, and this combination is an excellent remedy in colic, cholera, and cholera morbus. In strychnin-poisoning chloral is the

antagonist. It is generally given by the mouth in very dilute solution, with some simple elixir, syrup of tolu, or cinnamon water, but is well absorbed by the rectum. Its hypodermic administration is liable to result in great local irritation, and even in sloughing ulcers.

Chloral may be applied to the skin as an antipruritic in the eruptive diseases, for which purpose it is well combined with carbolic acid, 10 grains of each to an ounce or two of water or oil. It is said to be the best of all local applications for boils—1 1/2 drams in 15 ounces each of glycerin and water constantly applied to the boil by a tampon of cotton. For ulcers and cancers a 25 percent solution is a good antiseptic and anodyne application.

The chief contraindication to the use of chloral is the presence of cardiac affection. Other contraindications are rosacea and hysteria of grave character.

In insomnia:

℞.	Chloral hydrate,	ʒ j to ij
	Potassium bromid,	ʒ ij
	Syrup of wild cherry,	ʒ j
	Water, enough to make	ʒ iij.

Dessertspoonful at night.

In spasmodic asthma:

℞.	Chloral hydrate,	gr. xv
	Peppermint water,	ʒ j.

To be taken every 3 or 4 hours.

For seasickness:

℞.	Chloral hydrate,	gr. xxx
	Camphor water,	ʒ j.

In poisoning by chloral give emetics in the early stage; or if later, use the stomach-pump, with external heat. Give strychnin in 1/20 to 1/10 grain dose, or atropin to stimulate respiration. Tincture of digitalis in 10-drop doses may be given hypodermically every 20 minutes. Ether and ammonia or brandy and whisky may precede these. The head should be lowered to the level of the heels to keep the blood in the brain.

CHLORAL HABIT.—Chloralism is easily acquired by those who have used the drug for insomnia, etc. The patient suffers from digestive and vasomotor disturbances, as evidenced especially by diarrhea, and erythematous eruptions; there is lowered temperature, mental and physical weakness and depression, muscular tremor, dyspnea, cardiac palpitation. Sudden withdrawal of the drug is hazardous.

Treatment consists in the gradual withdrawal of the drug and the administration of stimulants, tonics, massage, electricity, good nourishing food. For the insomnia, sulphonal, trional, or veronal may be tried.

CHLORALAMID.—A name incorrectly applied to chloral formamid. In doses of 10 to 30 grains it is a hypnotic usually efficient in simple insomnia. It seems to have no cumulative effect, or tendency to induce a habit.

CHLORALOSE.—Anhydro-gluco-chloral. It is a prompt hypnotic, producing sound sleep in which sensibility is not lost, and leaving no unpleasant after-effects. It depresses the cerebral functions, but excites the spinal cord, so that reflex activity is exalted by it. A dose of 10 grains has produced profound unconsciousness. The maximum dose is 5 grains, in capsule, and this may have to be repeated in not less than an hour.

CHLORETONE.—Chlorbutanol, acetone chloroform. A hypnotic, antispasmodic, anesthetic, and antiseptic, also narcotic in overdose. In moderate doses it promptly relieves gastric irritability, and prevents the nausea and vomiting due to ether or chloroform inhalation. As a hypnotic it is valuable in insanity and in cases of simple insomnia. In epilepsy it has been used with benefit, and it is frequently employed with cocain for the production of spinal anesthesia by subarachnoid injection, also in a 1 percent solution as a local anesthetic application in ulcers and wounds. It is considered by many authorities to be a dangerous narcotic in doses over 30 grains. Dose, 5 to 20 grains.

CHLORIN.—The gas is not official under its own name.

Preparations.—**Liquor Chlori Compositus,** *Compound solution of chlorin, chlorin water,* is an aqueous solution containing about 0.4 percent of chlorin, with some oxids of chlorin and potassium chlorid. It should be freshly made when wanted. Dose, 20 minims to 2 drams in water; as a lotion or spray 1 to 4 drams, well diluted. **Calx Chlorinata,** *chlorinated lime, chlorinated calcium oxid* (often improperly called chlorid of lime), is a compound resulting from the action of chlorin upon calcium hydroxid, containing not less than 30 percent of available chlorin. It occurs as a white or grayish-white, granular powder, of repulsive taste, partially soluble in water or alcohol, but when dissolved in diluted acetic acid gives off an abundance of chlorin gas. Dose, 3 to 6 grains in water; for external use a 1 to 3 percent solution. **Liquor Sodæ Chlorinatæ,** *solution of chlorinated soda* (*Labarraque's solution*), is an aqueous solution of several chlorin compounds of sodium, containing at least 2.4 percent by weight of available chlorin; prepared by adding together aqueous solutions of monohydrated sodium carbonate 65, and chlorinated lime 90, then adding water to 1000. Dose, 10 to 30 minims in 20 parts of water.

Incompatible with *chlorin water* are: Alkalies, ammonium salts, arsenous salts, bromids, ferrous salts, hypophosphites, iodids, lead salts, lime-water, mercurous salts, oxalic acid, silver salts; with *chlorinated lime* are fats, glycerin, iodids, oils; with *chlorids* are hydrogen peroxid, lead, mercurous and silver salts, nitric acid, sulphuric acid; with *chlorates* are ammonium picrate, arsenites or bromids in acid solution, charcoal, cyanids, ferrous salts in acid solution, gallic acid, glycerin, honey, hydrochloric acid, hypophosphites, hyposulphites, iodids in acid solution, iodin, iron (reduced), lycopodium, mercurous salts in acid solution, oxalic acid, phenol, phosphorous (amorphous) salicylic acid, shellac, starch, sugar, sulphids, sulphites, sulphuric acid.

Action and Uses.—Antiseptic; disinfectant; stimulating; intensely irritating to mucous membranes, especially those of the deeper respiratory

passages. Action mainly local, but aside from this it is thought to have a narcotic effect upon the brain. Chlorin is inferior to formaldehyd and sulphurous acid anhydrid as a disinfectant for rooms, because it is more difficult to apply in sufficient quantity, and it also has the disadvantage of injuring or bleaching fabrics. Fresh chlorinated lime is the best disinfectant for excreta, and is also excellent for drains, closets, urinals, etc. The chlorinated preparations are very useful for destroying fetor in scarlet fever, diphtheria, aphthæ and gangrene, and also in sloughing wounds and ulcers. Chlorin water is somewhat stimulating, and, well diluted, it has been used with good effect in the diarrhea of typhoid fever, especially in markedly septic patients.

CHLORODYNE.—A proprietary remedy supposed to contain chloroform, ether, morphin, cannabis indica, hydrocyanic acid, and capsicum.

A COMPARISON OF TEN FORMULÆ FOR CHLORODYNE, THE QUANTITIES BEING CALCULATED FOR EACH TO A FOUR-OUNCE MIXTURE, OR 1920 MINIMS.—(*Potter.*)

Articles.		Quantity of Each Article in a Four-ounce Mixture, According to the Formula of:									
		Squire, P.	Smith, Edw.	Chandler.	U. S. Disp.	Nat'l Disp.	P. D. & Co.	Whitla.	Bartholow.	Brit. Phar.	Collis Browne.
Morphin hydrochlorid.	gr.	1	16	16	32	33½	14	16	1 3/10	4	24
Chloroform	♏	236	192	240	372	375	207	240	247	240	240
Ether	♏	59	96	...	...	.....	...	120	62	60	....
Cannabis indica, tincture.	♏	....	...	...	348	250	207	20	.....	...	....
Cannabis indica, extract.	gr.	....	...	32	...	.....	...	...	.....	...	24
Hydrocyanic acid, 2 per cent.	♏	118	192	...	50	50	42	90	123	120	48
Ol. menthæ piperitæ.	♏	2	6	16	10	8	7	7	2	2	....
Capsicum, fluidextract.	♏	....	...	4	...	.....	...	...	.....	...	....
Capsicum, tincture.	♏	....	290	...	...	37	7	120	.....	...	....
Capsicum, oleoresin.	♏	....	...	...	4	.....	...	...	.....	...	....
Alcohol	♏	236	...	810	994	1010	690	...	247	240	....
Hydrochloric acid.	♏	....	...	...	126	62	...	30	.....	...	....
Sugar, burnt	gr.	....	...	...	...	.....	...	20	.....	...	....
Glycyrrhiza, extract.	gr.	147	...	...	...	.....	...	...	154	240	....
Acacia, mixture.	♏	....	384	...	...	.....	...	...	.....	...	....
Tragacanth, mucilage.	♏	....	...	...	...	.....	...	903	.....	...	....
Theriaca, or syr. fusci.	♏	236	760	...	...	.....	...	150	247	240	1632
Syrup	♏	....	760	...	...	.....	...	...	992	q.s	....
Glycerin	♏	1033	...	818	...	.....	760	...	.....	...	....
Water	♏	....	...	...	126	128	...	240	.....	...	....
Morphin hydrochlorid in 15 minims.	gr.	1/18	1/8	1/8	1/4	1/4	1/10	1/8	1/18	1/32	1/8

The various imitations differ widely. It is a powerful anodyne and narcotic, but very dangerous. Dose, 10 to 30 minims, *with care.* Unof.

CHLOROFORM.—Trichlormethane, $CHCl_3$. A heavy, colorless liquid obtained by the action of chlorinated lime in ethyl or methyl alcohol, or by that of an alkaline hydroxid on chloral. The commercial article, **C. venale,** contains 2 percent of impurities, and is unfit for administration. The **official form** consists of 99 to 99.4 percent by weight of absolute chloroform, and 0.6 to 1 percent of alcohol. Administered internally, chloroform produces narcosis and violent gastroenteritis. Chloroform has an agreeable odor and a sweetish taste. Its specific gravity is 1.526. It is excellent in true cholera and in similar diseases of the stomach and bowels. Externally, it is much employed as an ingredient of rubefacient and anodyne liniments. Mixed with a large percentage of air (1:3000) and inhaled, it is one of the most valuable of general anesthetics, but occasionally causes death by cardiac paralysis. For a full discussion of the anesthetic use of chloroform, see Anesthetics (General). Deep injections in the vicinity of the sciatic nerve are recommended in sciatica.

Preparations.—**C., Aqua.** Saturated solution. Dose, 1 dram to 1 ounce. **C. Linimentum** contains chloroform 30, soap-liniment 70. **C., Emulsum,** chloroform 4, expressed oil of almond 6, tragacanth 1, water to 100. Dose 1 to 4 drams. **C., Spt.,** pure chloroform 6, alcohol 94 parts. Dose, 10 minims to 1 dram, well diluted.

CHLOROMA.—Formerly known as "green cancer" and regarded as a rare variety of sarcoma, is now classed among the leukemias because it is the result of a leukoblastic hyperplasia resulting in the formation of atypical leukocytes or leukocytes corresponding to some one of the normal types. Chloroma differs from other forms of leukemia in its marked neoplastic type and in the green infiltrations and metastases. The bone-marrow is paler in color and there results an intense anemia. An infectious origin has been suggested. It is of a greenish tint, usually situated upon the periosteum of the bones of the head or upon the dura. It is sometimes found in the orbit.

CHLOROSIS. Synonyms.—Green sickness; primary anemia.

Definition.—A form of anemia in which there is an excessive reduction of hemoglobin over that of the reduction of red blood-corpuscles.

Etiology.—It generally occurs in women or girls under the age of 20. Faulty hygiene, tight lacing, mental anxiety, overwork and improper food are probably some of the many causes. Sir Andrew Clark laid stress upon constipation as a causative agent. Virchow has observed that a hypoplasia of the circulatory system is often present. Association with hyperchlorhydria is common. Chlorosis is more common when there is a disturbance of the menstrual organs.

Pathology.—There is hypoplasia of the aorta and arteries, and a defective development of the uterus and ovaries has also been found in many cases. The heart is often in a condition of hypertrophy, with dilatation.

Symptoms and Course. The Blood.—The blood as it flows from the puncture appears watery and pale and coagulates very quickly. Cabot states that the fibrin is not increased. The red blood-cells may be much deformed, but only slightly reduced in number (4,050,000), yet there is an excessive reduction in the percentage of hemoglobin, 41.2 percent being the average found by Cabot.

The color index is always low. The number of red blood-corpuscles may be estimated very quickly by the use of a hematocrit. Stengel and Cabot prefer the Thoma-Zeiss hemocytometer. See Blood (Examination).

The stained specimens of red cells show a great loss in coloring-matter. There is a great diminution also in the average diameter of the cells (microcytes).

Many deformed red cells (poikilocytes) are present, showing the high grade of anemia. Nucleated corpuscles, so apparent in pernicious anemia, are scanty in chlorosis. There is no leukocytosis.

The skin is tinged yellowish-green, hence the name "green-sickness." The circulatory system is much altered. Palpitation and breathlessness are often complained of. Commonly a systolic murmur is heard near the base of the heart, and a peculiar hum over the right jugular vein. The pulse is soft but of good volume. Nervous manifestations are often present, and hysteria may be a common symptom.

Complications.—Gastric ulcer, phthisis, exophthalmic goiter, and amenorrhea.

Diagnosis.—The early stages may be mistaken for tuberculosis. The other forms of anemia may be confounded with chlorosis, but a complete examination of the blood will clear up doubtful cases. See Blood (Examination).

Prognosis.—Under proper treatment the patient should recover.

Treatment.—Iron is the sheet-anchor in the treatment of chlorosis. Mass of the ferrous carbonate beginning with 15 grains a day and increasing to 30 or even 35 grains, is the classic treatment and may be given for weeks. The tincture of iron, in doses of 10 drops after meals, may also be given. Any of the other prescriptions recommended under the head of anemia may be of benefit. French observers highly recommend sea-water injections. See Anemia, Iron.

℞. Arsenic trioxid, gr. 1/3
Sulphate of strychnin, gr. 1/2
Mass of ferrous carbonate, ʒ ij.
Divide into 20 pills or capsules. One after each meal.

CHOKED DISC.—See Optic Neuritis.

CHOLAGOGS.—Those agents that stimulate the flow of bile and produce free purgation at the same time, the stools being green-colored, or "bilious," and liquid. Podophyllin is the type of this group. Calomel is the most reliable.

The alleged cholagogs are the mercurials, aloes, colchicum, colocynth, rhubarb, euonymin, podophyllin, iridin, and phosphate of sodium.

Cholagog pills:

℞. Resin of podophyllin, gr. vj
Extract of belladonna, gr. iij
Powdered pepper, } each, gr. xxiv
Powdered white sugar, }
Powdered acacia, gr. vj.
Make into a mass with glycerin and syrup and divide into 24 pills. One or two as required.

To secure the best cholagog effect it is advisable to combine an hepatic stimulant with an intestinal stimulant which shall produce increased secretion from the intestinal mucous membrane and excite peristalsis. The hepatic stimulants are bile, bile salts, sodium salicylate, colchicum, the phosphates, sulphate, phenolsulphate of sodium, mineral acids, arsenic, hydrastin, etc.

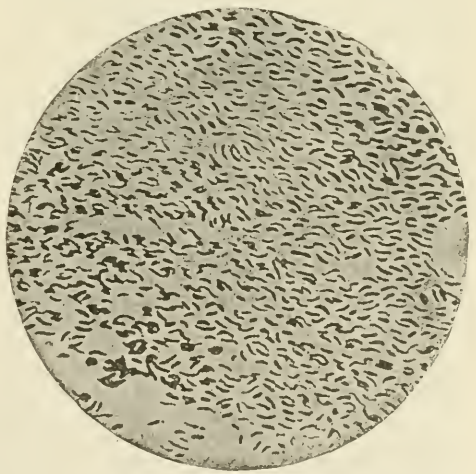
CHOLANGITIS.—Inflammation of the bile ducts. The acute catarrhal form is usually due to extension of inflammation from the duodenum. Suppurative cholangitis is caused by pyogenic organisms from the duodenum or conveyed in the bile. Chronic catarrhal cholangitis usually results from obstruction of the bile ducts by gall-stones, tumors, aneurysm, parasites, adhesions, prolapse of liver or kidney, strictures. See Gall-bladder (Diseases).

CHOLECYSTENTEROSTOMY.—See Intestines (Surgery).

CHOLECYSTITIS.—See Gall-bladder (Diseases).

CHOLELITHIASIS.—See Gall-bladder (Diseases).

CHOLERA, ASIATIC.—An acute infectious, epidemic disease, caused by Koch's comma bacillus,



Spirilla of Cholera, from a Culture on Starched Linen.—(*Fränkel and Pfeiffer.*)

and characterized by violent vomiting of a fluid resembling rice-water, with purging, and great wasting of the fluids and tissues of the body.

Period of Incubation.—Two to five days, as a rule. It may come on in a few hours.

Etiology.—The exciting cause is the **spirillum of cholera,** or the **comma bacillus of Koch.**

The spirillum of Asiatic cholera was discovered by Koch in the year 1884. It is a rather short bacterium, about half the length of the tubercle bacillus, somewhat broader, and usually curved.

The microorganism is exceedingly motile, and in the hanging drop is seen to move across the field of the microscope with great rapidity by means of flagella. Frequently two bacilli will be seen to join ends, forming a shape similar to the letter S.

The organism grows well upon artificial culture media, such as gelatin, potato, peptone bouillon, agar-agar, and milk. Probably the best medium is the gelatin, and its growth by the plate method is very characteristic. The isolated growths then appear as small white dotlets growing upward toward the surface and liquefying the medium, and causing small depressions with sloping sides. The growths have been compared to air-bubbles (McFarland). They stain well with ordinary aqueous solutions of anilin dyes—fuchsin being preferable.

In order to find the bacilli most abundantly a piece of the desquamated internal lining membrane of the bowel should be selected and stained in the ordinary way. The bacillus of Finkler and Prior, which causes ordinary cholera morbus, is larger and thicker, and grows differently on peptone bouillon. In order to cause the disease the organism must gain entrance into the alimentary canal through the mouth. Drinking water, milk, fresh uncooked vegetables, and fruits are the most common articles that convey the virus. The disease attacks old and young alike. The intemperate and debilitated are more susceptible. It is endemic in India, and is often carried by immigrants from this region to all parts of the world.

Pathology.—The face has a shriveled appearance (pinched features), and the whole frame is wasted to a great degree; the eyes are deeply sunken, the temples hollow, the nose pointed, the skin of an ashen color and shriveled. Rigor mortis sets in early, and is greatly prolonged; so strong is this change that the features may become entirely altered after death, and the body may assume new positions before interment. Occasionally the temperature rises 4 or 5 degrees while these changes are taking place. On section, the skin is devoid of serum; the blood is deprived of its watery constituents, and is thickened and darkened, being occasionally of a chocolate color in the vessels. The stomach and intestines contain a turbid material resembling rice-water, and are greatly congested, often showing ecchymotic spots where the epithelial lining has desquamated.

The liver and kidneys are normal in size and may show evidence of parenchymatous degeneration. The spleen is not enlarged. The heart is normal in size and flabby. The lungs are shriveled, collapsed, and devoid of blood except at the bases.

Symptoms.—(1) Stage of invasion, (2) stage of collapse, (3) stage of reaction.

Stage of Invasion.— Anorexia, headache, diarrhea, with colicky pains in abdomen, and generally borborygmus. Nausea and vomiting are not common. The temperature is generally normal. This stage may last a week or only a few hours and gradually disappear, when it is called *cholerine;* or it may be followed by the stage of collapse.

Stage of Collapse.—At this period the diarrhea is profuse, and large quantities of a rice-water material are ejected from the bowel with force and may be thrown several feet; tenesmus is usually absent. Copious quantities of the rice-water material are also forcibly ejected from the mouth and may be scattered over the attendants. Intense cramps often begin in the fingers and toes, extending to the calves of the legs and muscles of the abdomen. The temperature in the axilla is subnormal (90° F.), but the rectal temperature may show a rise of several degrees (103° or 104° F.). There is great weakness, the face and extremities appear shrunken, the eyes deeply sunken, the cheeks hollow, the nose pointed, the skin cold, clammy, and of a gray, ashen color, and the pulse very feeble. The urine is scanty and may contain albumin. This stage usually extends over a period of a few hours, when reaction sets in if a favorable termination is to be expected. Otherwise coma and death may ensue.

Stage of Reaction.—The bodily temperature begins to rise. The ashen-gray color gives way to a more normal hue; the urine, which has been deficient, is passed in increased quantities; the pulse becomes stronger; vomiting is less profuse and recurs at longer intervals; the stools assume a semisolid character; and convalescence is rapidly established. In this stage a typhoid condition may be developed, giving rise to a protracted illness, and finally death follows symptoms of uremia.

Diagnosis:

Cholera.	Cholera Morbus.
1. History of epidemic.	1. May occur at any time.
2. Due to specific organism.	2. Usually due to indiscretion in diet, especially late at night.
3. Evacuations in early stages free from tenesmus.	3. Tenesmus often great.
4. Material rice-water in character.	4. Often greenish cast.
5. Illness protracted.	5. Usually ends in recovery within a day or two.
6. Detection of comma bacilli by staining and culture methods.	6. Organisms are of a different character.

Prognosis.—In the beginning of an epidemic the death-rate is often above 70 percent; toward the

end it frequently falls to 30 percent. The disease is more severe in the young and the very old.

Prophylactic Treatment.—In a certain proportion of cases one attack protects from subsequent attacks. All cases must be isolated, and all clothes about the bed should be burned when taken out of the sick-room. Drinking water must be boiled, and the hands of the attendants thoroughly scrubbed with soap and water, then with a solution of bichlorid of mercury 1:3000. The dejecta should be thrown into a solution of carbolic acid 1:20, let stand half an hour, and finally buried. The bed linen should be boiled.

It should be remembered that fresh fruits and vegetables and salads are a frequent source of conveyance, and during epidemics of cholera should be thoroughly cooked before being eaten. All food and dishes should be screened from flies and handled only with clean hands. Dishes should be washed in boiling water and dried with sterile towels or by heat. Inoculation of cholera toxin or cholera vaccine, according to the Japanese method, apparently produces immunization.

The following **"Cholera Circular"** is used in the Philippines, and (with modifications) might be used anywhere:

Cholera can be introduced into the system only through the mouth. It is caused by organisms. too minute to be seen except with a microscope These organisms are readily killed by heat, and the disease may, therefore, be successfully combated by the proper use of fire and hot water, which are at the disposal of everyone.

To avoid cholera and prevent its spread, observe the following precautions:

1. Boil all drinking water and place it while hot in covered vessels. Do not dip up the water when needed, but pour it into drinking cups, otherwise cholera germs may get into the water from the hands.

2. Do not touch drinking water or food with the hands unless they have just been washed in water that has been boiled.

3. Eat only cooked food. Avoid all fruits, raw vegetables, and raw fish. Dried fish may be made safe by thoroughly heating. Fruits may be made comparatively safe by dipping them a few seconds into boiling water.

4. Flies may carry cholera germs on their feet from human excreta to food; therefore, to protect it from flies, cover all food immediately after it is cooked.

5. If cholera appears, build smudges under houses to drive flies away.

6. Boil all water used for diluting milk.

7. Cook all meats and fish thoroughly so as to heat the same throughout.

8. Keep kitchen and table dishes thoroughly clean and scald them before using.

9. Keep the place in which you live, the ground under the house, and everything pertaining to it, clean.

10. Outhouses, closets, and vaults can be made safe by putting in lime or carbolic acid. When this cannot be done, dejecta must be buried or thoroughly covered with earth.

11. Isolate all the sick. It is recommended that a house in each barrio be set aside for this purpose.

12. All the dead should be embedded in lime and buried three feet under the surface.

13. Filth, or vomit, and the dejecta of the sick should be promptly cleaned up with boiling water and buried.

14. Clothes and bedding used by sick persons must either be burned or boiled. Do not wash any clothes near wells or springs nor permit surface water to run into any well or spring.

15. Municipal presidents and municipal councillors should enact these rules as ordinances and see that they are enforced.

16. All school children are requested to inform their parents of these rules, which, if observed, will prevent great loss of life.

Treatment of the Attack.—To relieve the excruciating pains in the abdomen and extremities, hypodermic injections of morphin (1/4 grain) should be given every 4 hours if necessary. Phenyl salicylate has proved very beneficial given in doses of 5 to 15 grains every 2 or 3 hours. It may be combined with large doses of bismuth naphtholate or bismuth iodophthaleinate. Calomel also has been effective, an initial dose of 4 to 7 grains being given and followed by small doses at intervals of 2 hours.

Squibb's cholera mixture is composed of the following:

℞. Tincture of opium,
Spirit of camphor,
Tincture of capsicum, } each, ℥ j
Chloroform, ℥ iij
Alcohol, enough to make ℥ v.

Teaspoonful every 2 or 3 hours.

"Sun Cholera Mixture":

℞. Tincture of opium,
Tincture of capsicum,
Tincture of rhubarb, } each, ℥ j.
Spirit of camphor,
Spirit of peppermint,

A teaspoonful in water after each evacuation of the bowels.

For the extreme thirst, champagne or water containing cracked ice may be taken. Water acidulated with sulphuric acid or lemonade may be grateful to the patient, and may be taken in large quantities. Hot-water bags and fomentations should be applied over the abdominal region. For the feeble pulse, stimulants, such as whisky (1 ounce) or the aromatic spirit of ammonia (1 dram), may be largely diluted with water and taken every 2 or 3 hours. Possibly the best local application to the seat of disease is large quantities (2 quarts) of warm water containing laudanum

bed, and greatly disturbs sleep. It is best treated with such sedatives as potassium bromid. Camphor and opium, in the form of a pill or suppository, are of value (see CAMPHOR). The local application of cold, and a hot bath before going to bed, are highly recommended. A few drops of a 4 percent solution of cocain applied locally to the glans or injected into the urethra will frequently afford prompt relief. See GONORRHEA, PENIS.

CHOREA (St. Vitus' Dance).—Chorea is a subacute, nonfebrile disease, usually affecting children, and characterized by local or general irregular twitching and incoordinate movements of the muscles. It is a disease that is common in cities; less frequent in the country. It affects children, of all classes, chiefly between the ages of 5 and 15, and about in the proportion of 2.5 girls to every boy. Children with any neurotic heredity are more inclined to it than those in robust health and with sound family histories, but the heartiest are not exempt. It almost never occurs in pure-blooded negroes or Indians, and is rare in half-breeds, and mulattoes. It is of world-wide distribution, and with the exceptions noted, affects all races in every climate. More cases occur in spring and autumn than at other seasons. School pressure seems to exercise a decided influence, and subjects of this disease are usually children who are active-minded and stand well at school. Among exciting causes it is common to hear parents assign fright, slight injuries, and mental worries, but it is more than doubtful if such psychic causes have any direct influence upon the production of the disease. Reflex irritation (such as worms and nasal and genital irritation), and eyestrain were also formerly considered as etiological factors. Scarlet fever, whooping-cough, and measles are occasionally followed by attacks of chorea, probably owing to the impairment of tne child's system by these diseases, leaving it open to the attack. In young mothers, especially one bearing her first child, chorea is occasionally seen during pregnancy. A certain degree of anemia commonly accompanies chorea, although it is seen in robust children too often for anemia to be considered as having any causal relation to it.

The most important related condition is articular rheumatism. This is certainly a very frequent precedent phenomenon, apparently is not seldom a predisposing cause, though as yet it may not be said to stand in a direct causal connection with chorea. Of 554 cases studied by Osler on this point, 15.5 percent had a history of rheumatism in the family, 15.8 percent had at some time suffered with acute or subacute articular swellings; adding to these latter the cases doubttul in description, but probably rheumatic, the percentage reaches nearly 21. English authors place the percentage of occurrence of this complication at a much higher point even than this, but acute rheumatism is a much more common disease in Great Britain than in America.

At the Johns Hopkins Hospital there was a history of arthritis in 18.24 percent of 175 cases.

Symptoms.—The disease usually begins insidiously and with slight early manifestations. The child is noticed to twitch a hand, or the facial muscles move in grimaces, or it is observed to be dropping objects handled. For a week or more there is a little steady increase, then for 3 or 4 weeks the disease progresses more rapidly, or remains, in mild cases, at the same stage. Speech is very often affected from movements of the lips and tongue, of an irregular character, corresponding to those affecting the muscles of the trunk or limbs. In a developed case the child winks, grimaces, its hands can scarcely be used at all, it will even stumble in walking, and generally the movements are made much worse by attempts at voluntary motion. When at rest, the expression of the child is peculiar. A wistful, fixed look is common. Upon attempting to speak or smile, expressions of mirth, grief, or fright rapidly succeed one another, from the twitching of the facial muscles. One or both hands are in constant motion, the head is thrown about, and the trunk-muscles twitch the body. Movements are occasionally so severe that the child cannot feed itself; and in violent cases they may even recur with such force as to throw the child from its bed. Exceptionally, these irregular, incoordinate movements are replaced by a more or less constant tremor, sometimes coarse, sometimes fine. This may be present on one side of the body or on both, or may be small, fine, and rapid on the one side, and larger and slower on the other. Like the ordinary movements, this may be nearly continuous or may cease at intervals. Rhythmic tremors should, however, excite suspicion of a probable hysteric element.

Certain differences in the effect of will-control and of voluntary motion are to be observed in chorea that are interesting:

1. Certain cases, when at rest, present no movements at all, and only develop the incoordinate twitchings during muscular exertion. This may happen in either slight or severe cases.

2. The next group has continuous movements when no muscular exertion is made, which are greatly increased by muscular acts.

3. In another group the movements cease during intentional effort.

4. In a fourth group the movements are not at all affected by voluntary muscular effort, continuing, when the patient is at rest or when he makes exertion, at about the same grade.

Finally, it should be said that these differences in effect of voluntary effort are not continuous in any one case, but that any single instance of chorea may, in the course of the disease, present all these varieties of effect from voluntary effort.

Intelligence is not usually affected, except that the power of concentrated attention seems to be somewhat impaired. The temper alters greatly, the parents describing the children as irritable or even violent. Movements generally cease during sleep, but at times in severe cases they continue even then, or may keep the patient awake so constantly as to produce very serious effects.

Certain general symptoms are found in all cases; anemia has been mentioned, and this poverty of blood is further exaggerated by a poor appetite and by constipation, and if the case is a long one,

the child usually loses flesh. If close inquiry is made, it will be found that many cases, especially those suffering from the one-sided form (hemichorea), complain of vague pains in the trunk or limbs. In children old enough to describe their feelings headache will almost always be complained of. The electric reactions of the muscles are usually unaffected, or in occasional cases are slightly increased. In rare instances the reflexes are lessened or lost.

Course.—Typical ordinary cases last 6 weeks or less; many continue for 2 or 3 months. Occasionally a disorder of a very permanent character arises out of the first condition. Whether a case will last long or not may usually, but not always, be predicted from the severity of the symptoms. If the movements are very general, large, and constant, the case will be a long one. The reverse cannot always be said to be true, for many cases with but mild symptoms continue for months to resist the most careful treatment. The gravest possible complication in the course of an attack of chorea is the occurrence of disorder of the heart, which may take any one of several forms. Painstaking examination should always be made of the heart of children suffering from this disease, and the practitioner must not be content to examine through the clothing, but should strip the chest entirely naked, and see that the patient lies down for some minutes before the examination, in order that the heart, which is very liable to be overactive from the excitement of examination, may have time to quiet down. After examining in this way, the organ should be studied for the effect of exercise and of the erect position. The strictest attention needs to be given to the cardiac conditions, because young children are unlikely to complain of palpitation or to describe accurately the pains that may be present in the neighborhood of the heart. Rapidity, palpitation, and irregularity are tolerably frequent symptoms. If the movements are very severe and constant, there is often an excessive rapidity of the heart. A large percentage—probably not less than 30 percent—of all cases of chorea are found, if properly examined, to present some form of heart murmur. Functional murmurs are very frequent. The most common one is a basic systolic murmur, heard best at the pulmonary area. This so uniformly disappears when the patients are kept quiet in bed as to make it seem probable that it is due rather to overaction of the heart from the excitement of examination than to valvular disorders or hemic states. When the patient is anemic and enfeebled, a murmur, systolic in time and associated with a diffuse apex-beat, will be heard at the apex and in the pulmonary area and along the left edge of the sternum. It is very often only possible to hear these murmurs when the patient is recumbent; under such circumstances they may often be traced into the veins of the neck. Other less important murmurs may sometimes be detected. A mitral systolic murmur at the apex may occasionally be found; the split second sound is observed in a few patients. It is tolerably safe to assume that any murmur entirely basal in its distribution or heard *only* along the left margin of the sternum is functional in its character.

It must never be lost sight of in these examinations that a diagnosis of valvular disease cannot be made from the evidence of murmurs alone, however distinct in character and distribution they may be. The possibility of endocarditis requires the most serious consideration and study in every choreic patient. Not even acute rheumatism is more often associated with acute endocardial inflammation than is chorea. In the rare cases in which opportunity occurs for postmortem examination it is exceptional to find the heart of a choreic subject healthy. It is only by minute observation and close study that the presence of endocardial inflammation can be determined. The general symptoms of acute endocarditis are too inconstant and too slight for a basis of diagnosis; indeed, the physical signs themselves are too uncertain to be safely relied upon. The signs of slight dilatation of the left heart—viz., a diffused apex-beat, a slight increase of cardiac dulness to percussion—may be present; a mitral murmur, usually blowing in character and heard at the apex, if constant and not disappearing when the patient is erect, as functional murmurs are very likely to do, is a more useful sign. If in addition to this there should be fever, even if the rise of temperature is very slight, the diagnosis becomes more certain. A complaint of pain is of great importance, but it is rare to hear of it from the patient. Many attacks of cardiac disease in the course of chorea must pass unrecognized at the time, judging by the very large percentage of choreic cases that, when examined at a later date, present evidence of organic heart trouble.

In Osler's 140 cases examined more than 2 years after the attack of chorea, 51 3/7 percent had signs of distinct damage to the heart; 17 more cases he considers may be classed as functional disturbances. By no means all of his 72 patients suffering from cardiac disorder had had rheumatism, so that it must be concluded that heart-disease may occur and be serious in its results quite independently of rheumatic affection. Pericarditis occasionally occurs, but with much less frequency than inflammation of the lining membrane of the heart.

Diagnosis.—The diagnosis of chorea is an easy one, as there are few disorders with which it can be confused. The history of the beginning with slight and increasing movements, the age of the patient, the characteristic expression, can scarcely be simulated by any other disease, although in slight cases some question may arise of diagnosis from hysteric conditions. In fact, hysteric choreic movements are not uncommon, and probably the two neuroses are closely related. In hysteria the movements are more likely to be of a rhythmic character, and there is very often rigidity in addition. Convulsive tic may readily be differentiated, if the history is carefully examined.

Prognosis.—Chorea, in this country at least, is very rarely a fatal disease; in children it may be said almost never to end in death, and in adults but rarely. Under proper conditions the patients

recover entirely, usually without any permanent damage to the nervous system. In the more susceptible patients, or in those exposed anew to the operation of the same causes that brought about the original attack, relapses are likely to occur. One relapse is of quite frequent occurrence; 2, 3, or 4 attacks in the same patient are not unusual. The methods to be used in guarding against these recurrences will be considered under treatment. In 410 cases analyzed by Osler with reference to this point, 240 had but a single attack, 110 had two attacks, 35 had three, 10 had four, 12 had five, and 3 had six relapses.

Treatment.—The most important indication in the treatment is rest. If the case is a mild one, it is not necessary to put the patient to bed, but violent exercise or exciting games must be forbidden, and, among the poor at least, it is often easier to put a child to bed than to watch it carefully to keep it from overexertion. In the severer cases both rest and seclusion are essential, and in those in which anemia and debility are present, especially when the subjects are girls at the age of puberty, full "rest treatment" with all its details may be necessary. No other means will so soon or so easily bring about a cure as to place the patient in bed under proper care and restrictions. Attention must be paid to the diet, to remove all possible causes of irritation to the digestive organs, and to make sure that the patient receives wholesome and nourishing food of the best kind possible in his circumstances. Impairment of appetite is so common a feature that some insistence may be required upon this point. If sufficient ordinary food is not taken, it is well to direct that milk should be given in considerable quantities. Even if the case is not bad enough to warrant the child's being put to bed, it must, as a rule, be withdrawn from school during the continuance of the disorder and for some weeks after recovery. Candy, cake, and sweets must be absolutely proscribed, and the habits of the patient in regard to tea and coffee will often bear investigation, as it is not uncommon, especially among the working classes, for children of tender age to be dosed daily with tea and coffee of the same strength that their elders drink, and usually with disastrous results to their nervous systems. Such measures as these may be entirely successful without resort to drugs at all. It is not unusual to see a child after unsuccessful treatment for a week or two in the out-patient department make as much improvement during 2 or 3 days of complete rest in bed as would have required weeks of treatment had the patient been upon his feet. It is probable also that rest in this fashion diminishes greatly the chances of serious heart complications. If the movements are very severe, and the general twitching so great as to risk the child's being thrown from bed entirely, it is not safe to confine the patient by placing him in a crib, lest he injure himself against the headboard or sides. A safer measure is a soft mattress placed upon the floor, and guarded around with pillows and other mattresses.

A warm bath daily, especially if a little prolonged, will sometimes help to lessen the violence of the movements, and when it can be practised, systematic massage, in the form of deep but gentle and slow kneading of all the muscles, will be found useful and will add to the ease of cure. This is a method of treatment proposed by Lablache for this disease, and will greatly hasten the recovery. Descending galvanic currents may be applied to the spine with advantage. Sedative drugs, like bromids and chloral, should be altogether avoided unless absolutely required from the violence of the patient's jactitations. They have no effect on the course of the disease, and can only produce a temporary palliation, at the probable cost of disordered digestion and depressed nervous system. Indeed, it cannot truly be said that there is any safe drug that has much influence on the course of the disease or that decidedly lessens the movements. Arsenic in some form is the safest remedy for regular use in most cases. It is probable that it helps rather by its effects upon the general condition of the patient in modifying nutrition and improving digestion than that it directly controls the twitchings. The most available form is Fowler's solution, which may be ordered for a child from 6 to 9 years in 3-drop doses, well diluted, to be taken after food 3 times a day. The amount should be increased a drop every day, care being taken that the attendant understands that danger may result from too rapid increase of the drug, and comprehends clearly that "one drop every day" of increase does *not* mean "one drop at every dose." The person in charge should also be told that watch must be kept for possible symptoms of constitutional effect of the arsenic; the earliest is likely to be edema of the lower lids, or disturbance of the stomach or bowels, shown by vomiting, diarrhea, or pain. Pigmentation of the skin is now and then seen from the continued use of arsenic in this manner, but it is rare. Several cases have been observed of neuritis and troublesome consequent paralysis from long-continued administration of the arsenical solution. Children, however, bear arsenic rather better than do adults, and the solution may be increased in this fashion steadily until 12 or 14 minims 3 times a day are given, which is as high as it is desirable to go. If the child has borne this amount well, the dose should then be reduced to 10 drops 3 times a day, and this quantity continued for some weeks.

In out-patient practice, where visits are infrequent, often only once a week, it is a good rule to give clearly written or printed directions for the administration of the drug, with an added description of the possible bad effects, in order that the earliest symptoms of overdose may be noticed and the medicine stopped. Fowler's solution may be used hypodermically in proper doses by ordering it specially made without the addition of lavender, and this method is useful when the internal administration disturbs the stomach too easily.

If there is an extreme degree of anemia, as shown either by the pallor of the patient's skin and mucous membranes or by a functional cardiac murmur, iron may be advantageously given at the same time with the arsenic. Full doses will be required, such as 10 to 20 drops of the tincture 3

times a day in children 5 or 6 years old, or 5 to 15 grains of Blaud's pill of the subcarbonate after each meal in older patients. If expense does not forbid it, there are numerous elegant and useful forms of iron preparations available. None produce better results than freshly made pills of the subcarbonate, *when given in sufficient dose.* H. C. Wood used, and highly recommended, quinin in very large doses. Its favorable action he believed to be due to the fact that quinin is a stimulant to the inhibitory functions of the spinal cord, and he held that failure of spinal inhibitory power is a large element in the development of the choreic movements. There is, he says, an extraordinary tolerance of quinin in those cases in which it does good, and in one instance he gave as much as 1000 grains in a month to a child of 12 without producing cinchonism, but with cure of a chorea of 2 years' standing. The fluidextract of cimicifuga will sometimes succeed when other drugs fail; the preparation must be freshly made, and has the disadvantage of a most abominable taste and smell. It should be taken in increasing doses, beginning with 15 to 20 minims in a child 6 years old, until the point is reached at which it produces headache, dizziness, or gastric discomfort. Antipyrin has been recommended, but is scarcely a safe drug for constant administration. Trional or choralamid must be used if the sleep is disturbed.

Certain **complications** may require attention. Acute arthritic troubles should be treated, like rheumatism, with full doses of the salicylates, although the effect of this drug is less favorable in the arthritis of chorea than in ordinary acute rheumatism. Careful protection of the affected joints and local applications of laudanum may be needed. Endocarditis will require the placing of a frequently renewed ice-bag over the region of the heart, both to quiet the movements of the organ and to lessen the tendency to throw out exudate, and cardiac sedatives or mild anodynes may be given as required.

In order to prevent relapses great care of the child's general health will be needed, especially in the spring following the attack. The danger of exciting a return of the symptoms by overexertion, either physical or mental, must not be forgotten, and it is wise to direct that a patient be brought back for inspection, even when seeming perfectly well, during the early spring. In such cases, if the health appears not to be first-rate, the administration of sufficient doses of iron, perhaps with the addition of arsenic, may prevent a relapse, or, as Wood suggests, full doses of quinin.

Of the other diseases sometimes classed under the head of chorea it is necessary to say but a few words.

Chorea major includes those affections in which violent choreic movements, often general and simulating coordinate purposive actions, occur. The epidemics of chorea major described for many centuries by various writers have no doubt been largely hysteric. Indeed, it is difficult in most of these cases to separate the real from the hysteric disorder. **Salaam convulsions**, the **dancing chorea** of Laycock, and the **jumpers** of Maine and Canada, described by Dr. Beard, may be included under this classification; but the treatment is wholly moral or suggestive, except in those cases in which the hysteric element preponderates, when the general principles of treatment of hysteria would apply.

Electric chorea, as ordinarily described, is nothing but a violent form of the ordinary St. Vitus' dance. The name was originally used by an Italian observer, Dubini, for a fatal progressive disease bearing little resemblance to the ordinary chorea of childhood.

Hereditary chorea, or **Huntingdon's disease**, resembles chorea only in its movements. It is seldom seen except in adults. It is always hereditary, tends to grow worse, and is accompanied by steady mental failure, ending in total dementia. The vital points of difference are that while the movements resemble those of ordinary chorea, they are much more constant, are almost impossible to control by the will, and they are more steadily regular or rhythmic. As no cases of recovery are known, and no treatment seems to affect the course of the disease, it need not be further discussed here.

Hysteric Chorea.—Movements of choreic nature are occasionally seen in various classes of hysteric patients. They may affect one part of the body, sometimes even the muscles of the larynx. The spasm is usually rapid and rhythmic—two characters by which hysteric movements may be distinguished from those belonging to Sydenham's disease—and there is often, though not constantly, some degree of rigidity of the affected limbs.

Habit chorea, or habit spasm, as Gowers prefers to call it, is more nearly related to true chorea than the hysteric forms of choreic movement are. Its origin is nearly always in an acquired trick or habit of movement; it may affect any part of the body, sometimes limited to the smallest possible group of muscles, or even to a single muscle, sometimes affecting the whole of a limb, or appearing as a frequent, noisy breathing, or as blowing, whistling, a cough, a snuffle, shrugging of the shoulder, winking of one or both eyes, movement of the jaw, or some trick or play of the hands.

The treatment of such cases is not so hopeless as some writers upon the subject seem to think, but it certainly requires both minute care and great persistence on the physician's part as well as on the patient's. The first necessity is the bringing of the patient's health to the highest possible level by every means at our disposal. The second is, after having inculcated thoroughly the lesson of self-control and insisted upon it, to require the victim of habit to make many times a day for short periods the *effort* to stop the manifestations of his disease. Even if for a time no success attends his attempts, he must be encouraged, and made to understand that even to *try* to overcome his habit produces a good effect. It will soon be found that he will be able for a certain number of minutes to restrain the disposition to movement. Probably at first these periods of self-control will be followed by increase of the habitual trick, but no attention need be paid to this. Careful gym-

nastic movements of the affected muscles, massage, and constant encouragement will in the end succeed with any but the most inveterate cases.

A certain degree of success has been gained from hypnotic suggestion—a method scarcely safe, however, in cases of susceptible children. With adults, under proper control, less hesitation in its use may be felt.

CHORION.—The outermost of the fetal membranes. It lies between the amnion and the deciduæ reflexa and vera. A great number of minute finger-like projections (*chorionic villi*) develop on its outer surface, giving it a peculiar branched, bushy appearance. These villi are hollow at first, but later they contain blood-vessels and project into the decidua. About the third week of gestation the chorion is joined by the *allantois*, the whole forming the *complete chorion*. During the second month of gestation the villi projecting into the decidua reflexa atrophy (*chorion leve*), while those projecting into the decidua serotina hypertrophy (*chorion frondosum*). These latter form the fetal portion of the placenta.

Origin.—From the nongerminal layer of the epiblast.

Function.—The chorion leve protects the integrity of the ovum, while the chorion frondosum supplies nourishment to the early embryo.

Anomalies.—Occasionally there is failure of atrophy of that portion of the chorion that normally occurs, there being, instead, hypertrophy of the villi over the entire surface of the chorion. This gives rise to the formation of a placenta much larger in area and much thinner than normal (*placenta membranacea*).

Cystic Degeneration of the Chorionic Villi.—This is a rare myxomatous degeneration of the villi, with the formation of small, grape-like cysts. It occurs once in about 2000 pregnancies.

The causes of this peculiar affection are difficult to determine; probably some interference with the blood supply to the villi may occasion it. It sometimes shows a tendency to recur in the same individual.

The symptoms usually develop about the third month, with rapid increase in the size of the uterus, pain, nausea, hemorrhage, some rise of temperature, and possibly the extension of small, blood-covered cysts from the os uteri.

The diagnosis can only be made positively by the discovery of the characteristic grape-like masses.

The prognosis is rather grave, about 13 percent of patients losing their lives. There is sometimes a marked tendency to perforation of the uterine wall, the disease thus becoming malignant in character. Other dangers are sepsis and hemorrhage. The fetus is usually destroyed and frequently entirely absorbed.

The treatment should consist in complete and thorough evacuation of the uterus as soon as the condition is recognized. Care should be exercised in the use of the curet and placental forceps, as the uterine wall may be extremely thin.

Fibromyxomatous Degeneration.—This is an extremely rare condition, characterized by a fibroid formation in the connective-tissue portion of the chorion at the placental site. Subsequently the fibroid nodules undergo myxomatous degeneration. The condition is usually not recognized until after labor or abortion has occurred.

Inflammation (Chorionitis).—The chorion is subject to acute and chronic inflammation. The chronic variety is frequently syphilitic in origin.

CHOROIDITIS. Causes.—Inflammation of the choroid results from general diseases, such as syphilis, tuberculosis, scrofula, chlorosis, rheumatism, and gout. Senile choroiditis is probably preceded by choroidal apoplexy. Suppurative choroiditis is due to traumatism with infection; to metastatic infarction, empyema and endocarditis; and to severe infectious fevers. (See Colon Bacillus Infection.) High myopia, by causing extreme stretching of the choroid, often gives rise to a local or diffuse inflammation. Choroiditis may be an accompaniment of inflammation of the iris and ciliary body.

Varieties.—For convenience, choroiditis may be divided into the **exudative** and **suppurative** varieties, although many subdivisions, such as *disseminated, syphilitic, arcolar, central, guttate,* etc., have been studied pathologically.

Exudative choroiditis is distinguished by the impairment of vision due to the simultaneous involvement of the retina, and by the changes noticed with the ophthalmoscope. The disease runs its course without pain and without external symptoms, and the patient is only aware of his affection through the impairment of vision. It must be remembered that there is no definite relation between the amount of visual disturbance and the changes noted in the fundus. Alteration in the field of vision, the appearance of scotoma, metamorphopsia, night-blindness, flickering spots, and progressive lessening of the visual acuity are the most important subjective symptoms. The ophthalmoscope shows the presence of numerous dispersed patches in the fundus, thickly strewn near the equator, gradually diminishing toward the macula and optic disc, these being generally free from disease. If fresh, the patches are round, sharply defined, much smaller than the disc, and yellowish-red, lighter in color than the fundus. In addition, there are yellowish-white streaks along the vessels. As the disease advances the patches become larger and coalesce into irregularly shaped figures, showing the white sclerotic beneath, surrounded by hypertrophied pigment epithelium of the retina. In the majority of cases permanent white patches are left, either due to exposure of the sclera or to reflection from cicatrices. The optic disc is generally slightly red and cloudy. The term **disseminated choroiditis** is often applied to cases in which the spots in the fundus are numerous and diffuse. **Areolar choroiditis** consists of black patches and small pigment-blotches, gradually changing to whitish blotches with black edges. It is confined to the posterior pole of the eye, and endangers central vision. The **central** variety is located directly at the macula. Sometimes retinal vessels can be traced over spots of choroidal atrophy, showing that the choroid is the primary

seat of the lesion. The vitreous is generally clear, and good ophthalmoscopic images are obtained.

Syphilitic choroiditis is diagnosed by syphilitic history and speedy reaction to mercurial inunctions; the most characteristic symptoms are night-blindness and circumscribed scotomata in the field of vision. Vitreous opacities are also said to be more numerous in this variety.

Suppurative choroiditis begins with hemorrhage into the retina and choroid, which is soon followed by purulent infiltration of the whole interior of the eye. Externally, the lids and conjunctiva are red and swollen, and are covered with a purulent secretion; the cornea is hazy, and there may be hypopyon; the iris is inflamed, the pupil appears yellowish, and the eyeball is hard. The patient suffers intense pain, has acute febrile symptoms, and is blind in the affected eye. Viewed by the ophthalmoscope, the golden reflex, due to the exudative material thrown out between the choroid and the retina, confirms the diagnosis, although in children it may be mistaken for glioma of the retina. The inflammation may subside, but it is rare for any visual perception to be preserved. In the malignant form panophthalmitis ensues, and the whole eye becomes an abscess-cavity, and is lost. The infection may often be metastatic.

Myopic choroiditis is due to the ectasia or staphyloma of the sclera at the posterior pole, and is usually present in high degrees of myopia, and always in progressive myopia. The increased "myopic crescent," producing an enlarged blind spot, and the ordinary symptoms of myopia associated with the atrophic changes of the choroid, furnish a ready means of diagnosis.

Anterior sclerochoroiditis involves the anterior part of the choroid, inaccessible to the ophthalmoscope. It is differentiated from episcleritis, which is a benign local disease, while the former attacks the cornea, iris, and anterior portion of the vitreous, finally causing anterior ectasia of the sclera.

Prognosis of choroiditis is, on the whole, unfavorable. In the exudative variety and in high myopia it is only possible to retain part of the vision. In case of large ectasia there is constant danger of increase in inflammation and glaucomatous symptoms. If anterior ectasia is produced, blindness follows through flatness and opacity of the cornea, increased tension, and distortion of the eyeball. In suppurative choroiditis the eye may be preserved, but vision is inevitably lost.

Treatment of choroiditis must be directed toward any discoverable cause. In all acute cases, whether syphilitic or not, in which the patient is in fairly good health, mercurial inunctions should be begun. In debilitated cases constitutional and tonic treatment should be instituted, diaphoresis provoked, potassium iodid administered, and rest, with smoked glasses, ordered. Confinement in a dark room is unnecessary. In tuberculosis of the choroid, tuberculin treatment combined with the usual general measures of combating tuberculosis should be instituted. (See TUBERCULOSIS, ACUTE MILIARY.) In subacute or chronic cases, administration of the following is advised:

R. Mercuric chlorid, gr. ij
Extract of belladonna, gr. iv.
Make 40 pills; take 1 pill 3 times a day.

In the suppurative variety no more can usually be done than to quiet pain by narcotics or by the local use of atropin and hot compresses. Serum or vaccine therapy (*q. v.*) should be tried. If the eye is a virtual abscess it should be incised or enucleated under the strictest antiseptic precautions. In the anterior variety tension must be carefully watched, and if excessive, may be relieved by corneal puncture or iridectomy.

Tuberculosis of the choroid is of two forms, the first manifesting itself in small, whitish-yellow spots that are minute tubercles near the posterior pole of the eye; many are too small to be visible by the opthalmoscope. The second form is a spheroid tubercle causing detachment of the retina, and possibly inflammation of the eye. It is to be distinguished from sarcoma of the choroid, but in both cases enucleation may be peremptorily demanded.

Sarcoma of the choroid develops slowly at first, but later on involves the surrounding tissue with great rapidity. In the first stage, the only subjective symptom is disturbance of vision, the eye becoming more myopic, and distortion of images ensuing. The sarcoma is usually at the posterior pole. Viewed by the ophthalmoscope, as a rule, nothing but retinal detachment is distinctly elicited. In the second stage severe pain caused by increased tension is noticed, and total blindness ensues. The mediums become so cloudy that no reflex is obtainable. After this the growth penetrates the sclera, the whole eye becomes a malignant mass, and even if metastasis has not occurred, the patient may die of exhaustion. The disease is unilateral, and should be distinguished from glaucoma, in which there is no retinal detachment; and from simple retinal and choroidal detachment, in which there is no increase in tension. It is generally followed by sarcoma of the liver. The more fibrous the tumor, the less the liability to metastasis. As soon as the disease is recognized, the eye should be enucleated and the orbit thoroughly cleaned out, as death will speedily ensue if the disease is allowed to continue.

CHROMATOPSIA.—See COLOR BLINDNESS.

CHROMIDROSIS.—A rare condition of the sweat, in which it is variously colored, being bluish, blackish, reddish, greenish, or yellowish. *Black sweat* (*seborrhea nigra*) occurs usually in hysteric girls, the part affected being the face. It is associated with chronic constipation, and is due to the presence of indican in the sweat. *Red sweat* (*hematidrosis*) may be due to an exudation of blood into the sweat-glands or to the presence of a microorganism in the sweat. See SWEAT-GLANDS.

CHROMIUM TRIOXID.—Chromic acid, or, more properly, chromic trioxid, occurs in small, crimson, needle-shaped crystals, deliquescent in moist air, very soluble in water. It should be kept in glass-stoppered bottles, and great caution should be observed to avoid bringing it in contact with organic substances, such as cork, tannic

acid, sugar, alcohol, glycerin, etc., as dangerous accidents are liable to result. It is not used internally.

Preparation.—Potassii Dichromas, *potassium dichromate*, $K_2Cr_2O_7$—large, orange-red prisms of disagreeable, metallic taste and acid reaction, soluble in 10 of water at 59° F., an in 1 1/2 of boiling water, insoluble in alcohol. It is used locally in aqueous solution (5 to 60 grains to the ounce); and internally in doses of 1/10 to 1/2 grain, in trituration.

Incompatible *with chromic trioxid* are: Alcohol, bromids, chlorids, ether, glycerin, hypophosphites, iodids, oxalates, sulphids, tartrates; with *chromates* are the salts of barium, bismuth, lead, manganese, mercury, silver, and strontium; *with dichromates* are many alkaloids, also tannic acid, sugar, and other oxidizable substances.

Chromic trioxid is a powerful escharotic and penetrates deeply, but it is slow of action and is not very painful. It coagulates albumin and parts readily with its oxygen, oxidizing organic matter and decomposing ammonia and sulphuretted hydrogen; and is therefore an energetic disinfectant and deodorizer. When used as a caustic it is mixed with sufficient water to make a paste, which may be employed for the destruction of warts, hemorrhoids and other superficial growths; the neighboring parts being protected by cotton soaked in a strong alkaline solution. For syphilitic warts and condylomata, lupus, tinea tonsurans, etc., a solution of 100 grains to the ounce of distilled water is generally used. A solution of 1 in 40 is an excellent and inexpensive antiseptic lotion for putrid sores and wounds, syphilitic affections of the tongue, mouth and throat, ozena, leukorrhea and gonorrhea. In uterine catarrh and hemorrhages, a solution of 120 grains to the ounce has been injected into the uterine cavity with good results.

Potassium dichromate is a good antiseptic and escharotic of milder action than the trioxid. In doses of 2 to 4 drams it has proved fatal to life in adults, with symptoms of gastroenteritis, suppression of urine, and cardiac paralysis. It is chiefly employed as a local application in saturated solution to warts and venereal condylomata; and in dilute solution (1 to 10 grains to the ounce) for catarrhal conditions of the nasal, buccal or vaginal mucous membrane. Internally it has been employed with benefit in locomotor ataxia and in dyspepsia simulating gastric cancer; also in chronic gastric catarrh, the tongue having a thick yellow coat, in chronic diarrhea from intestinal ulceration, and in chronic ulcers of the pharynx and mouth. It is a good remedy in syphilitic sore throat, local rheumatism of the fibrous tissues, periosteal and syphilitic rheumatism, and acute catarrh and influenza, chronic nasal catarrh, chronic laryngitis, and chronic catarrhal affections of the bronchial mucous membrane, especially when the expectoration is tough and stringy. It has also been used with some success in diphtheria. In pharmacy it is employed in preparing chromic trioxid and valerianic acid, and as a test solution. Most of the medical galvanic and faradic batteries are run by a mixture of this salt with sulphuric acid.

CHROMOPHYTOSIS.—See TINEA VERSICOLOR.

CHRYSAROBIN.—$C_{30}H_{26}O_7$. A neutral principle extracted from Goa Powder. It is a gastro-intestinal irritant, and is almost a specific when applied locally in psoriasis. It stains the skin a dark yellowish-brown color, which may be removed by a weak solution of chlorinated lime. It is said to be a specific for warts when used in 10 percent solution. Dose, internally, 1/8 to 1 grain. **C., Ung.**, contains 5 parts of the drug with 95 parts benzoinated lard; for average use it should be diluted 2 or 3 times.

CHYLURIA.—The passage of milky-colored urine. It is thought to be caused by a disordered condition of the lacteals, and is also connected with the presence in the blood of filaria sanguinis hominis. The urine passed is generally above the normal in quantity, has the color of milk, and becomes jelly-like on standing, afterward again becoming liquid. It readily undergoes decomposition. The condition arises from an occlusion of the lymph-channels by the parasites. See FILARIASIS.

CICATRICES, AFFECTIONS OF.—A normal scar, or cicatrix, is at first smooth, hard, and, owing to its vascularity, red in color. Later, in obedience to the contraction of the fibrous tissue, it becomes white (avascular), more dense, and often wrinkled. It is insensitive, because of the absence of nerves, and contains no lymphatics. The itching or burning sensation sometimes referred to a scar is due to irritation of the nerve filaments in the adjoining skin or subjacent tissues. The principal deviations from the normal are the following:

Discoloration may be due to foreign substances, *e. g.*, gunpowder, particles of coal, or to partial retention of normal pigment, *e. g.*, in the negro. Excision, followed by careful apposition of the wound with a subcuticular suture, is indicated in some of these cases, as well as in some cases in which disfigurement is due solely to the shape and site of the scar, *e. g.*, a wide, irregular cicatrix on the face or neck.

Excessive contraction is most frequent after extensive superficial wounds, notably burns, the granulation tissue reaching the surface and undergoing conversion into fibrous tissue long before the completion of epidermization, hence, when possible, the necessity for early skin grafting in wounds of this character. On the surface of the body the evils of contraction are most marked about the face, the neck, and the joints. In these cases liberation of the parts by proper incisions, and filling the resulting gap by a plastic operation, is to be considered. In the various canals of the body contraction results in stricture.

Stretching may occur when a recent scar is subjected to an almost continuous strain, thus are produced the post-operative hernias of the abdomen. Stretching is sometimes utilized as a therapeutic measure, especially in the treatment of strictures.

Depression may be due to adhesion of the scar to deeper structures. A depressed scar, circular,

serpiginous, or semilunar in shape is suggestive of syphilis.

"Hypertrophied" scars are most frequent after infected wounds and in the negro. When the hyperplasia continues the growth is called a *false keloid.*

Painful scars are due to the pressure of the contracting tissue on a nerve filament. Relief is obtained by excising the painful area, or by finding and excising the involved nerve.

Ulceration is prone to occur in scars, because of their lack of nourishment, and for the same reason such ulcers are difficult to heal, unless the scar tissue is removed.

Epithelioma may develop in any scar, but is most frequent in those exposed to constant irritation, and in those following X-ray burns. Pain and lymphatic metastases are absent, so long as the growth is confined to the scar (Stewart).

CILIA.—See EYELIDS. (Trichiasis, and Distichiasis.)

CILIARY MUSCLE, PARALYSIS AND SPASM.—**Paralysis** of the ciliary muscle is known by destruction or diminution of the normal range of accommodation that usually corresponds to the age of the patient. The causes may be peripheral, as by atropin; or central, due to disturbance of the oculomotor nucleus. General intoxication by the poisons of infectious diseases, and conditions producing exhaustion or debility, may result in paralysis of the ciliary muscle. In this condition objects seem minimized—**micropsia.** The treatment is directed toward the cause. Locally, miotics, convex glasses, and electricity may be of value. See PRESBYOPIA.

Spasm of the ciliary muscle is a condition in which the range of accommodation is shortened, causing an emmetrope or hyperope to have myopic symptoms. In this condition objects appear enlarged—**macropsia.** The causes are the miotics, strain on the accommodation, and severe disease of the spinal cord. The treatment is directed toward the cause. Mydriatics give temporary relief. See HYPEROPIA, MYOPIA, ASTHENOPIA, MIOSIS.

CIMICIFUGA.—Black snakeroot; black cohosh. The root of *C. racemosa,* ord. *Ranunculaceæ.* A stomachic, antispasmodic, aphrodisiac, expectorant, and diuretic. Its action on the heart is similar to that of digitalis. It is efficient as a tonic in many cardiac diseases, in functional impotence, and in ovarian neuralgia. In simple chorea it ranks next to arsenic. It is used in chronic rheumatic affections of nerves and muscles, like myalgia, pleurodynia, sciatica, and lumbago, but is of little value in articular rheumatism. In atonic amenorrhea, menorrhagia, and sudden cessation of menses from cold or nervous shock, and as an expectorant in bronchitis and phthisis, it is useful; and in combination with gelsemium it is highly beneficial in the mental disturbances following pregnancy.

Preparations.—C., Extr. Dose, 1 to 6 grains. **C., Flext.** Dose, 5 to 20 minims. **C., Tinct.,** 20 percent in strength. Dose, 10 minims to 2 drams.

CINCHONA.—Peruvian bark. The official species are:

Cinchona, *Cinchona,* the dried bark of *Cinchona Ledgeriana, Cinchona Calisaya, Cinchona officinalis,* and of hybrids of these and of other species of cinchona, yielding, when assayed by a prescribed process, not less than 5 percent of total alkaloids.

Cinchona Rubra, *Red Cinchona,* is the bark of *Cinchona Succirubra* or of its hybrids, containing not less than 5 percent of cinchona alkaloids. From it is prepared the compound tincture of cinchona.

Cinchona bark contains 21 alkaloids, of which 4—quinin, cinchonin, quinidin, and cinchonidin—are the most important. Cinchona has the same physiologic action and therapeutic uses as its chief alkaloid, quinin. At first it promotes appetite, digestion, and the flow of saliva and of the gastric juice; long continued it causes gastric catarrh, indigestion, and constipation. See QUININ. It is also an astringent, bitter, and stomachic tonic, beneficial in atonic dyspepsia and adynamia, but especially useful in malarial affections.

In intermittent fever and certain nervous diseases:

℞.	Powdered cinchona,	ʒ vj
	Ammonium chlorid,	ʒ ij
	Powdered cinnamon,	ʒ j
	Syrup of orange,	ʒ iij.

Make into an electuary; a large teaspoonful 3 times daily.

For gastric atony:

℞.	Tincture of nux vomica,	ʒ j
	Compound tincture of cinchona, enough to make	ʒ iv.

Teaspoonful after each meal.

Preparations.—Fluidextractum Cinchonæ, *Fluidextract of Cinchona.* Dose, 10 to 30 minims.

Tinctura Cinchonæ, *Tincture of Cinchona,* has of cinchona 20, in alcohol 67 1/2, water 25 and glycerin 7 1/2. Dose, 1/2 to 2 drams.

Tinctura Cinchonæ Composita, *Compound Tincture of Cinchona,* has of red cinchona 10, bitter orange peel 8, serpentaria 2, in alcohol 85, water 7 1/2 and glycerin 7 1/2; and is intended to replace Huxham's tincture of bark. Dose, 1/2 to 2 drams.

Huxham's Tincture of Bark, 1788 (unofficial), is still used. Red cinchona, ʒiv, orange-peel ʒiij, serpentaria gr. lxxx, Spanish saffron gr. clx, cochineal gr. lxxx, brandy ʒxl, digested for 4 days, expressed and filtered. Dose, 1/2 to 2 drams.

CINCHONIDIN.—An alkaloid derived from cinchona. It is a crystalline substance resembling quinin in general properties. **C. Sulph.,** less bitter than quinin and valuable as an antipyretic. Dose, 1 to 20 grains or more. See QUININ.

CINCHONIN.—An official alkaloid derived from cinchona. It is a colorless crystalline body, similar to quinin in therapeutic effects, but less active, producing much headache and some muscular weakness. **C. Sulph,** soluble with difficulty in water, but soluble in acidulated water. Dose, 5 to 20 grains or more. See QUININ.

CINCHONISM.—The disagreeable symptoms that come on in persons who have an idiosyncrasy

to cinchona, quinin, or its salts, or who are poisoned by the drug. Buzzing in the ears is a most common result of overdosing by quinin, and severe epistaxis has ensued from the ingestion of 4 grains. Aural congestion and hemorrhage, deafness, amblyopia, and skin eruptions are possible complications. The bromid of sodium, 10 grains, with a little ergot, will give relief.

CINNAMIC ALDEHYD, *Cinnaldehydum*, C_9H_8O, is an aldehyd obtained from oil of cinnamon or prepared synthetically: soluble in alcohol, ether, and fixed and volatile oils. Dose, 1/2 to 2 minims.

CINNAMON.—The inner bark of the shoots of several species of *Cinnamomum*, native to Ceylon and China. Its properties are due to a volatile oil, which contains cinnamic aldehyd. It is an agreeable carminative and aromatic stimulant, useful, when combined with opium, for flatulence, colic, enteralgia, etc. **C., Aqua,** 2 parts of oil in 1000 of water. Dose, indefinite; average, 4 drams. **Fluidextractum Aromaticum,** contains aromatic powder in alcohol. Dose, 10 to 30 minims. **C., Oleum,** the volatile oil. Dose, 1/2 to minims. **C., Spt.,** percent of the oil in alcohol. Dose, 5 to 60 minims. **C., Tinct.,** 20 percent of the powdered bark in alcohol. Dose, 20 to 60 minims. **Pulvis Aromaticus** (aromatic powder), cinnamon, ginger, of each 35; cardamom, nutmeg, of each 15. Dose, 10 to 30 grains.

CIRCULAR INSANITY.—A mental disease characterized by regularly alternating and recurring periods of mental exaltation, depression, and sanity.

There is often hereditary predisposition. The exciting causes are any of those conditions that depress the brain or general system. There is no characteristic lesion associated with circular insanity.

It is essentially a chronic condition, and probably incurable. The disease usually begins as a melancholia, the depression being an apathy and torpor rather than a mental pain; and suicidal feelings and impulses are rare; this condition is soon succeeded by a mania, a mental exaltation with hyperesthesia and exaggeration of nervous functions, the reasoning power well retained; this is in turn followed by a lucid interval, often giving promise of recovery, to be sooner or later followed by another cycle. These periods follow one another with remarkable regularity, each being of the same duration. Rarely the various periods are of irregular duration. The general health is well maintained, the patient gaining in flesh during the stages of depression and lucidity and losing during the period of exaltation. The regularity of the different periods soon establishes the diagnosis. The disease is generally incurable.

Treatment consists in attention to the general health and meeting the symptoms of the different periods as they recur.

CIRCULATION, FETAL.—See FETUS (Circulation).

CIRCUMCISION.—See PENIS.

CITARIN.—Sodium anhydromethylene citrate. It liberates formaldehyd in the blood and thereby forms soluble combinations with uric acid.

Citarin is indicated in all forms of the uric acid diathesis including lithemia, gout, rheumatoid arthritis, and renal calculi. Dose, 15 to 30 grains well diluted with water.

CITRIC ACID.—$C_6H_8O_7$. Occurs free in lemons, black currants, bilberry, beets, and in various acid fruits. It crystallizes with one molecule of water in large rhombic prisms that melt at 100° F., are colorless, inodorous, and extremely sharp in taste. It is refrigerant, antiseptic, and diuretic.

CITRINE OINTMENT.—Mercuric nitrate ointment. See MERCURY.

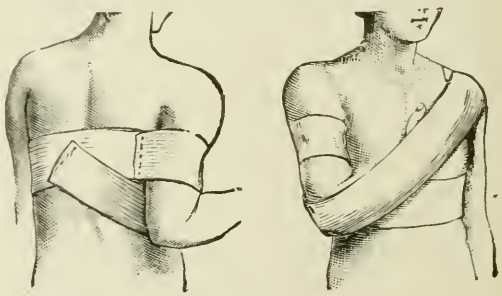
CLAP.—See GONORRHEA.

CLAVICLE, INJURIES.—Fracture of the clavicle is usually due to indirect violence, such as falls on the arm or shoulder; it is generally oblique in direction; it may be caused by direct violence, when it is commonly seated near the acromial extremity.

Symptoms.—The shoulder sinks *downward, forward,* and *inward*; the distance from the acromion to the sternum is less on the injured than on the sound side. In consequence of the sinking of the shoulder and the outer fragment, the sternal portion of the bone projects over the fractured extremity, and it may be distinctly felt by tracing the usual course of the clavicle with the finger.

Treatment.—A fractured clavicle is easily reduced, but the difficulty is to retain the broken ends in exact apposition. The arms and shoulders of the patient are to be firmly drawn backward by an assistant, when the fractured extremities come in apposition; the shoulders must be raised and supported in a direction *upward, backward,* and *outward.* The parts are then to be covered with adhesive plaster, and a bandage is to be applied, to retain them in their reduced apposition.

Sayre's dressing is one of the best that can be employed. Two strips of adhesive plaster 3 or 4 inches wide, and long enough to extend around the chest one and one-half times, are prepared.



SAYRE'S DRESSING.—(*Stewart.*)

Lint powdered with zinc stearate is placed in the fold of the elbow and between the arm and the chest. A collar of lint as wide as the adhesive strip is placed about the arm just below the axilla, and over this is applied the end of one of the strips of plaster, so as to form a loop; the strip is now used to pull the arm backward, and is fastened around the chest. The hand of the affected side is placed on the opposite shoulder, and the second strip of plaster, with a hole for the point of the elbow, is run from the back of the sound

shoulder, under the elbow of the affected side, over the sound shoulder, to the back, thus drawing the elbow forward and upward and, with the aid of the first strip, which acts as a fulcrum, forcing the shoulder backward and outward. A pad, held in place by a strip of adhesive plaster, may be placed just above the clavicle to press the fragment downward.

Velpeau's bandage is also often employed. (See BANDAGES.)

Dislocation.—The sternal end of this bone may be dislocated forward, and also backward; more frequently forward, when it is thrown upon the upper part of the sternum. When the dislocation is in front of the sternum, the reduction is easily effected; place the knee against the spine, draw the shoulders backward, and the clavicle will assume its natural position; then apply the clavicle bandage, placing a pad on the displaced end of the bone. The dislocation behind the sternum is a very rare occurrence; it may be produced by curvature of the spine, and in such case there is no method of reducing it.

The *outer extremity* of the clavicle is most frequently dislocated upward on the acromion; it is, more correctly speaking, a dislocation of the acromion from the clavicle, where the bone is thrown upon the *upper surface of* the acromion, or upon the *anterior part of the spine of the scapula.* It is usually caused by violent falls upon the shoulder.

Symptoms.—There is a distinct prominence, formed by the displaced bone, upon the surface of the acromion, which disappears on raising the arm; the limb hangs closely along the trunk, the shoulder is somewhat flattened. The facility of reduction, and the prominence of the clavicular portion of the trapezius muscle, indicate the nature of the accident.

Treatment.—Reduction is effected by raising the shoulder, drawing it backward and carrying it outward by placing a pad in the axilla and bringing the elbow well to the side. After reduction, the treatment is the same as for fracture of the clavicle. A thick pad, with the base directed upward, is placed in the axilla, and the arm and forearm must be well secured to the chest; direct pressure must be made by means of a pad and guttapercha plate laid on the projecting clavicle, and strapped tightly down by a band passing parallel to the arm and under the flexed forearm. This is retained in position by being attached to a strap passed around the opposite axilla.

CLAVUS.—See CORN.

CLEARING AGENT.—A substance used in microscopy to render tissues transparent and suitable for mounting. *To replace alcohol in a dehydrated section,* creosote, turpentine, xylol, and the oils of bergamot, cedar, cloves, and origanum are used. *For celloidin sections,* bergamot or cedar oil or creosote is preferable. *Before mounting vegetable sections,* glycerin, solution of carbolic acid, liquor potassæ, alcoholic solution of postash, liquor ammoniæ, solution of chloral hydrate, Javelle water, Labarraque's solution, are used. See PATHOLOGIC TECHNIC.

CLEFT PALATE.—A congenital defect due to an arrest of development of the processes that normally grow inward from the superior maxillary and palate bones, and meeting each other and the vomer in the middle line, and the premaxillary bone in front, form the hard and soft palates. This arrest of development may be complete, the fissure extending in the middle line through the uvula and the soft and hard palates, and hence through the alveolar process in the line of suture either on one or both sides of the premaxillary bone. It will in this case generally be combined with double or single harelip respectively. When the arrest is only partial, the cleft may extend through the uvula alone, or through the soft palate as well, or through the soft palate and part of the hard; while in other instances the alveolar process only on one or both sides of the middle line may be notched, as occurs so often in harelip. The vomer, which is continuous in front with the premaxillary bone, either presents a free border in the middle of the cleft or is attached to one or the other margin of the cleft.

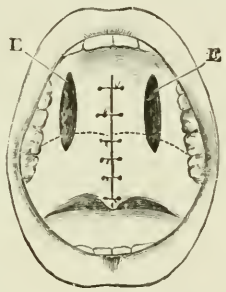
The consequences of cleft palate vary with the age of the patient and the extent of the cleft. In infancy suction and deglutition are seriously interfered with, while later the voice, articulation, taste, smell, and hearing may all be impaired.

Treatment.—The infant, if unable to take the breast in an erect or semirecumbent posture, must be fed with the mother's milk by a spoon passed well to the back of the mouth, or by a feeding-bottle with a large teat to act as a plug to the cleft. The operation for the cure of the deformity should be undertaken before the child begins to speak, which is generally about a year later than usual; but not in infancy, as bleeding is then badly borne, and the cleft of the bony palate diminishes in width during the first 3 years of life. Infants moreover, are very liable to such ailments as catarrh of the pharynx and lungs, and coughing and sneezing tend to tear the parts asunder. The cleft in the hard and soft palates should be closed at the same time. Harelip, if present, should be operated on in infancy.

Staphylorrhaphy, or Closure of the Soft Palate.—Chloroform having been given by Junker's apparatus, with the tube passed through the nose and the mouth widely opened by a Smith gag, which depresses the tongue at the same time, one end of the bifid uvula is seized with long forceps and the edge of the cleft pared from below upward, and the paring repeated on the opposite side. The uvula and the lower part of the palate are then united with horsehair; the upper part with silver wire. The wire sutures are best passed by Smith's needle, by which they can be carried through both sides of the cleft by one transit of the needle. This needle has "a small reel attached behind the handle to hold the wire, and a small serrated wheel half way up the handle to protrude the wire from its tubular point." The horsehair is passed across the cleft, and as the point of the needle protrudes from the palate, the end of the horsehair is seized and drawn out by nibbed palate forceps or by the suture-catcher, and the needle withdrawn. The silver sutures should be fastened by a wire-twister and cut

off short, care being taken to hold the edges of the cleft merely in apposition and not to apply any tension. The horsehair should be tied with a triple surgeon's knot. When the parts have been brought together, any undue tension should be relieved by making lateral incisions through each side of the soft palate parallel to the cleft and just internal to the hamular process, with a tenotome on a long handle. By these incisions the levatores palati muscles are divided. The palatopharyngei may also be divided, if necessary, by notching the posterior pillars of the fauces with scissors.

Uranoplasty, or Closure of the Hard Palate.—The soft palate having been previously brought together in the way described, the operation on the hard palate may be begun at that stage when the tension becomes such that the soft parts can no longer be brought together. The edges of the cleft having been pared, an incision from 1/4 to 3/4 of an inch long should be made on each side of, and parallel to, the cleft through the mucoperiosteum down to the bone. The incisions should fall a little distance from the alveolar process, so as to avoid wounding the anterior palatine artery. Into one of these incisions a raspatory or an aneurysm needle with a short curve should be introduced, and the mucoperiosteum separated from the bone along the whole length of the cleft in the hard palate, avoiding the neighborhood of the posterior palatine foramen, through which the posterior palatine artery runs. The attachment of the mucoperiosteum to the posterior margin of the hard palate should be divided with curved scissors passed through the cleft and behind the soft palate, which should be drawn forward to facilitate this step of the operation. Pressure should be made upon the parts with a small sponge by an assistant, while the mucoperiosteum is being separated in like manner on the opposite side. Wire sutures should now be passed, in the way described for uniting the soft palate, and any tension relieved by prolonging the cuts made for the introduction of the raspatory forward or backward, as the case may require. Hemorrhage, though often sharp, is seldom severe, and may generally be checked by pressure or by syringing with ice-cold water, the head being turned over to one side to let the blood escape; or, if it becomes serious, by plugging the posterior palatine canal with a small peg of wood.



Position of the Lateral Incisions, E, E, through the Mucoperiosteum, in the Operation for Cleft of Hard Palate. (*After Bryant.*)
The dotted line indicates the line of junction of the hard and soft palates.

After-treatment.—The patient should be fed on iced milk for the first few days, and then on soft food for a fortnight. The sutures may be left in for 3 weeks or a month; if the patient is unruly, they should be removed under chloroform. The cleft should heal by first intention, and the lateral cuts for taking off tension, by granulation. If a portion of the cleft fails to unite by first intention, it will often heal up subsequently by granulation; if not, a second operation must be undertaken. It is somewhat doubtful whether the mucoperiosteum ossifies.

CLIMATOLOGY.—It is very common for persons to speak of climate and weather as the same thing, while in truth there is a difference between them.

Climate consists of the values of the average of the current conditions of the weather in a given district, taken in connection with its soil, vegetation, topography, latitude, and elevation.

Weather consists of the individual atmospheric conditions experienced from day to day.

A visitor to a resort may encounter for a time weather that is below the average, yet the weather of the season or year may show an average equal to its reputation, and so he may gain in the long run the benefit for which he came.

Soil.—The quality of the soil at a resort is of great importance. Two different resorts with the same rainfall may have very different degrees of dampness, because of the difference in the capacity of the soil for holding or absorbing moisture. More humidity arises from arable than from meadowland. Shade trees increase both the humidity and the coolness of the air. Evergreens require and give off less moisture than deciduous trees. The climate is greatly modified by the configuration of the ground; thus, that of a plain country is usually windy, variable in temperature, and generally more or less dry. Mountain slopes vary in temperature and dryness according to their aspect toward the sun and their relation to the ocean and to the main direction of the winds.

The sunshine as it strikes the earth falls upon the mountain sides more at a right angle than upon the valleys or plains, and so has greater force; and after sundown the cold, and therefore heavier, air sinks to the bottom of the valleys, while the warmer and lighter air rises along the slopes. For these reasons the mountain slopes are usually warmer in the evenings and cooler in the mornings than the valleys. The day temperature of a valley depends upon its aspect toward the sun and wind. The walls of a valley, while they give shelter from wind, detract from its ventilation and sunniness. The air of a valley is usually damper and more sedative than that of mountain slopes or of plains.

Air, like water, tends to purify itself by motion; so in places where causes exist that make the air impure, the presence of breezes has a mitigating influence. A slight decrease in oxygen or a slight increase in carbonic acid in the atmosphere that surrounds us is of enormous relative importance. Ozone, or allotropic oxygen, is most abundant in open places, such as the ocean, deserts, and mountains. It is an evidence of the abundance of oxygen.

Wind.—Continental and oceanic currents have more to do with the occasional big stroms than with the daily breezes. At the seashore, owing to the difference in the heating of the air that lies over the surface of the sea and that that lies over

the land, there is usually a breeze blowing from the ocean during the day and from the land during the night; and where plains border upon mountains, the day breeze is from the plain and the night breeze from the mountain, because of the difference of heating, owing to the greater obliquity of the sun's rays falling on the plains than on the mountains. In the valleys the day breeze is from the bottom of the valley, where the air is more quickly warmed, toward the mountain slopes; and the night breeze descends from the slopes, where the air has cooled more rapidly, to the valleys. Winds ventilate and purify the atmosphere, but they transport dampness, heat, cold, and impurities, and so they may to some extent engraft one climate upon another. Wind increases or decreases the climatic characteristics of a resort. A cold wind is more severe than still cold; an extremely hot, dry wind, such as the sirocco or chinook, is more irritating or trying than still heat of the same temperature, and a cold, damp wind is more depressing and dangerous than still, damp cold. On the other hand, with moderate warmth, either damp or dry, a breeze, if not directly stimulating, may yet be refreshing through causing increased evaporation from the skin, even when the actual temperature of the air is not lowered. With moderate cold a breeze is usually stimulating whether it is damp or dry.

Water.—The modification of climate by water is chiefly through the increase of atmospheric humidity. A light rainfall does not necessarily mean a low humidity; on the contrary, the resort may have a very damp air, partly because the rainfall is light; for if air charged with moisture remains at a temperature that enables it to retain that moisture, it follows that the humidity will be high. The number of rainy days in a resort is of importance as limiting the hours of exercise, and, also, the time of the day or night when rain occurs has an influence on the value of the resort. Rain in moderation is often beneficial in purifying the atmosphere, and moderate cloudiness is often a relief from the glare and heat.

The proximity of seas, lakes, and rivers increases the humidity and the local rainfall, and, through the difference in radiation from the dry and liquid surfaces, intensifies the day and night breezes. If those bodies of water are at all extensive, the breezes thus caused carry an abundance of the pure air over the land.

Dew.—A dry soil with sparse vegetation lessens dew deposit. A low dew-point and a low relative humidity at a resort are evidences of the infrequency of dew, mists and fogs.

Sunlight.—The effects of the light of the sun, apart from its heat, check the growth of bacteria and increase oxidation. Sunlight has a greater intensity in dry climates, and lasts longer during the summer in high than in low latitudes. While during the winter the hours of sunshine are shortened, still, as a general rule, the temperature of a resort rises with its proximity to the equator, though its temperature may not be entirely governed by its latitude. Its warmth may be increased by the shelter from cold winds formed by a mountain range, or by the nearness of warm water currents, such as the Gulf Stream and Kurosiwa, which warm the air-currents passing over them toward the shore. On the other hand, a resort may be colder owing to the proximity of large bodies of cold water, of Arctic currents, of snow fields, of glaciers, or from its altitude, or from frequent cloudiness. All these matters are therapeutically of greater importance than the mean annual temperature, which may be the same, or which may approximate that in climates which are in reality very different. The temperatures of the seasons, of day and night, and the range, are of most importance to the invalid, as hindering or promoting the opportunities for outdoor life. Humidity increases the effects of heat and diminishes those of cold.

Electricity.—The electricity of the earth is negative and that of the atmosphere is positive. Its therapeutic effects are little understood.

Heat promotes growth, but diminishes muscular power. The appetite and the amount of food needed are also lessened. These effects of heat are intensified in proportion to the increase of atmospheric humidity.

Heat is less healthful than cold. This is shown by the fact that the rate of mortality increases toward the equator.

Cold limits growth, but tends to preserve it and to increase muscular power. The appetite and the need of food are increased, as are also the waste of substance and the exhalation of carbonic acid. These effects are lessened in proportion to the increase of atmospheric humidity.

Humidity, as has been stated, increases the special effects of heat and diminishes those of cold. Absolute humidity, as it increases, lessens the amount of water vapor that is given off from the lungs and from the surface of the body. Relative humidity, as it increases, has the same effect, because warm air contains more vapor than cold air. Dry air, when cold, lessens the bodily temperature by increasing the evaporation from the body, though, because of the lessened evaporation from the skin, the depressing effect of cold can be guarded against by extra clothing. Thus dry air, whether hot or cold, is less depressing than damper air at whatever temperature it may be. Wind increases these effects.

Air Pressure.—The phenomena that appear in consequence of the marked increase or decrease of barometric pressure upon living beings is due almost entirely to the difference of the amount of oxygen in the air.

Increased barometric pressure as a factor of climate is of very slight importance, as it is only found in a few places and in a very moderate degree. It is through the study of caisson disease that the effects of increased air pressure are best known. More oxygen is absorbed and more carbonic acid exhaled, and the effects are the exact opposite of those brought about by decreased air pressure.

Decreased Barometric Pressure.—In considering its effects upon the human economy as exhibited at high altitudes, the great difference must be recognized between those that are immediate and

those that ensue after acclimatization has taken place. At first the phenomena are the direct result of oxygen starvation. There are hyperemia of the lungs and skin, with anemia, or rather spanemia, of the internal organs, increased pulse rate, lowered tension, rapid and shallow respiration, a tendency to nausea and vertigo. Within a month, in normally constituted beings, and in invalids according to their condition, there is a relief from the oxygen starvation, owing to an increase in the number of red blood-cells and hemoglobin in direct ratio to the decrease of air pressure. By this time the respiration has become normal in rate, but deeper, from an increase of chest expansion; the heart cavities are extended and its muscle strengthened, so that the pulse becomes normal in rate and increased in strength and volume; the appetite and power of assimilation are also unusually developed.

The classification of climates is the crux of the climatologist. Because general laws are so greatly modified by local peculiarities and seasonable variations, and because of the intimate relation that the various climatic factors sustain to one another, the subject can only be treated in a broad general way. The principles of the subject, however, are sufficiently definite to allow of a physical classification into sea and land climates, and into a meteorologic classification.

Sea Climates.—The climate of the ocean is always damp, by reason of the constant evaporation of the sea-water, which keeps it equable in temperature.

Owing to the humidity of the air the radiation from the body is increased, and when the air is cool, it seems to be cooler than it really is. Sea-air has a sedative effect upon the nervous system; increases metabolism, weight, appetite, and inclination to sleep, and so, to those with whom it agrees, the air of the ocean acts as a sedative tonic.

Island Climates.—The climate of small islands, unless they possess high mountains with deep valleys or thick forests, closely resembles that of the ocean, and is often as beneficial, without the objections that may justly be urged against life on board ship.

Coast Climates.—Coast climates have some of the advantages of the ocean and of islands, as well as that of inland; but in consequence of the difference in radiation of heat from the land and from the water, they are subject to much greater variability, and are less equable, and make a greater demand upon the strength of the invalid. There are, however, some coast climates that are so sheltered from the land breezes that they very closely resemble the climate of the ocean.

Inland climates of low elevation (under 2500 feet) lessen in humidity as the distance from the ocean increases, though this quality is often modified by the proximity of mountain ranges or of bodies of fresh water. Such climates exhibit a decreased barometric pressure as the land ascends, but they are less equable. The changes from day to night and from season to season are more marked.

All low inland climates of an extreme temperature, either hot or cold, are, of course, unsuited for therapeutic use.

Moderately moist, warm climates usually possess equability and a moderate rainfall, thus allowing of pleasant outdoor life, and exerting a sedative effect upon the mucous membranes and nervous system. Southern California, southeastern Georgia, Florida, and the Riviera are good examples of such climates. In these places delicate persons can escape the rigors of their home winters and so invalids to whom climatic extremes are unsuited, resort to them with benefit.

Moderately moist, cool climates are, for the most part, negative in their characteristics and effects, but they are rather more stimulating than the last group considered, and are well suited to those who require a slight change, mild stimulation, and active life. It is in these climates that most of the mineral springs are found, such as Saratoga and Baden-Baden.

Many mountain resorts below 3000 feet, where there are pine woods and plenty of waste land, so that hunting and camping can be enjoyed, have such climates. The Adirondack, the Allegheny, and the Cumberland Mountains contain such resorts.

Moderately dry, warm climates have a positive and stimulating character, and are of much value when the more extreme effects of high ground are not desirable. They would be more frequented were it not that their chief qualification, that of dryness, has prevented them from being settled, and so they are likely to be deficient in accommodations and amusements. For permanent residence they have the objection of being too hot in summer. They are desirable especially for the purity and abundance of the air and for the simple open-air life that may be led by those who resort to them. Egypt and Algeria are the most frequented and best known of such climates, but the lower ground of Arizona, New Mexico, and southeastern California is coming into use, and, except in the matter of accommodations, interest, and enjoyment, the American climates offer greater advantages.

Moderately dry, cold climates, such as the winter climates of parts of Canada, Dakota, Nebraska, and Minnesota, are healthful and stimulating to the robust, but are too severe for all but the strongest class of invalids.

Depressed climates are found in the sinks, notably around the Dead Sea, the Caspian Sea, and in southeastern California. Being surrounded by deserts, these sinks are hot and dry, and enjoy in a moderate degree the therapeutic advantages that follow the use of compressed air; but they are usually monotonous and disagreeable to reside in.

Elevated Climates.—The important characteristics of elevated climates are present, but not marked, below an altitude of 4500 feet. These climates have a cool air and a wide range of temperature—that is to say, the difference shown by the thermometer in the sun and in the shade, during the daytime and at night, is very decided. This is especially true in the winter, though the seasonable

changes themselves are not very extreme. The classification of a climate as "dry" does not necessarily imply a scanty precipitation, but as a good deal of rain or snow falls at a time, the number of clear days is very large. The direct rays of the sun have exceptional power, both for light and heat, but the temperatures are not excessive; for, as a rule, temperature decreases a degree for every 300 or 400 feet ascended. Winds are of frequent occurrence, but are rarely dangerously high. The air is aseptic, containing few germs and a large amount of ozone and positive electricity. The soil is likely to be of a composition that promotes good drainage, and it is, therefore, usually dry; but the chief claim of elevated climates upon the attention lies not in these details, important though they undoubtedly are, but in the lessened barometric pressure, as causing blood regeneration and increased power of the lungs and heart.

Winter days in such localities usually have warm sunlight and cool shade, the nights being cold; but the night air, like the air in daytime, is ordinarily dry.

Spring is, as a rule, the least desirable season, melting snow on the mountains making it objectionable to many invalids, though this is less apparent on the high continental plateaus, such as are found at the base of the Rockies, than among the mountains of Switzerland.

During summer it is cool in the shade and at night. The sun is hot, but its heat is usually modified by the cloudiness that accompanies the short thunderstorms occurring in the afternoons.

Autumn, in the elevated resorts of the United States, is the most desirable season; but in Europe the early falls of snow with intervals of thaw make it less beneficial than either winter or summer. The dryness of the air modifies the effects of both heat and cold.

Summer Climates.—In estimating the value of a summer climate the question of greatest importance is the sensible temperature—that is, the effect of the evaporation from the surface of the body in lowering its internal temperature. This evaporation, of course, increases as the humidity of the air diminishes. For these reasons the extremes of summer heat in Eastern cities are hardly bearable, while the same or actual higher temperatures in many Western elevated districts are quite compatible with a comfortable existence.

Winter Climates.—In choosing a winter climate other factors than the temperature are to be considered. The value of similar temperatures in winter is different from their summer value. This may be judged by the feeling of the air, which in a very moist climate may be chilly at 56° F., while in a very dry climate at the same temperature no feeling of chilliness will be noticed. Dry, cold air is stimulating. In the selection of a satisfactory winter climate only a moderate amount of cold is desirable.

A cool, dry atmosphere will be found near the Rocky Mountains above latitude 35 degrees. **A warm, dry atmosphere** is found in western Texas, southern New Mexico and Arizona, and in southeastern California.

Owing to the warm, humid air from the Pacific Ocean, the greatest softness and mildness of climate in the United States are found along the California coast, the daily variation of temperature during the winter months scarcely exceeding 2° F. Arizona and the interior valleys of California average 3°, as do the Gulf coast and Florida, south of St. Augustine. The rest of the country varies from 4° to 6°, increasing toward the Canadian border; from the Gulf coast northward the variability increases 1° or 2° during the months of January to March.

The resources of the United States in the matter of climate are extremely varied, from the mountains, lakes, rivers, and elevated plains along the Canadian border to the extreme southern limits of Florida and Texas.

The best climatic advantages of the Alps can be found in an improved form—because available all the year round—in the ranges, valleys and plains of the Rocky Mountains; climatic conditions similiar to those of Egypt prevail in the deserts between El Paso (Texas) and Palm Springs of Mohave (California); while the equable climate of the Riviera, with the same advantage of the protection afforded by the mountains above the coast, with a smaller amount of annual rainfall and less discomfort from harsh, cold winds, is to be found in southern California. Florida, too, offers an asylum for winter visitors, especially on the Atlantic coast, at St. Augustine and southward to Lake Worth; while Key West is an excellent example of a warm, equable, and very moist climate.

Among interior health resorts in the Southern States, Aiken, Thomasville, and Asheville have many advantages for invalids needing moderate elevation with medium warmth, dryness, and good accommodations.

Climatology in Disease

Phthisis.—In passing to the consideration of the treatment of disease by climatic change, it is best first to discuss its effects upon phthisis, as the most important and most frequent cause of invalids changing climates. Speaking broadly, in their influence upon phthisis, cold is better than heat, dryness than dampness, sunshine than cloudiness, high ground than low; wind in moderation is healthfully stimulating, unless it is damp, in which case it is depressing. Variability of temperature with dryness is generally beneficial, and with dampness the reverse. For most cases of phthisis the ideal condition of the atmosphere is one in which cool, dry air can be taken into the lungs while the surface of the body is pleasantly stimulated by the warmth and light of bright sunshine, and in which the chamber windows may safely remain open at night, so that the patient may breathe dry air while sleeping under a warm cover.

The first essential of air is plentifulness. For this reason it is better to be outside than inside the house. Within, the air changes too slowly. The next essential of the air is purity.

In the early stage of pulmonary tuberculosis, before the phthisis or wasting is marked, almost any change of climate where there is abundance of

pure air, such as is usually found on the ocean, seashore, desert plains, moorlands, or mountains, is beneficial and often curative. The climate may be damp or dry; but if damp, it may be cool, but not cold; if dry, it may be either hot or cold. That patients will get well under all kinds of climatic conditions, provided they get abundance of pure air by living out of doors, is shown by the results obtained, even in England, by the open-air treatment; but to insure a permanent cure in a majority even of the earlier cases, or an arrest in those in whom wasting has begun, a more radical climatic change is demanded. When we consider that, though all tuberculous cases are dependent for their special character and development upon the same cause—namely, the tubercle bacillus—yet we must remember that the antecedent causes that prepare the tissues of the patient for the reception and which foster the growth of the disease are often very different, and so the climate that tends to remove these underlying conditions, though it may not be ideal for the cure of the tuberculosis pure and simple, is often the best for the individual case. Again, the personal equation enters into the problem of selecting the climate, and it is unwise to place a patient in a climate, however otherwise suitable, if he is mentally depressed by the surrounding circumstances of his residence there. Therefore, to some extent, in choosing the appropriate climate each case is a law unto itself. There are, however, certain general guiding principles that have been established (1) from a study of the geographic distribution of phthisis. This study (which was chiefly made by Hirsch) shows that in isolated or sparsely settled places phthisis is infrequent, because the element of infection is largely absent; that among people given to outdoor occupations it is less frequent than among those who pass their time in houses; that phthisis is less prevalent in dry than in damp climates—this, however, applies more to the soil than to the air; that the most remarkable diminution in the distribution of phthisis is found on high ground, the rate diminishing in proportion to the elevation above sea-level, and this, as shown by the investigations of Müller and others, is not dependent upon, though modified by, the density of the population and the nature of the occupation, and other conditions of the residents.

(2) The guiding principles have been established by clinical evidence. In order to ascertain, as far as possible, what climates have been found best for the majority of phthisical health-seekers, a collection has been made of all the reports to be found of the influence of change of climate upon phthisical persons. A search through all the literature known resulted in finding some 9000 cases. In separating these into groups under the chief types of climates resorted to—namely, ocean, island, seashore, lowland, desert (also lowland), and highland climates—the two facts were clearly demonstrated that, as a rule, the subjects of phthisis improve in greater numbers as they remove from the sea to the interior of the continent, even when the elevation of the ground is but slightly increased. The marked increased percentage of benefit in those resorting to desert climates over those who frequented the sea and its borders proves very clearly that dryness is better than dampness, while the still greater percentage of improvement indicated in cases resorting to high climates, even over the dry climates of the desert, proves the second fact—namely, that diminished barometric pressure is even more powerful than dryness in arresting the progress of phthisis. So it may be said that while desert air is good, mountain air is better. The reasons for this undoubtedly lie mainly in the increase of the hemoglobin and of the red blood-cells brought about by the diminished air pressure with the accompanying increase of the capacity of the lungs and the increased strength of the heart, and probably the increased germicidal power of the blood. These general propositions may be considered proved; but to distinguish between the effect of climate upon the different forms of phthisis suitable for the different climates, it is most convenient to group them as the tuberculous, catarrhal, and pneumonic, as giving their chief characteristics and tendencies, though remembering that in all cases tuberculosis is present, generally catarrh, and often pneumonia. In this sense, then, the broad statement may be made that the chief climatic factors are of value in the order given.

For the tuberculous: first altitude, second cold, third dryness.

For the catarrhal: first dryness, second medium elevation, third warmth.

For the pneumonic: first warmth, second moderate humidity, and third a low altitude.

Tuberculoses other than pulmonary, as a general rule, are benefited by climate along the same lines as the pulmonary cases.

Convalescents from croupous pneumonia, pleurisy, and empyema should go to a warm seashore, or to a dry, sunny, inland resort; but later the cure is often hastened by removal to higher altitude and, therefore, to a more bracing climate. The high altitudes are often of great value when the heart is not involved and when there is sufficient breathing space.

Catarrhal pneumonia generally is better in a more equable climate and lower altitude.

Chronic bronchitis does best in low, warm, dry, sheltered resorts.

Asthma.—The climate must be stimulating or sedative, according to the neurotic conditions, and warm or cold, damp or dry, according to the catarrhal conditions. Both increased and decreased air pressure, as demonstrated in the laboratory and by climatic change, markedly benefit asthma.

Heart-disease is usually somewhat affected by any moderate climatic change, and greatly affected by a considerable change, especially in elevation. In the young, with fair compensation, and if great watchfulness is exercised, a higher altitude is often of the greatest benefit; but most cases, and particularly cases occurring in persons past middle life, are best suited to a sedative, warm, equable climate.

Nervous Disorders.—Organic lesions, if acute

or inflammatory, need low, sedative climates; when stationary and anemic, to a bracing seashore or even a high altitude is often the best change. In neurasthenia the first essential of a climate is to give rest; the second to cure the anemia. The irritability of the nervous system that is inherent is most relieved in a sedative air; the irritability that is caused by the anemia is soonest removed by change to a high altitude, or if this is too great a change, then to a bracing seashore or an ocean voyage.

Kidney-diseases.—The majority of cases do best in warm, dry, low climates; but when there is great anemia, a cool, dry, and even high climate is often better.

Liver-diseases.—Serious organic cases should not be subjected to marked climatic change unless it is necessary to remove them from a bad climate, such as that of a malarial or tropic country. In functional disease, however, a radical change is indicated. The fair and full-blooded are usually less subject to hepatic disturbance at the seashore, and the dark-skinned and anemic on the mountains.

Stomach disorders need climatic change in accordance with their causes.

Gout and rheumatism are more often benefited by a warm and dry than by a cold or damp climate.

CLONUS.—Involuntary, reflex, irregular contractions of muscles when put suddenly upon the stretch. According to the part stimulated, the phenomenon is spoken of as *ankle-*, *jaw-* or *wrist-clonus*, etc. See Reflexes.

CLOVES (Caryophyllus).—The dried flower buds of *Eugenia caryophyllata*, distinguished by their aromatic odor and pungent, spicy taste. Its properties are due to a volatile oil, which is antiseptic, stimulant, and irritant. It also contains a crystalline body, *eugenin*, $C_{10}H_{12}O_2$, a camphor, *caryophyllin*, $C_{10}H_{16}O$, *caryophyllic acid*, and tannin, gum, etc. It is useful as a stomachic, and to prevent griping when combined with purgatives. As an external application it is efficiently employed for anesthetic and counterirritant purposes, to relieve pain in chronic rheumatism, myalgia, lumbago, superficial neuralgia, toothache, etc. The oil of cloves is an effective deodorizer for sponge-tents, a good application to a painful tooth, and is occasionally applied over the course of an aching nerve with relief to the pain. The oil is an efficient local application for pediculus pubis and similar parasites. It is in common use as a clarifying agent in microscopy. Cloves are one of the ingredients of the **spice poultice**, which consists of powdered cloves, ginger, and cinnamon, each 1 or 2 teaspoonfuls; flour, a tablespoonful; whisky, enough to moisten so as to spread on a soft flannel. It is a useful counterirritant for applying to the stomach of children with diarrhea.

Preparations.—**Oleum Caryophylli**, *oil of cloves*—a volatile oil distilled from cloves, soluble in alcohol, and of sp. gr. 1.060. It consists of a light and a heavy oil, the latter containing *eugenol*, a phenol, and *caryophyllin*, which yields as a product of its oxidation, *caryophyllinic acid*. Dose of the oil, 1 to 4 minims.

Eugenol—an unsaturated, aromatic phenol, miscible with alcohol in all proportions. Dose, 1 to 5 minims.

CLUBBED FINGERS.—Knobbed deformity of the fingers' ends, with curvature of the nails, seen in some cases of pulmonary and cardiac disease.

CLUB-FOOT.—See Talipes.

CLYSTER.—See Enema.

COAL-GAS.—Poisoning by coal-gas most commonly occurs from the gas-tap in a bedroom being left open, but it is sometimes due to a sudden rush of undiluted gas from meters or mains. In severe and fatal cases the symptoms are nausea or vomiting, vertigo, loss of consciousness, deep coma and muscular prostration, livid features, stertorous breathing, and frothing at the mouth. Death usually occurs quietly in coma, but occasionally with convulsions. The fatal period is variable, and remittent symptoms often give rise to fallacious hopes of recovery. The odor of gas on the clothes, breath, and perspiration, which continues after removal from the polluted atmosphere, is the best indication of the cause of coma.

Instant removal from the vitiated air is the first thing necessary, and then attempts to oxygenate the blood. Artificial respiration for at least 2 hours, and reflex stimulation of the face, chest, etc., by cold and heat and slapping, may be practised. In severe cases pure oxygen gas should be given. Venesection with infusion of normal salt solution is a plan of treatment likely to succeed. See Artificial Respiration, Asphyxia.

COCA.—See Erythroxylon.

COCAIN.—$C_{17}H_{21}NO_4$. The chief alkaloid extract of *Erythroxylon coca*. It is at first stimulant and afterward narcotic, and resembles *caffein* in its action on the nerve-centers, and *atropin* in its effects on the respiratory and circulatory organs. Its long-continued use (*cocain habit*) is followed by insomnia, decay of moral and intellectual power, emaciation, and death. Locally, it is a powerful anesthetic in a limited area of surface. It acts most rapidly on mucous tissues. Applied to the conjunctiva of the eye, it causes dilatation of the pupil and slight paralysis of the function of accommodation. Applied to the tongue, it temporarily destroys the sense of taste. Dose, 1/8 to 1 grain.

It is used principally to induce anesthesia for purposes of surgical application and exploration, and to secure temporary constriction of the smaller blood-vessels. After the impression last named ceases, a stage of dilatation ensues. It is thus hemostatic only in its primary impression, the secondary impression tending to induce bleeding. A cocainized surface is at first paler and more compressed than is the normal, and afterward it becomes reddened and somewhat turgescent. Since dilated states of vessels favor secretion, it follows that the secondary impression of cocain is accompanied by increased outflow when the application has been made to a gland-bearing surface. The effects above named will be varied by the peculiarities of the anatomic region, habits of patients, etc. Thus, pallor is more noticeable in the conjunctiva than elsewhere. The constricting and dilating effects in erectile tissues are espe-

cially marked in the nasal chambers, and the secretory effects are often noticeable in the larynx, where the untoward result of a full impression is noticeable in the impaired quality of the voice.

An overimpression of cocain may arise from almost any strength of solution, though it is more likely to occur in concentrated preparation; marked toxic symptoms have been known to follow an injection of a few drops of a 4 percent solution into the urethra; while, on the other hand, cases are reported in which large quantities of the drug have been injected without producing any unsought-for effect.

Cocain intoxication is characterized by vertigo, depression, nausea, difficult articulation, followed by restlessness. Flushes of heat are sometimes complained of. The duration of the impression lasts from 5 to 8 hours. Many cases of cocain poisoning have been reported. In all operations demanding the use of the knife it is well, after an application of cocain, to allow the parts to bleed freely after incision, in order to remove as much as possible of the drug from the circulation. It has been noted that persons addicted to alcoholic stimulants are peculiarly susceptible to the action of cocain. Cocain intoxication appears to be oftener seen after application about the head than elsewhere. For the relief of cocain intoxication inhalations of the nitrite of amyl should be resorted to, and the impression of caffein secured, while the patient's strength is being sustained. Among other measures may be mentioned the exhibition of belladonna, the inhalation of the vapor of ammonia, and external friction.

Cocain Anesthesia.—The following rules are requisite for the safety of the patient: The solution should always be fresh, the patient should invariably be in the recumbent position, and no longer than 5 minutes should elapse before operation is begun. Injections about the head are more dangerous than in the trunk or limbs. A 20 percent solution may be applied to the larynx, whence it is less readily absorbed than from the pharynx or esophagus (Stoerk). The ordinary strength is from 20 grains to 1/2 of a dram to the ounce. A 2 percent solution is used in the eye. Adrenalin chlorid solution is frequently used with the cocain in order to increase the effect of the latter. For hypodermic use, a 4 percent solution of cocain is used by Wyeth. Half a minim of this strength injected into the Malpighian layer of the derma will whiten the epidermis. The anesthesia spreads from 1/4 to 1/2 of an inch from the center of the injection. The needle, in hypodermic cocain anesthesia, is withdrawn and again inserted 1/4 to 1/2 of an inch from the first point of insertion, and another half minim or minim forced from the point at the same level, and the incision made previously to second entrance of the needle over the first area of anesthesia is now extended, and so on. An incision 1 inch long may be made into the subcutaneous areolar tissue after using in this manner 2 to 4 minims of a 4 percent solution. See also Intraspinal Anesthesia.

Preparations.—**C. Hydrochloridum,** $C_{17}H_{21}NO_4$. HCL, most commonly used for local anesthesia in 2 to 4 percent solution. Dose, internally, 1/8 to 1 grain; by hypodermic injection, 1/8 to 1/2 grain. **C. Oleas,** a 10 percent solution in oleic acid. olive oil and alcohol, for external use. See Antinarcotic Legislation, Harrison Law.

COCAINISM.—This pernicious habit is especially prevalent among physicians and others who are active mentally. A neurotic tendency predisposes to it. The use of cocain is an American practice and is extensive among the negroes of the South. Morphin habitués may acquire the habit by resorting to the drug as a substitute for morphin. It is estimated that over 4/5 of the output of cocain goes to habitués. The habit is a direct incentive to crime, the individual entirely losing his moral sense. Symptoms not unlike those due to alcohol and opium may arise. The patient is subject to insomnia, hallucinations and mental delusions especially of a persecutory nature; there is a peculiar sensation of worms or insects beneath the skin; nystagmus, ocular and circulatory disturbances may also occur. See Antinarcotic Legislation, Harrison Law.

Treatment consists in absolute withdrawal of the drug. It is imperative in cases complicated with alcoholism or morphinism that the patient be confined in an institution. Tonics and stimulants and good nourishing food are indicated. See Lambert Treatment for Narcotic Addiction.

COCCYGODYNIA.—An obstinate affection of the region of the coccyx, marked by severe neuralgic pain radiating from the sacrococcygeal joint. It occurs chiefly in parous women, though it has been ascribed to accidental injury, to excessive horseback riding, and to uterine or ovarian disease. Generally, no external evidences are visible. Sitting and defecation are painful.

General tonic treatment, together with rest, is to be tried. An aperient to insure a daily soft evacuation (sulphate of magnesium, 1 dram; wine of aloes, 1 dram;—in water every morning) will cure most cases in time. Morphin may be subcutaneously injected over the coccyx. Subcutaneous division of all the ligaments,muscles, and fasciæ about the coccyx has given good results.

COCCYX.—Injuries of the coccyx are generally dislocations, mainly of an incomplete kind. Dislocation may occur backward as the result of parturition, or forward from kicks or from falls in a sitting posture. Reduction may be effected by the finger placed in the rectum to reduce the forward displacement. Prolonged coccygodynia is likely to follow injury of the coccyx, since absolute rest is not obtainable, and the nerves become implicated in the inflammatory thickening that results.

CODEIN.—$C_{18}H_{21}NO_3$. An alkaloid of opium, and often contaminated by morphin. It somewhat resembles morphin in the general character of its action, but while it is powerfully analgesic, it is much less toxic and its hypnotic influence is quite limited. It has a decidedly stimulating effect upon the spinal cord, the medulla, and the lower parts of the brain, and is much less constipating than morphin or opium. It is especially useful in relieving cough of all kinds, and is more efficient

than opium in diabetes. It is often employed in cases where, as often happens in malignant disease, an anodyne effect must be maintained more or less continuously. It is free from odor and of a faintly bitter taste, soluble in 80 parts of water and in 3 parts of alcohol. The dose is 1/4 to 1 grain. See OPIUM, ANTINARCOTIC LEGISLATION, HARRISON LAW.

In diabetes:

℞. Codein, gr. xx
Extract of nux vomica, gr. xv
Extract of cascara sagrada, gr. xx.

Make into pills; give one 3 times a day.

For bronchitis with hard coughing:

℞. Ammonium chlorid, gr. v
Extract of licorice, gr. ij
Powdered cubebs, gr. iij
Codein, gr. j

Make into 20 pills; 1 every 2 hours until relieved.

The following are the salts: **C. Phosphate**, soluble in water. Similar to morphin in action, but less toxic. Dose, hypodermically, 1/4 to 1 grain. **C. Sulphas.** Dose, 1/4 to 1 grain.

COD-LIVER OIL (Oleum Morrhuæ).—The fixed oil obtained from fresh livers of the *Gadus morrhua* and other species of the codfish. It is a colorless or pale yellow, thin, oily liquid, of slightly fishy odor and taste, and faintly acid reaction, soluble in ether. It contains the fixed bases *Aselline* and *Morrhuine*, volatile bases, acids, etc.; also traces of iodin and bromin, the ordinary inorganic salts of animal tissue and products, and perhaps bile constituents. When saponified it does not yield glycerin, but oxid of propyl. Three varieties are found in the market, the pale, the light-brown and the dark. The pale is the official oil and the purest. Dose, 1 to 6 drams, beginning with a small dose, and increasing as assimilated. It has alterative powers, maintains bodily temperature, and directly influences the blood, increasing the red corpuscles. It is useful in persons whose mucous membranes are of low vitality, in the pretubercular stage of phthisis, in chronic rheumatism, in strumous skin-lesions, in scrofulosis, in enlargement of the lymphatic glands, in strumous ophthalmia, in advanced syphilis, in early stage of rickets, in marasmus, sciatica, lumbago, neuralgia, and in emphysema of the lungs.

It is generally administered in emulsion, but the oil itself is the best form for use. This may be given in large capsules, or a teaspoonful thrice daily for an adult, after meals, may be given in black coffee, beer, or lemon-juice. Oil of eucalyptus, in the proportion of 1 part to 100 of cod-liver oil, will extinguish the odor and taste. Extemporaneous emulsions are made with white of egg, mucilage of tragacanth, extract of malt, or any syrup, and flavored with lemon, cinnamon, or bitter almond. Ether, 4 minims to each dram of the oil, promotes its digestion.

An equal quantity of glycerin with from 1/2 to 1 drop of the oil of bitter almonds is of service to hide the taste. Syrup of bitter orange-peel also covers it. Tomato ketchup has been used. Cod-liver oil is most readily digested when given in nightly doses after supper, or after a light meal just before going to bed. In a few days it may be given after dinner, and after breakfast in about a week. It is readily combined with creosote.

Cod-liver oil may be used by inunction, especially in the wasting diseases of children. A tablespoonful may be rubbed into the skin of the abdomen twice a day, followed by the use of a flannel binder with oiled silk or mackintosh cloth. It passes readily through the skin and is absorbed.

Cod-liver oil is contraindicated in high febrile states and in chronic gastrointestinal inflammation.

Preparations.—Emulsion Olei Morrhuæ, *emulsion of cod-liver oil*, has of the oil 50, acacia 12 1/2, syrup 10, oil of gaultheria 0.4, and water to 100. Dose, 1 to 6 drams.

Emulsum Olei Morrhuæ cum Hypophosphitibus, *emulsion of cod-liver oil with hypophosphites*, has of the oil 50, acacia 12 1/2, calcium hypophosphite 1, potassium hypophosphite 0.5, sodium hypophosphite 0.5, syrup 10, oil of gaultheria 0.4, and water to 100. Dose, 1 to 6 drams.

An emulsion:

℞. Cod-liver oil, ℥ iv
Oil of wintergreen, gtt. xij
Calcium hypophosphite, gr. l
Sodium hypophosphite, gr. l
Acacia,
Water, enough to make ℥ viij.

Make into an emulsion; give a tablespoonful 3 times a day, after meals.

COFFEE.—The seeds of *Coffea arabica*. The dried and roasted seeds are almost universally used in infusion as a beverage, forming a cerebral stimulant and stomachic tonic. Coffee is valuable in promoting digestion and in allaying hunger and fatigue. It frequently causes excessive palpitation of the heart. Its properties are due to an alkaloid, CAFFEIN (*q. v.*), $C_8H_{10}N_4O_2.H_2O$, identical with *thein*.

Roasting the seeds changes the sugar into caramel, and several volatile substances are formed that give to coffee its peculiar aroma and some of its stimulant qualities. As a beverage, used with moderation, coffee assists digestion, promotes intestinal peristalsis, allays the senses of fatigue and hunger, lessens tissue waste, and decreases the formation and excretion of urea. In excess it disorders digestion and causes functional disturbances of the nervous system. The brief stimulation of the intellect consequent on drinking a cup of coffee is probably due to the volatile constituents developed in roasting. The wakefulness ensuing upon taking coffee is usually preceded by a brief period of drowsiness. The coffee bean contains from 0.2 to 0.8 percent of caffein.

COHOSH.—See CIMICIFUGA.

COLCHICIN.—$C_{17}H_{19}NO_5$. A yellowish, exceedingly bitter powder, freely soluble in water. It is a very active poison. Its dose is 1/120 grain, or 1/2 of a milligram, hypodermically.

COLCHICUM (Meadow-saffron).—The corm and seed of *C. autumnale*, with properties due to

an alkaloid, *colchicin*. It is an emetic, diuretic, diaphoretic, and drastic cathartic. It is one of the most powerful cholagogs. It is valuable in acute gout, and is used with good results in gonorrhea.

It is official in two forms: **Colchici cormus**, colchicum corm, the dried corm, less active than the seed. Dose, 2 to 8 grains. **Colchici semen**, colchicum seed. Dose, 1 to 5 grains.

For acute gout:

℞. Potassium iodid, ℥ j
Potassium bicarbonate, ℥ iij
Wine of colchicum seed, ℥ j
Camphor water, enough for ℥ vj.
A tablespoonful in a wineglass of water after meals.

Preparations.—**Extractum Colchici Cormi**, *extract of colchicum corm*, made with acetic acid 35 parts to 100 of the root, and sufficient water. Dose, 1/2 to 2 grains. **Fluidextractum Colchici Seminis**, *fluidextract of colchicum seed*. Dose, 1 to 5 minims. **Vinum Colchici Seminis**, *wine of colchicum seed*, 10 percent. Dose, 10 to 60 minims. **Tinctura Colchici Seminis**, *tincture of C. seed*, 10 percent. Dose 10 to 60 minims.

COLD, EFFECTS.—The usual effect of exposure to cold is to lower, even to extinction, vital activity. The more special effects vary in degree and kind: (1) With the degree of cold, the duration of the exposure, and the medium or manner of application; (2) with the part and extent of surface exposed; and (3) with the general constitution and physiologic condition of the sufferer.

Moderate cold acting for a short time, or severe cold for a shorter time, followed by speedy reaction, is tonic and stimulating. Continued exposure to cold keeps at low ebb the activity of nutrition and function. Dry cold is less injurious; and cold water cools sooner than cold air of the same temperature. The young and the aged suffer from exposure to cold, and among the healthy, hunger, fatigue, sleep, anxiety of mind, fear, and mental depression lower the power of resistance to cold. The list of maladies most commonly fostered by exposure to the influence of cold is: General depression of the vital powers; congestion and functional derangement of various internal organs (*e. g.*, the lungs, liver, and kidneys); catarrhal and other forms of inflammation of mucous membranes, especially of the respiratory tract, the intestinal canal, and the bladder; paralysis from central or peripheral lesion; rheumatism; chilblain; frostbite; and gangrene.

Treatment of sufferers from cold consists in the restoration of warmth and the reestablishment of the processes whereby natural heat is maintained. This must be done gradually. The patient is wrapped in blankets, and put in a room in which the air is dry, still, and cold, but that can be gradually warmed. He is then subjected to gentle and continuous friction, but no rough manipulation, of the injured parts. Ice or ice-cold water may be used at first, afterward dry flannel or the bare hands, and later stimulating liniments. Tea, coffee, soup, aromatic infusions, beef-tea, and warm and stimulating drinks may be given at first, but no spirits. Alcohol is beneficial only when judiciously administered in the restoration from exposure. If insensibility exists, efforts to restore animation should be continued for a long time. In severe cases temperature must not be restored too quickly. The bladder must always be examined, and urine not allowed to accumulate but for a short time. The general health often needs attention long after recovery from immediate effects.

COLD, THERAPEUTICS.—Cold as a remedial agent acts, according to the manner and degree of its application, as an anesthetic, antiphlogistic, antiseptic, hemostatic, or tonic. The simplest and cheapest, but a painful, method of producing anesthesia for minor operations by cold is by the direct application of ice crushed in a cloth, or a mixture of about equal parts of ice and salt. Sprays of volatile liquids may be used so as to produce the same effect. Pure anhydrous ether may be sprayed from a hand-ball. Chlorid of ethyl or methyl sprays are sold in glass tubes with brass caps for use in blanching and freezing surfaces. Rhigolene is used as a spray in an atomizer.

Injuries to the head are greatly benefited by the application of cold. India-rubber bags serve well as containers, and animal membranes—*e. g.*, bladders—insure comfort, but require watching. In strangulated hernia and in swollen joints the even pressure of an ice-bag adds to the efficiency of the cold, while coils of rubber tubing, or Leiter's metallic coils, or irrigation based on the action of the siphon may be of great avail.

Wetting the surface of the skin that is exposed to the air, and thus maintaining constant evaporation, is a most useful way of reducing high temperatures. The **cold pack** is a valuable means of reducing the body temperature in cases of hyperpyrexia. The patient is wrapped in a sheet wrung out of cold water; as this becomes warm, it is replaced by a fresh cold one, or iced water may be poured upon it, or lumps of ice placed upon and around it. When the temperature is reduced, the wet sheet should be removed, and a light covering applied, but not a blanket. This is not so efficacious as the cold bath.

A cooling lotion consists of:

℞. Sweet spirit of niter, ℥ ss
Ammonium chlorid, ℥ ij
Vinegar, Acetic acid, Methylated spirit of wine, each, ℥ jss
Water, O j.

By increasing the niter and sal ammoniac to 5 ounces of each, a good substitute for ice is obtained.

In sprains, in superficial neuralgias, and in the treatment of pneumonia and pleurisy by means of an ice-jacket or poultice, and to stay peristalsis and check hemorrhage in enteric fever, this agent is very useful. Cold injections by vagina or rectum may succeed in checking severe uterine hemorrhage. In bleeding internal piles and as an antipyretic enema cold water injections may be used.

A cooling lotion may be made from spirit of wine and water or from dilute cologne water. Potassium nitrate, 4 drams, or ammonium chlorid, 4 drams, to 15 ounces of the lotion will add to its cooling and sedative effect. One part of alcohol to 3 parts of camphor water is highly praised in gout.

The tonic action of cold baths is well known. Cold to the face and hands is a popular method of reviving fainting persons. Cold hip-baths and enemas are useful in piles, varicocele, and general pelvic weakness. Cold salt-baths, particularly if sea-baths, are more stimulating and not so relaxing as fresh-water baths. Cold water dashed or sopped against the perineum is a remedy advised for nocturnal seminal emissions, or the scrotum may be submerged in a tumblerful of cold water for a few minutes. In dysentery 1 or 2 quarts of ice-cold water may be injected into the rectum, and this treatment may be of use for piles. Cold may also be used in pruritus ani, in prolapse of the anus, in prostatic disorders, in atonic impotence in the male, and in pruritus of the vulva and vagina in females.

COLD IN THE HEAD (Coryza).—See CORYZA, RHINITIS (Acute).

COLEMAN-SHAFFER DIET.—See under TYPHOID FEVER.

COLIC. Definition.—A severe griping pain in the bowels or adjacent organs. In intestinal colic the pains radiate over the abdomen from the region of the umbilicus. The abdomen is usually distended, and pressure will generally relieve the pain.

Etiology.—(1) Indigestible food, such as green fruit or insufficiently cooked vegetables; (2) overfeeding, especially in children; (3) reflex from the ovaries, kidneys, liver, or uterus; (4) certain drugs, as lead; (5) the result of intestinal obstruction or enteritis; (6) autoinfection.

Symptoms and Clinical Course.—Paroxysms of sharp pain set in over the abdominal region, especially around the umbilicus, frequently being so severe as to make the patient flex the thighs upon the abdomen. The face has an anxious expression or is entirely distorted; the eyes are closed tightly, the fingers clenched, and the teeth firmly set. The intestines are filled with gas, and expulsion of flatus from the stomach and bowels generally occurs. Romberg thus describes a paroxysm of intestinal colic: "There are attacks of pain, spreading from the navel over the abdomen, alternating with intervals of ease. The pain is tearing, cutting, pressing, most frequently twitching, pinching, accompanied by peculiar bearing-down pains. The patient is restless, and seeks relief in changing his position and in compressing the abdomen; the surface of the body may be cold and the features pinched. The pulse is small and hard. The abdomen is tense, whether puffed up or drawn inward. There are often nausea and vomiting, and desire for stool. There is usually constipation, but sometimes the bowels are regular or even too loose. These symptoms last from a few minutes to several hours, relaxing at intervals. The attack ceases suddenly, with a feeling of the greatest relief, although some soreness remains for a few days."

Diagnosis.—Gastralgia differs from colic in the pain being in the epigastric region and associated with disorders of digestion.

In **hepatic colic**, or the passage of gall-stones, the pain is in the hepatic region, attended with soreness over the gall-bladder, and retching and vomiting, followed by jaundice and the presence of bile in the urine.

In **nephritic colic** the pain follows the course of one or both ureters, shooting to loins and thigh, with retraction of the testicle of the affected side, strangury, and bloody urine.

In **uterine colic** the pain is in the pelvis, and associated with menstrual disorders—in fact, a dysmenorrhea.

In **ovarian colic** or neuralgia there is pain on pressure over the ovaries, with hysteric phenomena.

Inflammatory disorders of the abdomen differ from colic by the presence of fever and of tenderness on pressure.

Lead colic is always preceded by symptoms of lead-poisoning: to wit, slate-colored skin, dark gums showing a blue line, heavy breath, with sweetish metallic taste, obstinate constipation, impaired appetite, slow pulse, and contracted abdominal walls.

INTESTINAL COLIC.	BILIARY COLIC.	RENAL COLIC.	LEAD COLIC.
1. History of having eaten improper food.	1. History of colic, vomiting, followed by icterus.	1. History of previous attacks and passage of calculi.	1. History of having been exposed to inhalation of lead: blue line on gums.
2. Pain chiefly in region of umbilicus.	2. Pain in region of liver, radiating toward umbilicus and right scapula.	2. Pain in region of affected kidney, radiating down thigh, often accompanied by retraction of testicle.	2. Pain in region of umbilicus.
3 Abdomen tympanitic.	3. Abdomen tympanitic.	3. Abdomen tympanitic.	3. Abdomen very hard.
4. Absence of rigor.	4. Sweats and chills frequent.	4. Rigors pronounced.	4. Rigors absent, constipation persistent.

Treatment.—First eliminate the possibility of mechanic obstruction, such as hernia, twist or, adhesions. Pain should be relieved by subcutaneous injection of morphin (1/8 to 1/4 of a grain), or of morphin (1/8 of a grain) and atropin (1/60 of a grain); by inhalations of amyl nitrite, chloroform, or ether; or by drop doses of chloroform. A large warm-water enema may be administered, and a combined sedative and purgative given, such as a grain of opium with 5 to 10 grains of calomel, or 20 grains of rhubarb followed by a saline cathartic. One of the best purgatives in colic, no matter from what cause, is calomel, 1/2 of a grain every half hour until 4 or 5 grains are taken, followed by citrate of magnesia. A suppository of

1/2 of a grain each of morphin hydrochlorid and extract of belladonna may give immediate relief from pain. The warm bath, mustard or turpentine stupes, hot fomentations sprinkled with laudanum, or large, light linseed poultices are grateful. Steady but not severe friction with warm oils or liniments gives relief. Liquids, with small quantities of stimulants, constitute the best diet. Copious drafts of hot water to relieve the pain and to favor evacuations.

The colic-like enteralgia of women is relieved by sodium salicylate in 20-grain doses. In malarial subjects colic is best relieved by quinin and arsenic, and, generally, aperients should be given with sedatives. Treatment subsequent to an attack of colic should include regulation of the diet and prevention of the lodgment of solids and gases in the bowel. The abdomen should be kept warm by a flannel roller or belt, and the feet by thick woolen stockings or by a foot-warmer.

Hepatic or biliary colic requires the use of anodynes to relieve the pain and to facilitate the escape of the stone. Morphin, 1/4 to 1/2 of a grain, together with 1/60 of a grain of atropin, should be given hypodermically. A turpentine stupe may be placed over the liver, and gentle rubbing employed. Nauseating emetics are contraindicated. Cotton-seed oil or olive oil, in the dose of at least half a pint, may be given during the attack, with the addition of 1/2 of a dram of ether with each dose. The inhalation of chloroform or ether may be resorted to if the pain is not relieved by previously stated means. See GALL-BLADDER (Diseases).

Renal Colic.—Treatment is by rest in the recumbent position, hot fomentations of belladonna over the whole side, and repeated injections of morphin in free doses hypodermically. In the case of blood-clots, calculi, or tissue shreds, free kneading and manipulation over the tract of the ureter may assist the passage of the foreign body into the bladder. See KIDNEY (Stone).

In **lead colic** purgatives are indicated, and opium or belladonna are to be used. Magnesium sulphate is the best purgative, and potassium iodid is usually given to remove the lead from the system. Sulphur baths are also recommended. Excellent results often follow one or more small venesections in lead-poisoning. Gratifying results have been reported from large doses of olive oil, repeated until some 6 ounces have been used. This substance is said to be curative in lead-poisoning, in daily doses of 2 ounces, continued for some time. See LEAD.

COLIC, INFANTILE.—Colic may be a symptom of intestinal inflammation; it may be due to swallowing foreign bodies, as the seeds of fruit; or possibly to the presence of round-worms in great numbers; but the usual colic of infancy is that associated with flatulence and caused by indigestion. This form of colic is seen the first 6 months of life, but is most frequent the first 3 months, and it may be present at any time when the digestion is very feeble. Many young infants suffer from colic a greater part of the time; others have only occasional attacks. It is not likely to occur at night. Colic is seen quite as often in nursing infants as in those artificially fed. It may be produced by an oversupply of food, by a deficiency in the amount of food, or as a result of decomposition in the digestive tract. In most cases, however, it is due to the character of the milk. Excessive proteids are nearly always the cause of colic in nursing infants, as well as in the bottle-fed babies, though it may be caused by an excess in the proportion of sugar; it is a common symptom in infants fed on farinaceous foods.

Symptoms.—Soon after taking food the infant becomes restless, picks and draws up its legs, twists its body, and has frequently repeated paroxysms of loud crying. The abdomen is full and hard, the hands and feet are cold, and in severe cases the fontanel is depressed. After a varying time eructations of gas or curdled milk occur or gas is expelled by the bowels, and the symptoms disappear for a time.

The cry of colic may sometimes be difficult to distinguish from that of hunger, as a child with colic will often take food eagerly, and for a time the warm fluid in the stomach will give it relief. In these cases the pain will be quieted but for a short time.

Treatment.—One of the following formulas will in most cases give relief:

℞. Lime-water, Compound tincture of cardamom, each, ℥ j.

Give a teaspoonful every half hour.

℞. Spirit of chloroform, gtt. xvj
Aromatic spirit of ammonia, ℥ ss
Sodium bicarbonate, gr. xvj
Syrup, ℥ss
Peppermint water, q. s., ℥ ij.

One teaspoonful, as necessary, for pain.

℞. Oil of cajuput, gtt. v
Acacia, Sugar, Water, q. s., ℥ j.

Make an emulsion and give 1/2 of a teaspoonful as necessary.

In severe cases the following is very helpful:

℞. Chloral hydrate, gr. xvj
Sodium bromid, Sodium bicarbonate, each, ℥ ss
Syrup, ℥ ss
Peppermint water, q. s., ℥ ij.

Give 1/2 to 1 teaspoonful every half hour until quiet.

In many cases the most efficient method of relieving the pain is an enema of 3 or 4 ounces of warm water and sodium bicarbonate (1/2 a teaspoonful).

Hot applications should be made to the abdomen, and when symptoms of collapse appear, a hot bath should be given.

COLITIS.—See DYSENTERY, ENTERITIS, FECES.

COLLAPSE.—A condition of lowered vitality induced by reflex inhibition, and affecting all the functions of the nervous system. The chief object of treatment is to restore the function of heart and

vessels. For this purpose the recumbent position, external heat, cessation of hemorrhage, and cardiac, stimulants, like ammonia, by inhalation or by the mouth (diluted), hot drinks, brandy or spirits, strychnin, etc., are to be administered. Hot milk and coffee are useful.

Collapse is a condition of nervous prostration. When extreme, the vital nervous functions are sometimes completely in abeyance. Death may ensue, or there may be gradual reaction and complete recovery. Strictly speaking, collapse and shock should not be classed together. Shock is the term applicable not only to the state or morbid condition, but also to the cause of that condition. Collapse arises from many causes, shock being one of them, and collapse may occur when no shock has preceded. Collapse presupposes nervous exhaustion. Shock occurs in a healthy state as well.

The severity of collapse depends on the age and vigor of the individual. A moderate amount is seen in fevers, and well-marked collapse exists in severe injury or results from loss of blood. Severe purging and tobacco poisoning produce a condition resembling traumatic collapse. Some malignant fevers terminate in collapse, and in cholera collapse gives high internal temperature with cold external parts. Collapse from loss of blood differs from syncope. In syncope the prominent symptom is loss of consciousness. The more we know of shock and collapse, the less we pin our faith to drugs (Bastedo). If we employ them, we must not let the stress of the emergency lead us into giving them in too large doses. In such an emergency drugs have been administered in amounts that might have proved fatal to a healthy person; and it seemed as if the patient might have died from the drugs rather than from the collapse. See Exhaustion, Shock.

COLLARGOL.—Colloidal silver. Argentum Credé. It is said to contain 97 percent of silver. Collargol is a general antiseptic and germicide producing neither local reaction nor general poisonous effects. It is said to cause marked and rapid leukocytosis, to be completely excreted within a month, to be incapable of producing argyria, and to have inhibitory action in the blood on bacteria. It has been used with benefit in skin and venereal diseases, local suppurations, and septic disorders; also in diphtheria, scarlet fever, pneumonia, pericarditis, and typhoid fever. Dose, by mouth, 1 grain tablet, or 1 teaspoonful of a solution of 1 to 500 or 1 to 100; for irrigation, 1/50 percent to 1 percent solutions; 5 percent dusting powder; in most cases it is best used locally in the form of a 15 percent ointment (Collargol ointment, Unguentum Credé).

COLLES' FRACTURE.—See Forearm, Fractures.

COLLODION.—Ordinary collodion is a solution of gun-cotton in alcohol and ether. It is a clear, syrup-like fluid, smelling strongly of ether, and is used externally, making an air-tight dressing for wounds and abrasions, and rendering small dressings waterproof. A camel's-hair brush may be used to apply the solution. In boils collodion may be used as an abortive, but not after rupture. In small-pox collodion may prevent the pitting, and it is serviceable in gouty inflammations when mixed in equal parts with iodin. There are 4 official collodions: Collodion, flexible collodion, cantharidal collodion, styptic collodion. The flexible collodion contains 5 percent of Canada turpentine and 3 percent of castor oil; styptic collodion contains 20 percent of tannic acid; and cantharidal collodion contains 60 percent of cantharides.

COLLYRIUM.—A lotion for the eyes, generally containing a soluble astringent salt dissolved in rose water or distilled water in the proportion of 1 to 4 grains to the ounce.

Boric acid is extensively used as a mild antiseptic lotion in solutions of 10 grains to the ounce. It is hardly to be classed as an antiseptic, but, on account of its soothing qualities, is to be recommended in cases in which only a simple lotion is necessary.

The following are common formulas:

℞.	Boric acid,	gr. xl
	Distilled water,	℥ iv.

Bathe the eyes freely several times a day.

℞.	Boric acid,	gr. xl
	Camphor water, Distilled water, each,	℥ ij.

Bathe the eyes freely several times a day.

The following mixture may be used freely in all mucopurulent inflammations about the eye:

℞.	Boric acid,	gr. xl
	Sodium chlorid,	gr. ij
	Zinc chlorid,	gr. ij
	Distilled water,	℥ iv.

Stain with pyoktannin, and doubly filter after standing.

The patient should be told that this lotion will smart at first, and that he should instil it in the eye when lying on his back, and not close the eyes violently and squeeze it out, but draw the lids together gently and roll the eye slowly about for a minute.

A very satisfactory combination is:

℞.	Boric acid,	gr. xij
	Mucilage of sassafras pith,	℥ ij
	Mercuric chlorid,	gr. 1/75
	Sodium chlorid,	gr. j
	Camphor water, Distilled water, each,	℥ jss.

COLOCYNTH.—The dried fruit of *Citrullus colocynthis*, from which the seeds and rind have been rejected. Its properties are due to a bitter glucosid, *colocynthin*, $C_{56}H_{84}O_{23}$, the dose of which is 1/20 to 1/5 of a grain. It is a tonic and astringent purgative, and is used mainly as an ingredient of compound cathartic pills. It is somewhat useful in colic, sciatic rheumatism, and neuralgia.

Preparations.—**C. Ext.**, dose, 1/4 to 1 grain. **C. Ext. Comp.**, contains colocynth extract 16, aloes 50, cardamom 6, resin of scammony 14, soap 14, alcohol 10. Dose, 5 to 20 grains. **Pilulæ Cathartic. Comp.**, compound cathartic pills have: compound extract of colocynth 8, calomel 6, resin of jalap 2, gamboge 1 1/2, water to make 100 pills.

Dose, 1 to 3 pills. **Pil. Catharticæ Vegetabiles** contain compound extract of colocynth 6, extract of hyoscyamus 3, resin of jalap 2, extract of leptandra 1 1/2, resin of podophyllum 1 1/2, oil of peppermint 0.8, water to make 100 pills. Dose, 1 to 3 pills.

COLON BACILLUS INFECTIONS.—Bacillus coli communis is a term clinically applied to a variety of organisms answering to a series of class reactions of the bacteriologist, but of which a number of specific ones have been isolated. In a general way this subdivision of the bacteriologist has but little clinical interest as yet, and the specific methods of identification are still matters of some dispute, but sufficient work has been done to make it desirable that the clinician speak of one or other organism as a "member of the colon group" rather than as this or that particular variety, unless approved methods of identification have been employed in addition to the general class methods.

While *members of the colon group* are regular inhabitants of the intestine in health, there is ample evidence that they vary decidedly in toxicity and in pathogenic quality. No rule is yet established why this change in toxicity should occur and it seems reasonable to suppose that the lowered resistance of debilitated subjects favors the development of the increase in pathogenic quality. The organisms in question are certainly pyogenic under certain circumstances and produce suppurative processes without the presence of any other organism, but they also occur in conjunction with other pus-producing bacteria in which event it is sometimes difficult to determine which organism was the original infective agent.

Infections from which pure cultures of colon bacilli are obtained are most frequently observed in the genito-urinary tract, but no portion of the body is immune to this type of infection. It may occasion local inflammatory lesions in the meninges, ear, eye, throat, breast, lung, pleura, pericardium, peritoneum, liver, pancreas, gall-bladder, biliary passages, spleen, appendix, intestinal wall and uterine adnexa. It produces abscesses and may be the cause of a general systemic sepsis with bacillemia. The direct mode of infection is by no means clear in all cases and the frequency with which colon bacilli can be demonstrated in blood cultures justifies the general belief that the infection is hematogenous in many if not most instances.

The recognition bacteriologically of the colon bacillus is not as simple as in the case of organisms which can practically be identified by their morphology, as it demands cultural characteristics in addition to microscopic appearance and staining qualities. The organism is a medium-sized bacillus with rounded ends varying somewhat in length and very sluggish, if at all motile. It does not stain uniformly, usually showing a few but faintly stained portions and is Gram negative. On nutrient gelatin or agar slant it shows a rapidly growing grayish translucent strip with irregular margins and does not liquefy the medium. It produces gas formation in media containing sugar. The essential features for the differentiation of the colon bacillus aside from its morphology are, the marked indol production in peptone solution and the fermentation of dextrose and lactose media, in all of which it differs from the typhoid bacillus, the Shiga bacillus and the paratyphoid bacillus which do not produce indol and do not ferment the media mentioned.

Genito-urinary Tract.—Colon bacillus infections are most frequent in this region and a careful consideration of the cases usually allows at least a suspicion that an underlying cause for inflammation, if not directly for colon bacillus infection, exists. An enlarged prostate with residual urine will usually soon lead to a cystitis. This catarrh of the bladder is one of two types, either there is alkaline fermentation or a colon bacillus infection with acid urine. The colon bacillus infection may ascend the ureter, sooner or later leading to a pyelitis or pyelonephritis, which extension may be sudden or gradual. If sudden there usually are pronounced characteristic symptoms with a rather high range of temperature. If gradual this may occur with few if any symptoms, and no rise of temperature and the diagnosis may have to rest on the conditions found on urine examination. In these cases it seems reasonable to suppose that the enlarged prostate and residual urine are the direct causes allowing the colon bacillus infection. There is no apparent reason why in one case an alkaline fermentation of the urine in the bladder is found and in the other case a colon bacillus infection, unless in the latter the colon bacilli in the intestine have become abnormally virulent as the result of faulty intestinal processes or for reasons unknown. The latter idea is prompted by the frequency with which cases of colon bacillus infection of this kind have a history of long-standing intestinal disturbance. The diagnosis rests on the same clinical symptoms noted in the respective lesions due to any cause and on the presence of a pure culture of a member of the colon group in the urine in addition to the changes characteristic of a cystitis, pyelitis or whatever the condition may be. The urine usually shows a pronounced macroscopic bacteriuria with an acid reaction and rather characteristic offensive odor, and it is not difficult generally to demonstrate the nature of the causative organism as previously described.

Cases are certainly met with in which there is a colon bacillus infection of the bladder with or without involvement of the kidney in which no underlying cause for inflammation, as in the cases just described, can be found. The ease with which fecal matter can soil the female urethra has frequently been described as a cause of colon bacillus infection. Further investigation will be necessary before the statement is justified that these infections are due to increased virulence of the colon bacillus in the intestine of the patient as the result of faulty metabolism or what not.

Cystitis, pyelitis and pyelonephritis developed during pregnancy are conceded by most writers as due to the colon bacillus in the majority of cases, and are invariably ascribed to this cause by others. In these cases the onset may be sudden with severe symptoms and high temperatures, or gradual with slight symptoms and no fever. Here also an un-

derlying cause for inflammation exists, namely, the pressure of the gravid uterus particularly on one ureter. The frequency of colon bacillus pyelitis in pregnancy in the women who for months have shown evidences of intestinal toxemia, as compared with those without such evidences, is certainly noteworthy and serves as an indication for the prompt relief of intestinal toxemia in pregnancy when it occurs.

Acute pyelitis and pyelonephritis due to colon bacillus infection in infants and young children has had the close attention of the clinician, particularly of late, in explanation of high ranges of temperature. This condition is by no means infrequent and, in most of the cases at least, a distinct history of intestinal disorder is obtained which tends to strengthen the belief that faulty intestinal processes increase the virulence of the colon bacillus and subject the child to infections of this kind. The frequency of this condition (if no other reason) should prompt a careful examination of the urine in the case of any child with unexplained fever particularly if there is a history of gastrointestinal disorder. Trautner argues that colon bacillus infections may be responsible for the formation of uric acid in the kidney, particularly in infants, although it is rather the exception than the rule to find renal calculi and colon bacillus infection associated.

Meningitis.—Pure cultures of colon bacilli have been obtained in cases of meningitis but the suspicion always seems justified that this is not the only organism concerned.

Ear.—Cases of purulent otitis media in which colon bacilli only are obtained on examination are not very uncommon. The infections are usually quite mild and an extension to the mastoid is not at all probable. Thrombosis of the sinus has not been described.

Eye.—A purulent conjunctivitis now and again shows colon bacilli only, which must be looked upon as the causative factor. The cases are usually not severe and the ordinary methods of treatment in which cleanliness is the chief feature usually result in prompt relief. Morris recently reported a case of severe choroiditis which threatened to end in total blindness which was due to colon bacillus infection. This patient had severe intestinal disturbances. On removal of the appendix not only the intestinal fault was relieved but the choroiditis also disappeared.

Tonsillitis.—Some cases have been described in which pure cultures of colon bacilli were obtained, but usually other organisms are found in addition and in that case it is possible that the colon bacillus represents a secondary infection. Pure cultures of colon bacilli have been obtained from the throat in practically every described case of similar infection of the lung.

Mastitis.—In the resulting abscesses pure cultures of colon bacilli are sometimes obtained, though usually this is due to a secondary infection after incision. The occurrence of colon bacillus abscesses of the breast in cases of colon bacillus puerperal sepsis with bacillemia suggests probable hematogenous infection.

Pneumonia.—Cases have been described with the physical signs of pneumonia in which pure cultures of colon bacilli were obtained. v. Schrötter and Weinberger published a case in which there was consolidation of both lower lobes with a normal blood picture instead of a leukocytosis and polynucleosis, the disease lasting four months.

Empyema.—Records are occasionally found in the journals of cases of empyema in which pure cultures of colon bacilli were obtained. Schmidt describes a case of a student with a severe colitis which was followed by an empyema on the left side showing pure cultures of colon bacilli, the infection evidently being hematogenous.

Pericardium.—As in the case of the pleura, colon bacillus infections occur and can be ascribed to hematogenous origin.

Peritonitis.—Inflammations of the peritoneum due to colon bacillus infection are commonly observed without solution of the continuity of the intestinal wall. The produced matting together of the structures and the inflammatory exudate have in a number of instances been taken for a tuberculous process or a neoplasm, which mistakes can be avoided by proper bacteriological examination. Severe infections of the peritoneum are invariably preceded by pronounced evidences of intestinal disturbance and accompanied by outspoken symptoms particularly those referable to the toxemia.

Liver, Pancreas, Bile Passages and Gall-bladder.—On account of the direct connection of these organs with the intestinal tract a colon bacillus infection can easily be understood. These infections are particularly common and generally very severe when they occur after typhoid, which disease is known to increase the virulence of the colon bacillus. Suppurative inflammations in the ducts, abscesses in the parenchyma of the organ and perihepatic abscesses occur. Colon bacillus infection of the gall-bladder is one of the chief causes of inflammation and suppuration and these infections are also looked upon as a common cause of gall-stones. It has been shown that the organism decomposes the biliary salts and causes a precipitation of cholesterin.

Spleen.—In a considerable proportion of the cases of splenic abscess pure cultures of the colon bacillus are obtained and it is probable that the infection enters through the blood stream. Ruptures of abdominal organs are also at times followed by colon bacillus infections.

Appendicitis.—The frequency with which pure cultures of colon bacilli are obtained in cases of acute or chronic appendicitis has led to the belief that this organism in its more virulent state is the direct cause of the inflammatory process. Instances such as the cited case of Morris where a choroiditis and a protracted intestinal disorder due to the colon bacillus were immediately relieved by the removal of the appendix would tend to corroborate this view. On the whole it would seem that caution should be exercised in pronouncing the lesion as invariably due to the colon bacillus as other pyogenic organisms are found associated with it in many cases.

Intestinal Wall.—Lesions in the intestinal wall due to disturbances in circulation or injury as in incarcerated hernia, intestinal obstruction from any cause, etc., usually lead to invasion of the tissues by the colon bacillus which may give rise to inflammation or suppuration.

Uterine Adnexa.—Acute suppurative processes in the uterine adnexa particularly when the inflammation extends into the pelvis usually show the presence of colon bacilli in addition to other pyogenic organisms though pure colon bacillus infections are also met with.

Abscesses, Wound Infections and General Sepsis.—Not infrequently pure cultures of colon bacilli are obtained from abscesses probably caused by hematogenous infection, and secondary infections of wounds by the colon bacillus are also not uncommon. The literature both in America and in Europe offers a considerable number of cases of general septicemia due to the colon bacillus which can be recovered in pure culture from the blood. Clinically they seem characterized by particular prominence of brain symptoms evidently referable to the toxemia produced. While some cases are acute and terminate fatally, the majority can be classed with the cases of chronic sepsis terminating in death or recovery after a longer period. The diagnosis must rest on positive blood cultures as in general sepsis due to other organisms.

Prognosis.—While exceptional cases of exceedingly mild and scarcely noticed infections occur as well as very severe ones, particularly those seen after typhoid, in general it may be said that colon bacillus infections are not as severe as those due to the streptococcus or staphylococcus and are also less likely to produce general systemic invasion.

Treatment.—In cases of colon bacillus infection of the urinary tract urotropin or a similar preparation has usually met with success. Urotropin can be obtained in one-half gram tablets which are given in water one every three hours to one three times a day. W. H. Thomson strongly advocates giving the benzoate of sodium with urotropin, ten grains of each every three hours in acute cases. Owing to the probability that the colon bacillus in the intestine is unduly virulent, measures for the frequent emptying of the bowel should be taken. In addition to laxatives, frequent and long continued high irrigations are undoubtedly of benefit, using normal saline solution or the addition of some antiseptic such as thymol. The administration of the bacillus bulgaricus either in tablet form or in one of the prepared milks has a decided influence on the growth and virulence of the colon bacillus and is to be recommended.

Colon bacillus infections other than of the urinary tract usually do not respond nearly as well if at all to urotropin and in these, symptomatic treatment is generally employed.

Vaccine therapy has found an unusually good field in colon bacillus infections. While its usefulness in acute infections, particularly those with a bacillemia, is still a matter of controversy, Wright and others claim that beneficial results are obtained by the use of very small doses injected rather more frequently than usual.

There is no doubt that vaccines do accomplish splendid results in the subacute and chronic localized colon bacillus infections. The use of autogenous rather than stock vaccines is strongly advised particularly as the organism in question is a member of the colon group rather than a true entity; and vaccines, as all immunizing substances, are specific in the strictest sense. The dose and interval between doses depend largely on the manner in which the vaccine is prepared so that absolute rules cannot be made; but in general it may be said that the initial dose is about 100 to 200 million and the interval from 5 to 8 days. If the initial dose produces no local or systemic reaction, subsequent doses may be increased but the interval between doses should not be shortened.

COLON, IDIOPATHIC, DILATATION.—See HIRSCHSPRUNG'S DISEASE.

COLOR-BLINDNESS. Varieties.—Total and partial; congenital and acquired.

Total color-blindness, in which the solar spectrum appears uniformly grayish, is very rare.

Partial color-blindness is quite common. Statisticians declare that the proportion is 1 in 25 among males, and 1 in 400 among females. There may be blindness to blue, yellow, red or green. However, the colors that most often fail to make proper impressions are red and its complementary color green. These colors do not appear as absolutely black, but they cannot be distinguished from each other and from certain shades of gray and brown. In extreme cases there is total blindness for red and green, and even the brightest shade of red cannot be distinguished from green. Unfortunately, the colors most often at fault have been selected by railroad companies and navigators as their signal colors; hence it may be seen how important it is for the employees of transportation companies to have the color-sense absolutely perfect.

Congenital color-blindness is the most common form. It is often hereditary, and sometimes skips several generations. The discoverer of color-blindness was Dalton, a distinguished professor of chemistry, who himself was color-blind, a fact that he ascertained by accident.

Acquired color-blindness may be the result of disease or accident. Defective color-sense often appears after disease of the optic nerve, and is a particular symptom in optic neuritis and in atrophy due to excessive use of tobacco and alcohol. However, central color-blindness may be seen in all forms of toxic amblyopia. A peculiar point to be noted in tobacco amblyopia is the fact that the patient may be able to distinguish colors close to the eye, but when they are further removed he is color-blind, particularly for green and red. This makes it quite important to test for color-blindness at the normal signal distance in addition to the skein-test at close range. Color-blindness is sometimes the result of traumatism; occasionally, after blows upon the head, color blindness is noticed in one-half the field of vision only, the other half being normal in its color-perception.

Chromatopsia is a condition in which all objects become tinged with certain colors. It is common

after cataract extraction. Large doses of santonin have the peculiar property of rendering the whole field of vision yellow.

Diagnosis.—In the ordinary **Holmgren test** the person is given a test-skein of wool of a light-colored pink, and told to *select* (and not name) from a mass of similar skeins those that most nearly resemble the skein to be matched. If he is color-blind, he will confuse the grays, the greens, the pinks, the browns, and the reds. As a confirmative test, he is then given a light pure-green skein to match in the same way.

Dr. William Thomson has devised a convenient apparatus for testing for color-blindness, which has been widely adopted by railroad examiners. It consists of a stick to which numerous bundles of yarn are attached, a light green being used as the test-skein. The method of using the **Thomson stick** is described by its inventor as follows: Using the light-green test-skein, the patient under examination is asked to match it in color from the yarns on the stick, which are arranged in alternate green and confused colors, and which are numbered from 1 to 20. The selection of 10 tints is required, and the examiner notes the number of the tints chosen. The odd numbers are green and the even ones the confusion colors. If the patient has a good color-sense, his record will exhibit none but odd numbers; if he is color-blind, the mingling of even numbers betrays the defect. To distinguish between green-blindness and red-blindness, the *rose test* is used, and the color-blind patient will select, indifferently, either the blues intermingled with the rose, or, perhaps, the blue-greens or grays. Finally, the red test is used as a control.

There are other color-tests, but these two are sufficient for practical purposes. The field of vision for different colors is tested in the same manner as the field for white, using a colored object instead of a white one.

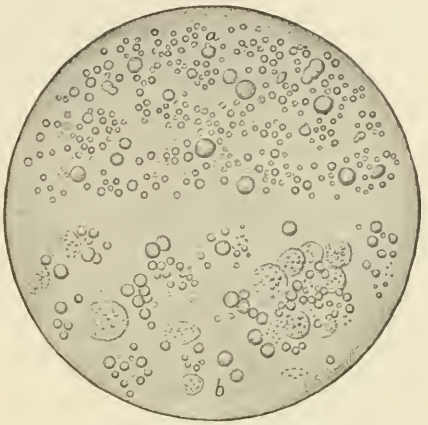
In the *peripheral* field of vision there is a contraction for colors ranging from white, thus: Yellow, blue, red, and green. In contradistinction to this the *central* vision for red is found to be the most distinct, and violet least distinct. Hence the use of red for signals.

The tests for distant color-vision should be made with colored lamps or lanterns, under normal conditions, either on the track or in the depot.

Treatment for the congenital form is useless. The treatment for acquired color-blindness is directed to the cause. In the toxic forms abstinence from tobacco and alcohol is necessary.

COLOSTOMY or COLOTOMY.—See Intestines (Surgery).

COLOSTRUM.—This is the secretion that appears in the breasts after the third month of gestation. It is a whitish, turbid fluid, containing **colostrum corpuscles.** These corpuscles are the epithelial cells of the mammary gland that have undergone fatty infiltration. About the third day of the puerperium these corpuscles burst and discharge their fat globules, thus forming true milk. Colostrum corpuscles disappear about the eighth or tenth day of the puerperium; they may, however, return at any time from some disturbance of the maternal health. Colostrum contains a laxative that is useful in expelling the meconium from the child's bowel during the first few days after birth. See Milk (Mother's).



The Upper Half is Normal Milk; the Lower Half Colostrum.—(*Hawk.*)

COLPORRHAPHY.—See Cystocele.

COMA.—Abnormally deep and prolonged sleep, with the cerebral functions in abeyance; it is due to many conditions affecting the cerebrum directly or indirectly. The well-marked form is characterized by stertorous breathing, relaxation of the sphincters, lividity of the face, and loss of parallelism of the optic axes.

Coma may be gradual or sudden in its onset, complete or incomplete. Stupor, or partial insensibility, has been used to designate incomplete coma. Coma due to hyperpyrexia, typhoid fever, cancer in other portions of the body than the brain, and from yellow atrophy of the liver (likely to be mistaken for disease of the brain), occurs so infrequently that description is unnecessary. The remaining causes of coma may, for the sake of convenience, be divided into 7 groups (described by Eskridge):

I. Transient Coma.—Syncope—as in fainting.

II. Coma from Lethal Doses of Medicinal Agents.

1. Chloral.
2. Opium.
3. Belladonna.
4. Hyoscyamus and its alkaloids.
5. Alcohol.
6. Lead.

III. Coma from Poisons Other than Medicinal Agents Circulating in the Blood.

1. Asphyxia from poisonous gases.
2. Ptomains.
3. Uremia.
4. Diabetes.

IV. Convulsive States from Coma.

1. The preeruptive stage of the exanthems, sometimes preceded by a convulsion.

2. Reflex convulsion, such as teething, overloaded stomach, etc., in children.

3. Epilepsy.

4. Hysteria.
5. Epileptiform and apoplectiform attacks due to paretic dementia or other organic brain-disease, such as syphilis and chronic alcoholism.

V. Voluntary Coma.
Feigning.

VI. Coma from Profound Disturbances of the Cerebral Circulation, but Unattended by Organic Lesion of the Brain-substance.
1. { Shock. / Concussion of the brain.
2. Congestion of the brain.
3. Anemia of the brain.

VII. Coma from Organic Disease of the Brain.
1. Simple apoplexy of the aged.
2. Traumatism of the brain.
3. Syphilis of the brain.
4. Cerebral meningitis.
5. Abscess of the brain.
6. Tumor of the brain.
7. Cerebral hemorrhage.
8. Cerebral embolism.
9. Cerebral thrombosis.

It will be seen that the subheadings of these 7 groups are quite numerous, and the effects of syphilis, alcohol, and a few others may be placed under more than one group. Were it not that many of these causes of coma are so infrequently factors in giving rise to unconsciousness, mistakes in diagnosis would be much more frequent than they really are.

Transient Coma

Syncope.—A sudden weakening or temporary arrest of the heart's action produces anemia of the brain, and results in unconsciousness, more or less profound. The symptoms are paleness of the surface of the body, especially of the face; extreme pallor of the gums and lips; dilated pupils; surface of the body cool and covered with cold perspiration if the syncope is very pronounced; the pulse weak, small, and rapid, or entirely absent at the wrist; respiration weak, but not restricted unless the heart's action is seriously interfered with, when it may become slightly stertorous; face cyanotic, and a puffing of the lips with each respiratory act. The negative symptoms are an absence of all those of a localizing nature, such as convulsions, muscular rigidity, paresis, or paralysis. The patient lies as if dead, except that the organic functions are performed in the quietest possible manner. The fact that the symptoms are fleeting in character and pass away on a return of the blood to the head is an important point in the diagnosis. It must be remembered that occasionally there are repeated attacks of syncope, the patient reviving from one attack and almost immediately passing into another.

In almost all cases the diagnosis will rest between syncope from temporary disturbance of the heart's action, degeneration of the heart, apoplectiform attacks of cerebral origin, and hysteria. When the loss of consciousness is due to degeneration of the heart, there will be other evidence of cardiac degeneration—such as the probable history of previous attacks, the weak action of the heart, the age of the patient, the condition of the radial arteries, and the fact that the unconsciousness has come on after exertion or on passing from a low to a high altitude. During the syncopal condition there will be a tendency to cyanosis.

The slight apoplectiform attacks sometimes seen in persons suffering from atheroma of cerebral vessels are called "fainting spells." The symptoms, as described by the friends of the patient, are very similar to those of syncope, and they, too, are fleeting in character. If, however, an attack is seen by the physician, or if an intelligent attendant or nurse is on her guard and observes closely, it will be found that there is a striking difference between the symptoms of the two conditions. In the slighter apoplectiform attacks that not infrequently precede occlusion of an artery from thrombosis, the pallor of the face and lips is less pronounced than in syncope, and frequently the lips present a slight cyanotic tinge. Sometimes there is a slight twitching of the facial muscles, with a tendency to stertor of the respiration for a few seconds. The symptoms are less fleeting than those of syncope, and rarely pass away immediately on lowering the head. The patient very frequently complains of headache for some time subsequently. In a few instances these slight apoplectiform attacks may recur 2 or 3 times within a few hours.

Hysteric Syncope.—Repeated attacks of syncope are always suggestive of hysteria, although, as we have seen, they may be due to other causes; and, further, a single attack of syncope may be of hysteric origin. Syncope, when due to hysteria, is not attended by intense paleness of the surface of the body, and the pulse at the wrist is neither absent nor greatly changed from the normal. Again, there may be present other evidences of hysteria, such as inversion of the color-fields, peculiar paralyses, globus, etc.

Coma from Lethal Doses of Medicinal Agents.

Chloral.—A condition of nonfatal coma from which it is very difficult to arouse the patient, except possibly for a momentary response, may be produced by chloral. In this condition the temperature is lowered; respiration is quiet, less rapid, but often fuller than normal; the pulse is weak and somewhat slow; the pupils are usually small.

The patient is in a profound sleep, with a lessening of the activity of all the vital functions. In toxic doses the temperature is often lowered several degrees, although a rise, with a subsequent fall to 91.20° F., has been observed soon after taking large quantities of chloral into the stomach; respiration is slow and full, until just before dissolution, when it may be irregular and very rapid; the pulse, at first soft and slow, becomes irregular and rapid; and the pupils, small at first, dilate later. There is complete muscular relaxation, and the patient lies as if dead, save that the action of the heart and lungs proves that life is not extinct. There are no localizing symptoms from chloral coma.

Opium-poisoning.—The slow pulse (reduced to

10, 8, or 4 beats a minute) and the noisy respiration, the contracted pupil, with a dilated condition of the capillaries of the face, are almost positive evidences of the second stage of opium-poisoning. Later, just before death, the pulse becomes very rapid; the pupils next begin to dilate, and finally respiration becomes very irregular. In some cases respiration is rapid but arrhythmic before death. The temperature is practically normal, except shortly before death, when it may rise. There is little danger of mistaking a case of coma from opium-poisoning for coma from any of the other narcotic poisons. The contracted pupil, slow pulse, and labored respiration sometimes found to occur from a hemorrhage at the base of the brain, especially into the lateral ventricles or into the pons, may, at first, lead one to suspect poisoning from opium; but the subnormal temperature from hemorrhage into the ventricles and the sudden increase of the body-heat from pontile lesions, together with localizing symptoms, renders the diagnosis quite easy.

Coma from **belladonna poisoning** is often preceded by delirium and convulsions. The skin, covered with a scarlet rash, is hot and dry, pupils dilated, temperature raised, pulse rapid, and respiration may at first be deep and slow, but before death becomes rapid. The scarlet color of the skin, the delirium, and the absence of localizing symptoms serve to distinguish coma from belladonna poisoning from coma due to brain-lesion. The scarlet-colored skin, the delirium, and the excitement of the heart aid in distinguishing coma caused by belladonna from coma due to the other mydriatics, especially hyoscyamus and its alkaloids.

Alcoholic Coma.—A noisy delirious condition points to alcoholic coma. The patient may be so profoundly unconscious as to fail to respond to an irritant or to attempt any response when his name is loudly called. If it is possible to arouse him, he will often strike at any one who is annoying him. The temperature is usually normal, and equal on each side of the body; the pupils may be normal, contracted, or dilated, and the conjunctiva congested. It should be remembered that a person who is intoxicated may also be suffering from organic disease of the brain, either acute or chronic. In all cases of alcoholic coma a careful examination should be made, lest a brain-lesion escape detection.

Coma from **lead-poisoning** is usually preceded by vomiting, purging, and convulsions. An analysis of the urine will reveal lead, and a blue line may be found on the gums if the metal has been taken into the stomach during a period of several days. Sometimes it is extremely difficult to diagnose a condition of encephalopathy from lead, unless a careful analysis of the urine is made for this poison, or unless the history should point to a source by which the metal has found its entrance into the system.

Coma from Poisons Other than Medicinal Agents Circulating in the Blood

Asphyxia from Poisonous Gases.—The surroundings of the patient, such as escaping gas in a room, charred wood that has filled the room with smoke, or the fact that the sufferer has become unconscious while working in an old sewer, etc., will make the diagnosis quite easy. Lividity of the tongue and lips and embarrassed respiration are commonly found in these cases.

Coma from Ptomains.—The cases of coma that have resulted from the ingestion of putrid food have usually been preceded by symptoms of an irritant gastrointestinal poison, such as vomiting and diarrhea, extending over a period of several hours or one or more days.

Coma from Uremia.—The onset of uremic coma is often attended by delirium or convulsions. Albumin and tube-casts in the urine suggest uremia; but albumin is frequently found in considerable quantity in the urine in cases of cerebral hemorrhage. It must be borne in mind that renal disease, especially the senile form (granular disease of the kidney), occurs in about one-third of the cases of cerebral hemorrhage. The peculiar physiognomy of a person suffering from renal disease, with local edema, equal pupils, often less profound coma than in cerebral hemorrhage, and usually normal temperature (according to Gowers, it is always subnormal except in cases in which local inflammation exists), the presence of the odor of urine in the breath, and the absence of hemiplegic symptoms, occurring in a young subject, are usually sufficient to enable one to diagnose uremic coma. Gowers states: "Rigidity of limbs or local muscular twitching during the coma is, if constant in seat, in favor of cerebral disturbance; if variable in position, it is in favor of uremia." Some writers lay stress on the normal or subnormal temperature in uremic coma, while others state the temperature is usually elevated. Besides local inflammation, repeated convulsions, and probably other complications, will cause an elevation of the body-heat in uremic coma. On the general temperature alone little stress can be laid. The fact that the temperature is the same on the two sides of the body in coma from uremia is an important point in excluding a unilateral brain-lesion.

Coma from diabetes is usually gradual in its onset. The presence of sugar in large quantities in the urine of a comatose person would point strongly to diabetic coma, and in the absence of any localizing symptoms the diagnosis would be justified; provided, however, there was no evidence of the ingestion of any poison.

Convulsive States

Coma ushered in by a convulsion is occasionally observed in children during the preeruptive stage of the exanthematous fevers, especially scarlet fever. The diagnosis would lie between the exanthematous fevers, reflex convulsions from an overloaded stomach, etc., and acute meningitis. A positive diagnosis is not always possible during the first 24 hours. The temperature of comatose children during the preeruptive stage of scarlet fever is usually very high—104° to 105° F.—the pulse exceedingly frequent, and, as a rule, there are only one or two convulsions. The respirations are very

rapid. The coma usually passes away as soon as the eruption appears.

Coma from teething or from an overloaded stomach is rarely attended by a temperature above 103° F., although in one case that has been observed the body-heat in the rectum was 104° F. The pulse and respirations are usually less rapid than in the exanthemata. The face is usually flushed. The coma passes away on removal of the cause.

When convulsions and coma usher in the obtrusive symptoms of **meningitis**, the convulsions may recur every few minutes, or hours, until several have occurred. The temperature in these cases is often very high—104° F., or even 106° F. —but the pulse is less rapid than in scarlet fever. A high temperature, a pulse of from 140 to 180, and a single convulsion would be in favor of scarlet fever. A moderately high temperature (103° F.), a pulse of 120, and a flushed face would indicate an overloaded stomach. Repeated convulsions, high temperature, and a pale face should create suspicion of meningitis. A diagnosis is not always possible during the first 24 hours, and in some cases not during the first 36 hours.

Coma from Epilepsy.—If the history of the patient is known and the onset of the convulsive seizure has been witnessed, little difficulty will occur in differentiating this from coma due to other causes. It should always be borne in mind, however, that persons suffering from epilepsy are equally subject to the other causes of coma. If the patient is first seen in the comatose stage following an epileptic fit, and the physician has no knowledge of his previous history, the absence of hemiplegic symptoms and the short duration of the coma would serve to distinguish the case from one of unilateral brain-lesion. On the one hand, it must be noted that in status epilepticus—a condition rarely reached without the history of the patient being known by the attendants—it may be impossible, in the absence of a history, to make a diagnosis between this condition and a sudden cerebral lesion without unilateral symptoms. On the other hand, it must not be forgotten that in some cases of epilepsy the convulsive seizure is followed by a weakness of one arm or leg, especially at the distal portion of the extremity. In nearly all cases of cerebral hemorrhage attended by convulsions, and following one another in rapid succession, unilateral symptoms exist, but multiple thrombi and emboli may give rise to a condition resembling that of status epilepticus without being attended by a single unilateral symptom.

Coma from Hysteria.—The subjects of this condition are usually women, and the coma comes on suddenly and is often preceded by delirium, or it may alternate with it. The face is flushed and hot and the temperature may be elevated, especially if the delirium that has preceded it has been prolonged and noisy and attended by much physical exertion. The pupils are either normal and respond to light, or slightly dilated and react imperfectly. The latter condition is only found in hysteria, while the patient is making considerable muscular effort. The pulse is normal, except in those cases in which the patient has exhausted herself by violent muscular exertion, when it may be rapid. The urine is retained. There is no vomiting or diarrhea, and the respiration is rapid, but not stertorous. A careful study of the symptoms will enable one to exclude the narcotic and irritant poisons. The diagnosis will rest between the subject under discussion, feigning, and some organic disease of the brain, especially cerebral congestion, meningitis, or a vascular lesion. Feigning may be excluded by the absence of all symptoms except those that may be produced by physical exertion.

With reference to hysteric coma, we may conclude (1) that the initial symptoms of a case of organic disease of the brain may be apparently purely hysteric in character; (2) the case may be purely hysteric in character in the beginning, yet as it progresses organic changes, or others equally intractable, may develop from exhaustion, disturbances in circulation, or from the results of metabolic processes.

Coma from Epileptiform and Apoplectiform Attacks due to Paretic Dementia or Other Organic Brain-disease, such as Syphilis and Chronic Alcoholism.—In paretic dementia the history of the patient would be the only reliable guide in the diagnosis, as the coma is similar in almost every respect to that which follows a vascular lesion. When, however, the convulsion with the resulting coma is the first apparent symptom of paretic dementia, time only would enable the physician to distinguish whether the attack was epileptic or epileptiform in character. Coma from syphilis or chronic alcoholism can only be diagnosed by evidence of certain organic brain changes. Even in such cases it is well to remember that syphilitic and alcoholic subjects who are suffering from brain-disease in consequence of these poisons are also liable to the other causes of coma.

Voluntary Coma

Feigning.—Malingerers occasionally feign coma, but more commonly the simulated coma is preceded by convulsions.

"Everything usually observed in an epileptic fit may be easily simulated by a clever malingerer except the change in the color of the face, the condition of the pupils, and insensibility to suddenly inflicted and unexpected irritation" (Eskridge).

Color of the Face.—A simulator, by muscular action, can produce redness of the face, and by holding his breath this color will change to a darker hue. It is very difficult voluntarily to cease breathing until the face becomes deeply cyanosed, as occurs in genuine convulsions. It is rare for a simulator to be seen sufficiently early for the absence of paleness of the face to be noted.

Condition of the Pupils.—In the early stage of the fit the pupils are said to be occasionally contracted. If this phenomenon is present, it must be very evanescent in character. At all events, during most of the tonic stage and throughout the clonic

stage the pupils are dilated, and the irises will not often respond perceptibly to light. As consciousness begins to return the extreme dilatation passes away, and the pupils may alternately contract and dilate every few seconds.

Keen, Mitchell, and Morehouse, in an article on malingering, state: "We ourselves are of the opinion that when, in a fit, the pupils, largely dilated, remain impassive and motionless before a bright light, the case is almost certainly a real one. But, unfortunately, this state of things is of very rare occurrence, even in severe fits. The pupils unquestionably contract in the presence of a bright light in many such cases. Sometimes the movement is sluggish and slight; in others it is almost normal as to range of speed and movement." These observers, experimentally demonstrated that violent muscular action will cause the pupils to dilate rapidly, and that so long as the muscular action is kept up, the irises will move only slightly and sluggishly to a bright light. From their observations they deduced the conclusion that only in those cases of epileptic fits in which the irises fail absolutely to respond to light is the pupillary test of the genuineness of the convulsion of any value.

Insensibility to Suddenly Inflicted Irritation.—In the unconsciousness from an epileptic convulsion, if the cornea is touched with the end of the finger, the eyelids may move a little, and if the supraorbital nerves are firmly pressed with the thumbs, the skin of the forehead may slightly corrugate, or if a pin is thrust into a limb, it may be flexed, but no purposive movements will be made to get rid of the irritant. In feigned epilepsy, if acute pain is suddenly and unexpectedly caused, an intelligent effort will at first be made by the simulator to avoid the irritant.

When the feigned coma is not preceded by simulated convulsions, the pupils will be normal, unless the malingerer is throwing himself around and making considerable muscular exertion, thus causing the pupils to dilate and to lessen their normal response to light. The face is usually flushed, showing the results of physical effort. Under such circumstances, if the malingerer lies quietly, the pulse, temperature and pupils will be normal. Respiration will be rapid or slow, according to the subject's notion of feigning unconsciousness. Sensibility to suddenly inflicted pain, if the simulator is unaware of what the observer is doing, will be manifest. The administration of an anesthetic is probably the best method of detecting feigned coma, as well as epilepsy.

Coma from Profound Disturbances of the Cerebral Circulation, but Unattended by Organic Lesion of the Brain-substance

Coma from Shock and Concussion of the Brain.—In the severer forms of shock consciousness may be completely lost. It immediately follows the depressing influences that have caused it. The pupils are usually dilated, muscles relaxed, face pale, surface of the body cool, temperature lowered, pulse weak and rapid, sometimes slow and irregular, respirations shallow and often frequent; the sphincters are sometimes relaxed, and vomiting may occur. In fact, the normal functional activities of all the organs of the body are lessened. Recovery, when it begins, is progressive. It is to be distinguished from so-called "delayed shock," which comes on some time after the injury, and shock followed by delayed or imperfect reaction, both of which are due to concealed hemorrhage or to some other complication. When the shock has been caused by a blow on the head, it is not always an easy matter to determine whether the symptoms are due to shock or cerebral concussion, or to these and an intracranial lesion. The absence of any localizing symptoms, and the presence of slightly subnormal temperature, equal in each axilla, a weak and rapid pulse, noiseless respiration with evidence soon after the injury of beginning reaction, which is continuous after it has become manifest, point toward the functional nature of the brain disorder. It is sometimes impossible to exclude organic disease of the brain in these cases until hours or days have elapsed, and even then the physician may be in doubt. In those cases in which the coma or semicomatose condition lasts for several days or weeks, even in the absence of all positive symptoms of an organic nature, it is probable that laceration of the brain has occurred—that slight capillary hemorrhage into the brain-substance has taken place.

Coma from Cerebral Congestion.—It is rare for coma to result from cerebral congestion, unless the cause is insolation or the vasomotor disturbance found in paretic dementia. The lighter forms of cerebral congestion, passive or active, sometimes pass into a stuporous condition. In either event the coma is gradual in its onset, and is often preceded by headache and delirium. In the active form there will be the history of exposure. The face is flushed, the carotids throb, the pulse is rapid, full, and strong, temperature elevated, pupils contracted, conjunctivæ injected. There are no localizing symptoms, and the attack soon ends in recovery if inflammation does not result, or if the patient is not exhausted by the hyperpyrexia. In the passive form the appearance of the patient's face indicates venous stasis. The respiration is rapid and noisy, pulse rapid, and temperature is elevated 1 or 2 degrees above the normal. If death does not result, recovery soon takes place. In neither form of congestion are there any localizing symptoms or evidence of cranial nerve involvement. Meningitis would be excluded by the absence of rigidity of the posterior neck-muscles, or of cranial nerve symptoms, together with the history of the case. A vascular lesion would be negatived largely by the absence of unilateral symptoms.

Coma from cerebral anemia is most commonly caused by sudden loss of blood. The appearance of the patient and the condition of the temperature and pulse would be just the opposite of those of cerebral congestion. Delirium and convulsions often occur if the loss of blood has been sudden

and profuse. The diagnosis is usually evident from the history and symptoms.

Coma from Organic Disease of the Brain

Coma from Simple Apoplexy of the Aged.—In persons advanced in life a condition sometimes occurs with a train of symptoms that resemble perfectly those of a vascular lesion of the brain, but at the autopsy no trace of hemorrhage or other gross lesion is found. The age of the patient and the history of previous similar attacks would aid in the diagnosis. It must be confessed, however, that a first attack of "simple apoplexy" might puzzle the most skilled diagnostician, especially if unilateral symptoms are present, as is sometimes the case.

Coma from Traumatism of the Brain.—If an injury has occurred to the head and coma results, the diagnosis will lie between simple concussion, or shock, and an organic lesion of the brain. Delayed coma—that is, coma coming on some time after the receipt of the injury—deepening coma, and delayed reaction from a deep comatose state would be almost positive evidence of organic intracranial disease, usually vascular in nature. Coma coming on immediately after the injury may be due to an organic lesion or to a functional disturbance. The sooner reaction begins to take place, and the more complete it is a few hours after the head injury, the greater the probability of the disorder being functional in nature. Stertorous respiration, congestion of the face, slow, full pulse, unilateral symptoms, and convulsions would indicate intracranial hemorrhage.

Coma from Meningitis.—In the absence of a history the diagnosis would depend upon rigidity of the posterior neck-muscles, cranial nerve involvement, heightened temperature, irregular respiration, and slow and irregular pulse if pressure-symptoms were still present, but rapid pulse if the stage of exhaustion had been reached. Changes in the optic discs are not always present. If the case had been of short duration, the discs might show simple hyperemia, or, if a rather prolonged course of the disease had preceded the comatose condition, beginning of optic nerve atrophy might be manifest. Optic nerve changes would enable the physician to exclude all vascular lesions, except possibly thrombosis. Choked discs, with evidence of meningitis, would indicate that the meningeal inflammation was secondary to tumor or abscess. The greater the swelling of the disc, the greater the probability of the primary intracranial lesion being a tumor. A tubercular tumor or nodule is probably the only growth of the brain that causes general meningitis.

Coma from Abscess of the Brain.—The history of the case, with a probable cause of intracranial suppuration, vacillating temperature, slight swelling of the optic discs, and unilateral symptoms, if these were present, would be the principal aids in the diagnosis. If there was optic neuritis, and the other causes of the condition, except tumor of the brain, were excluded, the diagnosis would consist in differentiating between tumor and abscess. The greater the swelling of the optic discs, the stronger would be the probability of the existence of a tumor. The greater the variation of temperature from the normal, and the more profuse the perspiration during the comatose condition, the more likely the presence of abscess. The terminal stage of abscess of the brain is usually attended by high temperature, and the body is bathed in perspiration.

Coma from Tumor of the Brain.—It sometimes happens that one sees a case of tumor of the brain for the first time when the patient is in a state of coma. It may be the coma that immediately precedes death, or such a condition may occur any time during the progress of the intracranial growth, especially if it is located in the region of the cerebellum, so as to give rise to pressure on the veins of Galen and cause effusion into the lateral ventricles. Pronounced choking of the optic discs would suffice to settle the diagnosis in favor of tumor, provided that renal disease, anemia, and lead encephalopathy had been excluded. It is only in those cases of tumor of the brain in which there is extensive softening of the brain-substance that a vascular lesion is simulated by the coma and paralysis, which come on suddenly and at the same time. In the absence of any history in such a case the presence of choked disc would be the only guide in excluding a vascular lesion.

Coma from Nontraumatic Vascular Lesions.—These include hemorrhage, thrombotic and embolic occlusion of vessels. The coma that occurs as a result of a vascular lesion is, as a rule, sudden in its onset and more or less profound, depending upon the nature of the vascular disturbance. One of the most common symptoms attending the coma from a vascular lesion is hemiplegia. Having determined that the coma in a given case is due to hemorrhage or occlusion of a vessel, it is of considerable importance, before treatment is instituted, to seek further and determine the nature of the vascular lesion; in other words, is it embolic or thrombotic occlusion, or hemorrhage?

Embolic Occlusion.—It is probable that no one is justified in diagnosing cerebral embolism in the absence of an apparent cause. Endocarditis, chronic in nature, with subacute attacks, is the most common cause. The next most frequent cause is a suppurative process in some portion of the body, especially in the thoracic or abdominal cavity. The parturient state, and the blood changes often found in chronic syphilis, with exhaustion, favor the formation of an embolism. The coma from embolism is shorter in duration and less profound than in hemorrhage. In cases in which a more or less complete hemiplegia has taken place in a young person, without profound coma of several hours' duration, the chances would be against hemorrhage and in favor of embolism, except in certain conditions in which a thrombotic occlusion of the vessel would be more probable than embolism. The less the primary disturbance of temperature, provided the paralysis is extensive, the greater are the probabilities against the cerebral lesion being due to hemorrhage.

Coma from Thrombotic Occlusion of a Cerebral Vessel.—Atheroma of the vessels, a potent factor in

the causation of thrombosis, does not occur before the thirty-fifth or fortieth year, except possibly in association with Bright's disease or as a result of it. Syphilitic arteritis is a frequent cause of thrombosis from the twentieth to the fiftieth year, and it may occur earlier or later, but the frequency diminishes as the two extremes of life are approached. Thrombotic occlusion of a vessel may occur from the extension of an inflammatory process from a tuberculous nodule in the brain. This is the rarest of all causes of cerebral thrombosis.

Following are some points in the differential diagnosis between coma of thrombotic origin and coma from hemorrhage (Eskridge):

Thrombotic Occlusion.	Cerebral Hemorrhage.
1. Prodromata frequent.	1. Prodromata infrequent.
2. Great degeneration of arteries of limbs, or history of syphilis.	2. Turgid face and strongly beating arteries of the neck.
3. Pulse soft and often very compressible.	3. High arterial tension regardless of the size of the pulse.
4. Heart feeble, dilated, and irregular.	4. Heart hypertrophied; beating strongly.
5. Coma less marked in depth and duration.	5. Coma more intense; longer in duration.
6. Following grief and other depressing influences.	6. More likely to be induced by mental excitement.
7. Local convulsions more frequent.	7. General convulsions more frequent.
8. Slight initial temperature disturbance.	8. Often great initial temperature disturbance.
9. Slight variation of the temperature within a few hours.	9. Often a considerable rise of temperature from 12 to 24 hours after the attack.
10. Secondary inflammatory symptoms frequent and well marked.	10. Secondary inflammatory symptoms less in frequency and in degree.

Treatment.—The treatment of coma is, of course, immediately referable to the cause. Examination of the urine should speedily be made. In the absence of any history or indicative signs, the stomach-tube should be applied, in order to be on the safe side. One drop of croton oil is the speediest and least harmful revulsive. The patient should be put in a dark room, the head should be high, and should be shaved if there is much hair. Cold applications to the head are indicated. The diet should be very light. Hot applications or sinapisms may be applied to the back of the neck, spine, abdomen, or back of the legs. All these general methods are of value, but if the cause is serious, it must be discovered at once, and appropriate treatment administered, or the patient will be beyond help.

COMA-VIGIL.—A symptom of unfavorable import, in which continuous sleeplessness is associated with partial unconsciousness. It occurs toward the end of diseases in which the nervous system is directly or indirectly involved, and frequently appears in the latter part of a severe attack of typhoid or typhus fever or of delirium tremens. Coma-vigil is distinguished from coma by a certain amount of consciousness, by the quick pulse, and by the stertorous breathing. It differs from the coma of concussion of the brain, since the uncontracted pupil, the history, the absence of coldness of the skin and of signs of shock are not present. It is almost invariably a fatal symptom, and may last from a few hours to 3 or 4 days, 24 hours being its usual length. It may deepen into actual coma, but more usually the pulse quickens and weakens, respirations become more feeble, and death from asthenia results.

The treatment does not regard the coma-vigil itself, but nutritive and stimulating measures for the primary disease. Hydrotherapy is valuable, but it must be subject to a consideration of the ensemble of the conditions.

COMEDO (Blackheads; Flesh-worms).—Comedo is a condition characterized by black, pinhead-sized, sebaceous plugs lying in the mouths of the excretory ducts.

Symptoms.—Comedos appear as yellow, brown, blue, or black points, involving chiefly the nose, forehead, and cheeks. They may, however, occur upon other parts of the body. When the comedo is squeezed out, a yellowish-white, maggot-like body with a dark external point may be seen. The dark color is due partly to dust from without and partly to chemic changes in the secretion. Comedos are liable to undergo inflammation and to give rise to acne papules or pustles.

Crocker mentions a variety of comedo (*grouped comedones*) characterized by closely aggregated, often symmetric lesions, occurring upon the temples and cheeks of children, and not subject to inflammation.

Etiology.—Puberty, dyspepsia, anemia, constipation, and menstrual disturbance are frequent causes. They probably produce a lack of tonicity in the follicular walls.

Comedos are often produced artificially by deposition from the atmosphere of various solid impurities. Thus, workers in tar, brass, and iron are frequent sufferers from this affection.

Pathology.—Unna claims that there is a thickening of the corneous layer of the external surface, and consequently a closure of the duct. The horny lining of the ducts undergo similar change, and scales are thrown into the canal, which, combining with the sebum, form the comedo.

The *Acarus*, or *Demodex folliculorum*, is sometimes accidentally present in comedos.

Prognosis.—Favorable. The condition is likely to recur.

Treatment.—The systemic treatment aims at a correction of the predisposing causes. Strychnin, iron, cod-liver oil, and the hypophosphites are often required.

Locally, applications designed to remove the plugs are indicated. The larger ones should be squeezed out either with the fingers or a comedo extractor. Soaps containing sand or chalk are

sometimes used. The tincture of green soap is an excellent remedy in sluggish cases. Equal parts of alcohol and ether make a useful sebaceous solvent.

The appended formula is at times very efficacious:

℞. Precipitated sulphur, Soft soap, } each, ʒ j
Pulverized chalk, ʒ j to ij
Zinc oxid ointment, ʒ j.

Or the following lotion may be used:

℞. Boric acid, ʒ j
Alcohol, ʒ iij.

COMPENSATION.—See HEART-DISEASE.

COMPRESS.—See PRESSURE.

COMPRESSION AND CONCUSSION, CEREBRAL.—See BRAIN (Injuries).

CONDENSED MILK.—Milk that has had most of its watery elements evaporated according to a known process. Condensed milk prepared with the addition of cane-sugar is a white or yellowish-white product of about the consistency of honey, and ranging in specific gravity from 1.25 to 1.41. It should be completely soluble in from 4 to 5 times its bulk of water, without separation of any flocculent residue, and then possess the taste of fresh, sweetened milk. Condensed milk prepared without the addition of cane-sugar is not boiled down to the same degree, and therefore remains liquid. Battershall gives the following analysis of both classes:

CONDENSED MILK WITH ADDITION OF SUGAR.

BRAND.	WATER.	FAT.	CANE-SUGAR AND MILK-SUGAR.	CASEIN.	SALTS.
Alderney	30.05	10.08	46.01	12.04	1.82
Anglo-Swiss (American)	29.46	8.11	50.41	10.22	1.80
Anglo-Swiss (English)	27.80	8.24	51.07	10.80	2.09
Anglo-Swiss (Swiss)	25.51	8.51	53.27	10.71	2.00
Eagle	27.30	6.60	44.47	10.77	1.86
Crown	29.44	9.27	49.26	10.11	1.92

CONDENSED MILK WITHOUT CANE-SUGAR.

BRAND.	WATER.	FAT.	MILK-SUGAR.	CASEIN.	SALTS.
American	52.07	15.06	16.97	14.26	2.80
New York	56.71	14.13	13.98	13.18	2.00
Granulated Milk Company	55.43	13.16	14.84	14.04	2.53
Eagle	56.01	14.02	14.06	13.90	2.01

See MILK.

CONFECTIONS are medicinal substances formed into a mass with sugar, honey, water, etc., with the object of rendering them palatable and preserving them from change. There are two official confections: C. Rosæ, and C. Sennæ.

CONFINEMENT.—See LABOR.

Methods of Determining Date. Naegele's Rule.—This is the most convenient rule, and is accurate enough for all practical purposes. Ascertain the date of the appearance of the last menstruation, count back 3 months, and add 7 days to the result. This date will be the middle of the probable fortnight in which labor will occur.

The Date of Quickening.—When no menstrual history is obtainable, the probable time of confinement can be ascertained by the date of quickening. As this occurs about 4 1/2 months after impregnation, the addition of 4 1/2 months to this date will give approximately the date of confinement.

The Height of the Fundus Uteri.—This method gives at best a rather imperfect idea of the date of confinement. It is based upon the size of the uterus at the varying months of pregnancy:

At the fourth month the fundus uteri is midway between the umbilicus and the symphysis pubis.
At the sixth month the fundus uteri is on a level with the umbilicus.
At the seventh month the fundus uteri is midway between the umbilicus and the ensiform cartilage.
At the eighth month the fundus uteri is on a level with the ensiform cartilage.
At the ninth month the fundus uteri is midway between the umbilicus and the ensiform cartilage.

It will be seen from the foregoing table that the fundus uteri occupies practically the same position at the seventh as at the ninth month. This need occasion no confusion, as at the seventh month the presenting part is above the superior strait, while at the ninth month it has descended into the pelvis.

And see TABLE ON NEXT PAGE.

Preparations for confinement and directions for the care of the mother and child are given under the heads of LABOR, NEW-BORN INFANT (*q. v.*).

CONIUM.—Hemlock. The green, full-grown fruit of the spotted hemlock, *Conium maculatum*. It contains 3 alkaloids and a volatile oil. Its properties are mainly due to the alkaloids *coniin*, $C_8H_{15}N$, and *methylconiin*, $C_8H_{14}NCH_3$. It produces motor paralysis, without loss of sensation or of consciousness. Toxic doses cause death by paralysis of the organs of respiration. All the preparations of conium are uncertain in action, as the active principle is very volatile. The dose of conium is 1 to 5 grains. The dose of the fluidextract is 1 to 10 grains.

Incompatibles with *Conium*, are: Vegetable acids, alkalies, tannic acid; with *Coniin:* albumin, aluminum, salts, alkaloidal precipitants, chromic trioxid; copper, iron, manganese, and zinc salts; nux vomica and its alkaloids, and picrotoxin.

Therapeutics.—Conium is indicated in diseases characterized by excessive motor activity. Large doses are required, as some physiologic action is necessary. Children bear it well, their constant activity preventing its full action. In chorea and paralysis agitans it is useful, by depressing the motor nervous system. In acute mania

ELY'S TABLE OF THE DURATION OF PREGNANCY

EXPLANATION.—Find in the upper horizontal row the date of appearance of last menstruation; the figure beneath will show the expiration of 280 days, or 10 months of 28 days each.

Jan.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Oct.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	Nov.
Feb.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	.....			
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March	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Dec.	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Jan.
April	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	....	
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Dec.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
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and delirium tremens, to quiet motor excitement and prevent exhaustion, it is remarkably efficient, especially when given conjointly with morphin. When pain and spasm are present, it will prove a useful agent; and in tetanus, blepharospasm, asthma, whooping-cough, and other spasmodic affections it is frequently used with benefit. Added to poultices, it makes a useful sedative for painful ulcers, cancer, etc.

Poisoning.—A prominent symptom due to conium poisoning is ptosis, or drooping of the eyelids. There is also much staggering and inability to walk. The treatment of poisoning consists in the use of strychnin as a respiratory and nervous stimulant and the use of external heat and of cardiac stimulants. Emetics or the stomach-pump are to be used before administering any antidote. Picrotoxin and other excitomotors are antagonistic.

CONJUNCTIVA, BURNS.—Burns of the conjunctiva are usually on the bulbar portion, which is most exposed. The treatment consists in cleansing the eye, unless the burn has been caused by lime, when the parts should be washed with a piece of cotton soaked in oil. Acids and alkalies should be neutralized at once. Olive oil or liquid vaselin should be instilled. Cocain and atropin are advisable to relieve the pain, and may be applied in the form of an ointment: Atropin, 0.1; cocain, 0.2, vaselin, 10.0.

CONJUNCTIVITIS. Simple Conjunctivitis.—Hyperemia of the conjunctiva is a symptom rather than a disease, and is generally the sequence of some irritation of the membrane, such as foreign body, weeping, heat or cold, exposure to light, etc. The treatment consists in removing the cause, which, in many instances, is a small foreign body that the patient has been unable to locate.

Chronic hyperemia or **dry catarrh** of the conjunctiva is caused in many ways. Irritation by dust, peculiar to such occupations as those of the miller, stone-mason, etc., is a fruitful source. Any derangement of the secretion or excretion of the tears is a cause. Firemen, puddlers, and others who work continually in a strong light; students using their eyes excessively, and often by poor light, and persons subject to any kind of eye-strain may be afflicted with dry catarrh of the conjunctiva. The symptoms are itching and sensation as of a foreign body or of heat in the eye. The distress increases toward evening, showing the indubitable presence of eye-strain. The upper lids feel heavy, and there may be blepharospasm in a mild degree. Upon examination the lids are seen to be congested, there is a uniform redness, and all the accompanying signs of a catarrhal condition are present. At the sides and over the tarsus there are often nodules resembling raw flesh. There is no pathologic secretion.

The treatment consists in correcting any error in refraction or any muscular disturbance. To avoid the deleterious influences of some occupations, protective glasses may be ordered. If there is ex-

posure to sunlight, smoked glasses should be prescribed. Astringent and antiseptic applications are advisable. Boric acid (10 grains to 1 ounce) is the solution most commonly employed; zinc sulphate and zinc chlorid (1 grain to 1 ounce) are useful. Camphor water is often used as a base for eye-drops. Alum may be used in solution of 6 grains to 1 ounce. In case the catarrh is persistent, applications of a 2 percent solution of silver nitrate every second day are recommended. Touching the eyes with a pencil of alum is sometimes of use. Often, in old and refractory cases, a variation in the astrigent employed is of advantage. Irrigation with hot or cold lotions of plain water is always advisable; besides the pleasant local effect, absolute cleanliness is assured.

Simple catarrh is one of the commonest diseases of the conjunctiva. In addition to being due to the irritative causes already mentioned, it is a frequent accompaniment of the ordinary infectious diseases, such as measles, scarlet fever, etc. A simple cold is a frequent source of conjunctival catarrh. Tobacco smoke and other irritant vapors are causes. Finally, any bacterial invasion producing inflammation elsewhere in the body may cause trouble in the conjunctiva.

Symptoms.—It begins with a hyperemia, followed by a profuse watery discharge. The lashes are matted, and the lids are glued together in the morning. There is profuse lacrimation, called forth to remove the excessive secretion from the conjunctiva, and, as the capacity of the drainage apparatus is overtaxed, epiphora results. Aside from the ordinary symptoms of conjunctival congestion, the patient is annoyed by the optic defects caused by flakes of mucus on the cornea. Photophobia is sometimes distressing. Again, the symptoms are worse in the evening. The patients complain that they have a sensation as of sand in the eye, and they are inclined to prolong the irritation by rubbing.

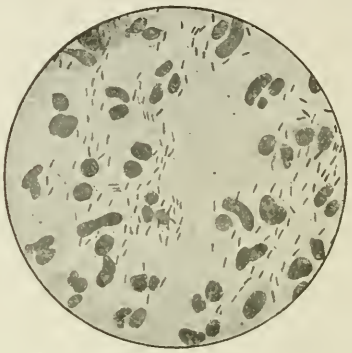
The course of the disease varies from one week to an indefinite period.

Treatment.—Ordinary measures with astringent and antiseptic washes will alleviate the symptoms; but when there is a hidden cause, the process continues. Occupation, habits, and continued eye-strain are causes that are often left uncombated. In such cases local treatment is of little avail. Anointing the lids with pure or medicated vaselin every evening should be insisted upon. Generally, the use of an astringent is advisable—alum, tannic acid, silver nitrate, and zinc sulphate are most commonly used. No direct rule can be given for the strength and frequency of the applications. Each case needs a special treatment. In intractable cases the applications, once or twice daily, of a 50 percent solution of boroglycerid in glycerin is often of great service.

Acute Contagious Conjunctivitis

This is also called "Pink Eye," acute mucopurulent conjunctivitis, and epidemic conjunctival catarrh and is due to a small bacillus first studied by Koch and Weeks.

Symptoms.—After an incubation period of two or three days the disease begins as an ordinary conjunctivitis. In the course of two or three days the discharge becomes thick and often purulent, the lids are glued together in the morning, and sometimes markedly swollen, and there is deep injection of the entire conjunctiva. Generally there is some extension of the catarrh to the nose and sinuses. The disease may last only a few days or recovery may be delayed for several weeks



THE KOCH-WEEKS BACILLUS. ×950 (*Hansell and Sweet.*)

by the intervention of a subacute stage. Rarely corneal complications arise. Recurrences are not infrequent.

Diagnosis is made by the finding with the microscope of the Koch-Weeks bacillus in the cells or discharge, by the yellowish secretion that adheres to the lashes and by the occurrence of other cases in the house.

Treatment.—The treatment is similar to that of simple conjunctivitis. Cold compresses may be applied during the first two days. Argyrol and protargol are generally valuable; in the more severe cases nitrate of silver should be applied to the everted lids.

Purulent Conjunctivitis

Purulent conjunctivitis is a term used to cover highly infectious processes of the membrane. It varies according to the mode of infection. The most serious cases are generally due to the gonococcus of Neisser. And see COLON BACILLUS INFECTION.

Simple blennorrhea of the conjunctiva is distinguished by redness, swelling, profuse yellowish secretion, and involvement of the lids, skin, and even the neighboring lymph-glands. Crusts are formed at the edges of the lids, and pseudomembranes on the internal surface. In the height of the inflammation the conjunctiva may be so swollen as to push between the lids, constituting what is called **chemosis** of the conjunctiva. The discharge is at first watery, then purulent, and at the subsidence of the disease it is similar to that of a simple catarrh.

Gonorrheal Conjunctivitis.—This disease is due to infection by the gonococcus.

Symptoms.—For the first 24 hours it may present only the symptoms of a simple catarrh.

The violence of the onset is dependent upon the stage of the inflammation from which the inoculation was made. Inoculation from an eye in the full stage of suppuration may cause violent symptoms in 6 hours. The conjunctiva becomes congested and the lids are edematous and swollen. As the disease progresses, the signs of inflammation are more marked. There is grayish infiltration of the conjunctiva, intense pain, and the lids become so swollen as to hide the eye, and project as boggy tumors from the face. Drops of yellow pus ooze between the lashes. Upon opening the eye pus fairly gushes forth, and the examiner must be cautious that none of the contagious secretion falls upon his face. In fact, it is well to wear protective glasses in examining such cases. At this stage the bulbar conjunctiva is scarlet in color and so chemosed that the cornea may be completely hidden. The disease attains its height on the third or fourth day, and slowly subsides, the catarrh usually running a course of from 4 to 6 weeks. Indications of abatement of the process are diminution of discharge and signs of inflammation and the gradual return of the normal wrinkles of the eyelids as the swelling subsides. There are often severe constitutional symptoms. The temperature is elevated and the pain may be agonizing.

Complications.—The most frequent complication is corneal ulceration, which is due in great part to the deprivation of vascular supply to the limbus from the constriction of the conjunctival vessels by the great chemosis of the conjunctiva. The ulcers may not perforate, but when they heal they leave a disastrous scar upon the cornea. Prolapse of the iris may follow perforation. If the perforation is small, it may heal, with synechial attachments of the iris; if large, anterior staphyloma may occur. The whole cornea may slough and panophthalmitis result, leaving nothing but a sightless stump.

Diagnosis.—A history of gonorrhea or discovery of the gonococcus in the secretions at the onset of the disease makes the diagnosis positive. At its height the disease will be plainly recognized.

Prognosis is always serious, and is dependent entirely upon the amount and location of corneal involvement. Large peripheral leukomas are less dangerous to vision than small central ones.

Treatment.—The patient should be put to bed, and if one eye is sound, it should be protected with a **Buller's bandage.** This contrivance consists of a watch-glass held in place before the eye by a perforated adhesive bandage. It must cover and exclude the sound eye entirely, and must be impervious to the irrigations upon the diseased eye. The attendants and patient must be cautioned against the infectious nature of the discharge, and all compresses must be destroyed. Ice compresses should be applied to the eye every minute, night and day. This treatment eases the pain, limits exudation, and prevents swelling and conjunctival edema, so fatal to the cornea. If the cornea ulcerates early, cold must be discarded for hot compresses, wrung out in water of from 115° to 120° F. An atropin solution may be instilled unless the perforation is quite peripheral.

The next important part of treatment is thorough **irrigation** at short intervals. This is the fundamental principle in the therapeutics of all autoinoculable and purulent processes: Remove the self-multiplying cause, and assist nature to combat the original infection. Strong antiseptic applications are usually unnecessary. The infection soon gains access to tissues possibly beyond the reach of local antiseptics, and, moreover, such substances in germicidal strength have generally a devitalizing effect on the tissues involved, and this is exactly what is to be avoided. Let cleanliness be nature's assistant, and only when the curative process is delayed, let stimulating applications be used.

In view of its importance, it is unfortunate that thorough and repeated irrigation of the sulcus is seldom effected. To cleanse at intervals of a half hour every portion of an infected conjunctiva in an active state of purulent inflammation is a difficult task. The lids are tense and swollen. The palpebral and bulbar conjunctival surfaces are glued together, making the depths of the sulci almost inaccessible. The pain in the manipulation is intense. A child vigorously resists all efforts to open the lids, and even in the case of adults it is often quite impracticable under these circumstances. To be effectual, irrigation must be thorough, and in the active inflammatory stage it should be repeated at least every half hour. What might be called the "golden rule" in these cases is: *Without careful irrigation, all other treatment is unreliable.*

With a retractor syringe the eye may be thoroughly washed at the shortest intervals, as there is little pain in its introduction. Every 20 minutes is the shortest interval ever necessary. At least 1/2 of a pint of water should be used at each irrigation, and during the cleansing the retractor should be moved about slightly in the sulcus. The liquid should be drained over the side of the face into a basin, care being taken that it does not enter the ear, nose, or mouth. This is particularly necessary in infants. Any solution may be used, although sterile water, or possibly a weak boric acid solution or permanganate of potassium, will be found effective. The fluid should be used at body temperature, unless for special reason the application of heat or cold is desired, either of which may be readily applied in this manner. The solution, gently run through the syringe, also offers an excellent substitute for wet packs[1] and fomentations in certain cases of ocular inflammation.

In addition to the irrigation the lids should be everted, if possible, and brushed 3 times a day with a copious 50 percent solution of boroglycerid in glycerin. Often this solution may be flooded into the conjunctival sac without everting the lids. This substance has given better results than the more widely known silver preparations. Nitrate of silver (10 grains to 1 ounce) and its substitutes (such as protargol and argonin) are widely recommended. Sometimes the chemosed conjunctiva is freely incised. As the disease subsides into a simple catarrh, the ordinary antiseptic and astringent

treatment is instituted. In cases of corneal opacities, frequent massage with a weak yellow oxid ointment (1 grain to 3 drams) is recommended. An iridectomy is often resorted to for optic purposes. An artificial pupil downward may give serviceable vision, although the lower part of the cornea is not always clear. The treatment of the other complications is discussed under their separate headings. In the course of the disease the pain may be so intense as to necessitate hypodermic injections of morphin in the temple. Constitutional and hygienic treatment is often necessary. Pure air, cleanliness, light diet, free bowel movements, etc., are demanded. The rigorous treatment precludes the possibility of much sleep.

Ophthalmia Neonatorum.—This disease is analogous to the gonorrheal conjunctivitis of adults, although the symptoms are less violent and the consequences not so severe. It is usually due to the gonococcus in the secretions of the parturient tract, although severe cases have been caused by the secretions of nonspecific vaginitis.

Symptoms.—The inflammatory symptoms are similar to those of a mild case of gonorrheal conjunctivitis in the adult. They appear between the first and third days of life. Later appearance strongly indicates postnatal infection. In lying-in hospitals the disease may be transmitted from one infant to another, unless the proper precautions are exercised.

The course of the disease is shorter than adult gonorrheal ophthalmia. Both eyes are usually involved.

The diagnosis is easily made by the appearance of inflammation of the eyes in a newly born child. A history of a vaginal discharge in the mother or urethritis in the father is confirmative evidence. Bacteriologic examination makes the diagnosis positive.

The complications are chiefly corneal ulcers, although destruction of the eye may result. If the ulcers do not perforate, the **prognosis** for the scars becoming more or less transparent is much better than in the adult affection. Perforating ulcers cause adherent leukomas, which are always great hindrances to vision.

Treatment.—As both eyes are usually involved, it is not necessary to protect one; in fact, this would be most difficult; but at all times care should be taken to avoid transference of secretions or irrigations from one eye to its fellow, as there is not always the same virulence of infection in the two eyes.

The prophylactic treatment consists in: (1) Removing the disease from the mother before labor if possible; (2) thorough disinfection of the vagina before labor with solution of creolin, carbolic acid, boric acid, salicylic acid, mercuric chlorid, or other antiseptic; (3) thorough cleansing and disinfection of the child's eyes as soon as the head is born. These precautions should be carried out in all suspicious cases.

Crédé's method should be employed in all cases in hospital or midwife service, and in suspicious private cases. In fact, there is a law to this effect in many communities. It consists of instilling a few drops of a 2 percent solution of nitrate of silver exactly on the cornea of a child born of a mother who is suspected of vaginal infection. Other solutions have been suggested, but have no advantages over this simple method. We think, however, as a prophylactic measure this strength is greater than necessary, and liable to cause inflammation. A 1 percent solution, together with cleanliness, etc., seems sufficient until decided symptoms appear.

The routine treatment is practically the same as that of gonorrheal conjunctivitis: cold applications, frequent and thorough irrigation, the application of boroglycerid, silver nitrate, etc. At the first sign of corneal complication, hot compresses should be employed and atropin instilled. Massage with weak yellow oxid ointment is indicated for the corneal opacites. The child must be well nourished and kept clean and warm. Early operation is indicated if the opacities are central and dense. The earlier an artificial pupil is established, the better for the child's mental development. Of course, operation should be deferred a reasonable number of months while waiting for the opacities to clear up. In treating these cases the physician himself should inspect the cornea, and make the applications at least once a day. Nurses or family attendants often fail to open the lids sufficiently to cleanse the culdesac and to administer the local treatment.

Diphtheritic conjunctivitis is an intensely disastrous disease, due to infection of the conjunctiva by the Klebs-Loeffler or similar bacillus. There is a painful, board-like swelling of the lids, and a scanty, seropurulent, or serous discharge. The ordinary constitutional symptoms of diphtheria may accompany the affection. The treatment does not differ from that of other purulent affections of the conjunctiva, except in the relief of pain by atropin and the ordinary diphtheritic measures, the most important of which is the administration of the antitoxin. Pyocyanase dropped in the eye is another valuable remedy according to some observers. Disease of the cornea is seldom avoided in this affection, and the prognosis is very grave. Fortunately, the disease is rare in this country.

Croupous conjunctivitis differs from true diphtheritic conjunctivitis in that it is characterized by a soft, painless swelling of the lids, and a membranous exudation on the surface of the conjunctiva. It must be remembered that the secretions of ophthalmia neonatorum may take on a membranous appearance. The treatment is virtually the same as for other purulent infections of the conjunctiva. Caustics are contraindicated.

Follicular conjunctivitis is an inflammation accompanied by the formation of follicles or nodules in the conjunctiva. It is more infectious than simple catarrhal conjunctivitis, and is more prone to relapses, although no cicatrices are left after the follicles disappear. The disease may be acute or chronic. The follicles cannot be seen until the congestion recedes, when they appear in rows, glistening through the overlying membrane. Accompanying pericorneal injection is a precursor of shallow ulcers at the corneal margin. From

its infectious character a special germ is supposed to be the cause. It is distinguished from trachoma by the small secretion, absence of cicatrices, and appearance in the lower culdesac only.

Treatment should be first directed to measures to prevent the transmission of the affection to those about the patient. The secretion should be kept washed away by sublimate solution. Applications of boroglycerid, blue-stone, or alum may be of use. Smarting can be soothed by cold compresses. The conjunctiva may be cocainized and the follicles squeezed out with cilia forceps.

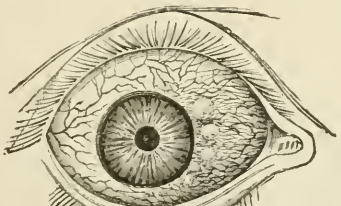
Granular Conjunctivitis.—See Trachoma.

Tubercular conjunctivitis resembles trachoma, but is, as a rule, confined to one eye. The ulcers are decidedly greater than in trachoma. The diagnosis may be definitely established by bacteriologic examination and by the symptoms of tuberculosis elsewhere. The prognosis is unfavorable. The local treatment is to effect destruction of tissue involved. The general treatment is that of systemic tuberculosis.

Vernal conjunctivitis, or spring catarrh, is a conjunctival inflammation recurring each spring or summer and disappearing with the frost, characterized by a pericorneal epithelial hypertrophy. The affection is binocular, and occurs chiefly in the young. It is characterized by a swollen and injected limbus and the signs of general catarrhal inflammation. The conjunctiva is pale, and looks as if it were covered with a thin film of milk. The cornea itself is not involved. There may be localized hypertrophies on the conjunctiva of the upper lid. The disease disappears spontaneously, only to return in the majority of cases the next season. The average duration is about four years. In a few cases slight opacities are left on the cornea.

Treatment.—The refraction should be carefully examined, and any ametropia corrected. In some cases it is even advisable to put the ciliary muscles at rest for several weeks, by the daily instillation of atropin. A mild, soothing lotion should be prescribed, and protective glasses ordered.

Phlyctenular Conjunctivitis. Symptoms.—This disease is characterized by the eruption of tem-



Phlyctenular Conjunctivitis.

porary vesicles or pustules on the bulbar conjunctiva. These blebs are called phlyctenules, and are grayish-red and flattened prominences from 1 to 4 mm. in diameter, with deep-red surroundings. Sometimes only a single bleb is seen. When a number of these phlyctenules are present, there will arise signs of irritation, congestion, pain, photophobia, and even blepharospasm. The lid is swollen and red, the conjunctiva injected and velvety, and there is mucopurulent discharge. The vessels supplying the infected region are swollen and become tortuous as they approach the phlyctenule. In the purulent form the disease soon reaches its height, remains severe for a few days, and then subsides. The milder varieties cause the patient slight inconvenience. Scrofulous children are particularly susceptible, and the disease is often seen in children with signs of eczema elsewhere on the body. It may follow the common infectious fevers. In debilitated children there is a tendency to relapse, and the disease may continue for years.

Unless the cornea becomes involved, the prognosis is good. Bacterial infection has been suggested as a cause.

Treatment.—The constitutional treatment consists of cleanliness, fresh air, good food, tonics, cod-liver oil, etc. Local treatment consists of the daily application of a mild Pagenstecher ointment and irrigation with a mild antiseptic solution. Calomel may be dusted over the affected area, unless the child is taking some preparation of iodin. The applications should not be made in too rapid succession. Massage with a 10 percent iodoform ointment, or with a weak salve of the yellow oxid, is often of value. A 1 : 1000 aqueous solution of pyoktanin has proved useful. Boroglycerid, 50 percent, is a useful application. The more severe applications such as silver nitrate and the zinc salts, were formerly used. Stimulating applications should be avoided if there are signs of a corneal ulcer. See Cornea (Diseases).

CONSCIOUSNESS, LOSS OF.—See Coma.

CONSTIPATION.—It is expedient to consider both extremes of intestinal evacuation together, the difference between the two being frequently more apparent than real. The course and the treatment of both conditions coincide in many points, and justify the attempt to describe them simultaneously. One evacuation, although it occurs at intervals of 48 hours, is not abnormal, and does not constitute costiveness, provided it is sufficient and causes no distress. Two soft evacuations in the same day similarly do not necessarily constitute diarrhea. See Diarrhea.

When the bowel evacuations occur rarely, are hard, and out of proportion to the food ingested, constipation exists; but even when an evacuation occurs daily, constipation may be present if the feces are insufficient in amount. It is important in doubtful cases to watch the quantity of ingesta for several days and to weigh the feces. Foods that can be readily recognized in the feces should be given as a test for the rate of peristalsis.

Constipation may exist even when a daily liquid stool occurs that is insufficient in the amount of feces; in fact, diarrhea may show itself and in reality constipation may exist. As feces consisting of bacteria and epithelium are formed even during periods of starvation, it is impossible to judge from the quantity of the evacuation whether it corresponds to the amount of ingesta, nor can

it be accurately determined how long food requires to pass through the intestine. The elements of time of passage of food, and the relation between the amount evacuated and the amount ingested, can only be approximately determined.

Symptoms

The characteristic symptoms are few: (1) Retardation beyond the normal duration. When an individual has no full evacuation in forty-eight hours, he may be considered constipated. (2) A disproportion between the amount of ingesta and the amount of feces. (3) The evacuations are of abnormal shape, deficient in water, hard, and dry. (4) Numerous other systemic symptoms and remote consequences.

Causes

Acute constipation is produced in various ways:

1. By direct obstruction of the lumen of the intestinal tube. This occurs in intussusception; in volvulus of the rectum or sigmoid flexure; in twisting or inverting of the cecum; in strangulation by the edges of the foramen of Winslow, perforations in the mesentery, mesocolon, great omentum, or other duplicatures of the peritoneum; in strangulated hernia; in obstruction by foreign bodies.

2. By pathologic changes in the intestinal tissues, impairing their functions. This occurs in the acute inflammation of the various sections of the colon or intestines, producing infiltrations of the muscularis—adhesions; occasionally in typhoid fever (here also the muscular layer has been found tumefied and the mucosa very much infiltrated, so much so as to project into the lumen of the canal).

3. By direct inhibition of peristaltic function through the nerve-centers. This occurs in acute meningitis; in tubercular meningitis; in apoplexy; in acute mania; in acute diseases of the spinal cord and its envelopes; in acute infectious diseases; in hysteria.

4. By absence of impairment of the quality of the bile. This occurs in acute diseases of the liver; in cholelithiasis and stenosis of the gall-duct.

5. By inhibition of the aid of the diaphragm and abdominal muscles. This occurs in acute diseases of the lungs and pleura; in rheumatism, and hyperesthesia of the abdominal parietes; in paralysis of the diaphragm and abdominal muscles; in acute diseases of the female genital tract.

6. Reflexly: Inflammation of retained testicle; some of the diseases of the female genital tract; acute diseases of the bladder and prostate.

7. By a combination of these various ways: In acute inflammation of the stomach; in gout.

The causes of chronic constipation are as follows:

1. Well-defined morbid processes.
2. Obstruction from foreign bodies.
3. Congenital malformation of a section of the colon; defective development or dislocation of the intestine.
4. Impairment of physiologic function.

1. **Chronic Constipation from Disease.**—The morbid processes that cause constipation are various:

(*a*) Obstruction of the lumen of the tube: Cicatricial narrowing of any portion of the intestine; constriction of intestine by bands; constriction of the cecum and jejunum (after appendicitis, typhlitis, or perityphlitis); cancer of colon or rectum; abdominal tumor; pelvic hematocele, retroverted uterus; rectal tumors; folds of mucosa.

(*b*) Impairment of the secretions poured into the intestines: In chronic hepatic diseases, deficient or abnormal bile; in pancreatic diseases.

(*c*) Inhibition of peristalsis through the nerve-centers: In chronic diseases of the brain, spinal cord, and its envelopes in insanity; saturnine intoxication (lead paralysis, saturnine encephalopathy); diphtheritic paralysis.

(*d*) Chronic venous congestion of the intestinal circulation: In organic cardiac diseases; in asthma, emphysema, etc.

(*e*) Voluntary abstention from stool; diseased conditions of the rectum: In hemorrhoids; rectal ulcers; anal fissure; chronic proctitis; irritability of the rectum.

(*f*) Changes in the mucosa that impair its irritability: In chronic and membranous enteritis; intestinal atrophy.

(*g*) Atony of the intestinal muscles: Gastric atony and dilatation; prolonged colitis.

2. **Chronic Constipation from Foreign Bodies.**—
(*a*) Intestinal obstruction from hair tumors.
(*b*) Voluminous intestinal concretions.

3. **Malformation of the Intestines.**—
(*a*) Abnormally developed colon.
(*b*) Undue length of sigmoid flexure.
(*c*) Diverticula of colon.
(*d*) Diaphragms in colon: (1) Enormous congenital development and primary atrophy of the colon; (2) congenital arrest of development of the muscularis.

4. **Chronic Constipation from Impaired Physiologic Function.**—
(*a*) Perverted action.
(*b*) Imperfect performance of function (habitual constipation).

Diagnosis

The diagnosis of constipation is, as a rule, an easy matter; in those cases in which there are daily apparently insufficient evacuations, but nevertheless a gradual accumulation of excremental matter occurs in the intestines, the diagnosis presents some difficulty. A patient may complain of diarrhea and nevertheless be constipated. In these cases distention of the colon and careful percussion and palpation will reveal the presence of stagnating masses of feces. It is well to bear in mind all of the causes that have been enumerated, in order to be able to make the all-important distinction between secondary constipation due to one of these causes and typical habitual or idiopathic constipation. It is difficult to determine whether the constipation is due to a reduced irritability of the nerves of the colon and rectum or to a defective

development (atrophy) of the intestinal musculature. If the coprostasis has been present from the earliest periods of childhood and has existed through life, the existence of defective development of the musculature is probable. But if the constipation has occurred later in life and is attributed to psychic and emotional causes, or assigned to the wilful suppression of stool, it may be assumed that there is an inhibition of the nervous supply of the colon and rectum. If idiopathic constipation is relieved or cured by treatment directed to the nervous system, without special regard for influences on the colon and rectum, it may be considered as due to neurasthenia. A serviceable method to facilitate the diagnosis of constipation is to observe the time required for any food to pass through the gastric intestinal canal. Raisins, eaten with the skin, and milk can be recognized in the stool.

Microscopic examination of the feces gives valuable information. Inspection of the rectum by Kelly's or Kelsey's tubes will prevent errors of diagnosis when the disease is caused by stricture or neoplasm in the sigmoid flexure or rectum. In persistent cases the colon should always be distended with carbon dioxid gas generated from a siphon of vichy. This will, in most cases, reveal the seat of strictures of the colon by the difficulty with which the bowel is inflated beyond the point of stenosis. In women the kidneys should always be examined for possible dislocation. The electrodiaphane has been successfully used for the diagnosis of stenosis and for determining the location of stenosis of the colon.

Prognosis

In the large majority of cases the prognosis is favorable as regards life. One case of death has been reported from asthenia despite apparent recovery from the constipation. Constipation of long standing may cause irreparable and anatomic changes in the bowel. Dislocations, atrophy, peritonitic adhesions, and perforations—these accidents are rare.

The prognosis as regards recovery is, as a rule, favorable. The prognosis is unfavorable (1) in marked dislocation of the bowel; (2) when the abdominal walls are very relaxed and with pendulous abdomen; (3) in old persons with chronic atony.

Treatment

The causal indication in the treatment of constipation is the removal of the stagnating fecal masses; this cannot be done in a manner that will unfailingly lead to recovery unless the diagnosis is accurately established (see Causes).

The various means of treatment may be classified, according to their curative value, in the following order: Diet, massage, electricity, gymnastics, hydrotherapy, medicines, mineral spring water, psychic or suggestive methods, mechanic methods. The management of constipation will differ according to whether it occurs in children, in middle age, or in senile persons. It is only by a severely individualizing management that constipation can be radically cured.

The detection of the causes of constipation presents many difficulties, and occasionally it is entirely impossible. The disease may sometimes be founded in an incurable fundamental condition, such as coloptosis or defective development of the muscularis or an acquired intestinal atrophy. But even when the cause seems irremovable, the physician will be enabled to select a more correct treatment when it is once clearly recognized: for instance, in inherited defective development of the musculature a diet should be selected that will make but slight demands upon the peristalsis of the intestines, while in other cases of constipation a diet is usually serviceable that leaves considerable undigested residue, thereby stimulating the peristalsis. Constipation is frequently caused by a faulty method of nutrition and irregular habits of life; it is a partial phenomenon of neurasthenia. Hence it is important to regulate and prescribe a suitable diet; insist upon proper habits and upon regularity of living, and urge the use of climatic, hydropathic, and physical methods of cure. The administration of purgatives is only palliative, and in some cases is directly injurious. Purgatives cannot, however, be entirely dispensed with. There is no treatment or therapeutic method of which it could be said that it is applicable to all cases of constipation or even to a larger portion of such cases.

There are three reasons why constipation often becomes intractable: First, in irremediable anatomic cause; second, the cause may be remediable, but the method of treatment may not be conformable to the cause; and, third, even when the treatment is correct, failure may result because it is imperfectly executed or not continued long enough.

In all cases of constipation purgatives should be withheld at first, and small doses of opium given whenever there is pain and the diagnosis is obscure. Opium can do no harm in such cases, but purgatives can and frequently do.

The first step in the treatment is to determine whether it is to be directed to constipation (*a*) due to atony, (*b*) due to spastic condition of the musculature, (*c*) to dislocations of the intestine, (*d*) to abnormal nervous inhibitions of the peristalsis.

The Diet.—Gastric hyperacidity being a cause, the state of gastric secretion must be determined and the diet adapted thereto. In this case alkalies are indicated. In the atonic form foods that do not form much residual matter are forbidden, also concentrated foods, and in their place foods rich in water and cellulose are recommended, these latter being adapted to excitation of peristalsis. Cocoa, chocolate, milk, tea, claret, Burgundy, rice, soup made of flour, and huckleberries are forbidden. Instead of wheat bread the patient should use only Graham or rye bread, together with butter and honey; all fruits are permissible excepting persimmons. Equal parts of plums and figs stewed together are serviceable. Soups may be taken if made from bouillon and herbs, leaves or roots; butter milk, kefyr, cider, and beer are serviceable. Fresh vegetables in the form of

cabbage, carrots, turnips, radishes, spinach, tomatoes, cresses, rhubarb, should enter extensively into the dietary. Sauerkraut favors evacuation. Fats should be liberally taken in the form of butter and rich gravies; meats should be eaten with sauces. When there is much flatulence, the addition of spices, such as pepper, salt, caraway seed, etc., is of utility. If constipation is due to enteritis, the diet cannot be taken in the form of vegetables; then the only vegetables that are permissible are cauliflower, spinach, tender asparagus, and perhaps mashed potatoes. A sufficient ingestion of cold water between meals is all important. One pint of fresh buttermilk or kefyr should be taken twice daily. The following is suggested for a detailed *diet list.*

Morning:
Before breakfast, Bedford magnesia spring water, 1/2 of a liter.
8 ounces of milk and coffee.
1 ounce of butter.
1 ounce of honey.
3 1/2 ounces of Graham bread.
8 ounces of buttermilk.

Noon:
8 ounces of bouillon.
8 ounces of mutton.
8 1/2 ounces of crisped cabbage.
8 ounces of plums.
8 ounces of apple-cider or beer.

Afternoon:
9 ounces of buttermilk.

Evening:
5 ounces of meat.
1 ounce of butter.
10 ounces of stewed apples.

For the several meals 8 ounces of Graham or rye bread. After the evening meal 1 pint of beer.

Excessive ingestion of food predisposes to constipation. The drinking of hot water early in the morning is not productive of regular evacuations, and must be emphatically forbidden. A drink of cold fresh water about 1 hour before breakfast and just before going to bed will assist defecation. A mixture of stewed apples, prunes, raisins, and figs, seasoned with sugar and lemon-peel, is palatable and efficacious.

Massage.—The main object is gradually to produce the independent healthy peristalsis of the intestines by proper manipulation. In order to be effective this mechanic treatment must be persisted in for several months; no permanent benefit can be expected even after a treatment of one month. In the beginning of this treatment it may be necessary to use laxatives occasionally. Massage must be practised by skilled hands, and must be executed correctly. Although the entire abdominal region must be treated, the greatest importance is attributed to massage of the colon. This is executed by short pushing and beating movements, by kneading and rubbing, and even attempting to grasp the colon between the fingers and systematically squeezing it along its anatomic course. Some expect from abdominal massage the direct working out of the intestinal contents. This is quite a mistake. The great benefit derived from systematic and skilled abdominal massage is the stimulation which the intestinal peristalsis receives and the improvement in the tonicity of the intestinal blood-vessels.

Electricity.—Most favorable results have been obtained in constipation due to atony, but not in the spasmodic form, by the faradic and galvanic currents, even when complete intestinal occlusion had been caused by fecal accumulations, and also in stenoses that had arisen from invagination.

The exact way in which electricity acts is not yet understood. Favorable results are obtained by a combination of both currents used at the same time.

Gymnastics, Body Movements, Swedish Movements.—That exercise will be the most advantageous that produces the most frequent contractions of the abdominal muscles. But in the absence of any special direction and conduct of exercises, constipated patients should systematically carry out whatever outdoor exercise is most congenial. At least 2 hours should be allowed to transpire after meals before extensive walks are undertaken by patients. Other favorite exercises are swimming, rowing, horseback riding, bicycle riding. All exercises should be taken in the open air, and must never be carried to exhaustion. The best guide as to whether the exercise has done good is the feeling of refreshment and invigoration, together with a stimulated appetite. Gymnastics and Swedish movements are best carried out under the guidance of an instructor; they must be kept up for several months.

Cannon-ball Massage of the Abdomen.—Sahli recommended a cannon-ball, from 3 to 5 pounds in weight, covered smoothly with chamois skin or flannel, to be rolled over the course of the colon by the patient himself. The procedure is best carried out early in the morning in bed, after the bladder has been evacuated; the knees are drawn up and the rolling over the colon continued for 10 minutes.

Hydropathic Procedures.—The external application of water may occasionally be effective in the treatment of constipation; but, as a rule, it is only an adjuvant to the methods mentioned.

An efficacious hydropathic method has been an alternating hot and cold douche directed against the abdomen (the Scotch douche). Cold sitz-baths are advisable, but great caution is necessary in their application in female patients, particularly in the period preceding menstruation. Clysters or enemas or irrigations of the colon with warm or cold water act mechanically, thermically, and antiseptically.

When injections are carried to excess, the necessity for abdominal pressure, which is an important element in the act of defecation, is avoided; the abdominal muscles, therefore, become unaccustomed to exerting the necessary pressure for defecation, and constipation may actually become aggravated.

Colon irrigations are indicated in the constipa-

tion due to chronic intestinal catarrh, to internal hemorrhoids, and to icterus. Cold tub-baths, cold moist compresses on the abdomen, and cold moist rubbing are also very valuable.

Medicines.—Excessive dilatation of the intestinal wall by fecal accumulations seriously injures the musculature and reduces the irritability of the intestinal nerves. It is advisable not to delay with the administration of purgatives in these cases until the intestine empties itself by unusual exertion. Such strenuous expulsive efforts are fraught with great danger to the contractile elements of the bowel. In old patients, paralytics, and those suffering from infectious fevers and confined to bed, the administration of purgatives cannot be avoided. On the whole, it may be said that the more rarely a purgative is used, the more effective will be its action when it is employed in an emergency. In the selection of drugs for this purpose the practitioner must carefully distinguish between atonic and spastic constipation and that due to obstruction.

In inflammation of the colon there may be constipation alternating with diarrhea, and the treatment will be regulation of diet, irrigations, hydrotherapy, massage, and oil enemas. The remaining treatment for this form of constipation will be considered under DYSENTERY, ENTERITIS, etc.

Purgatives are contraindicated when the constipation is the result of peritonitis or intestinal ulcerations, and in tonic spastic contraction of the musculature, as occurs in meningitis and lead-poisoning; in these cases the pains are increased by the purgatives, and they do not produce an evacuation. Spastic contractions of limited portions of the intestine may occur as a result of neurasthenia. Here, and in recent hemorrhage from the stomach and bowel, purgatives must be prohibited. All stenoses of the intestine, when they have reached an advanced degree, are aggravated by purgatives, because they favor the development of paralysis. During long-continued use of the same purgatives their effectiveness is lost; it is, therefore, necessary to change them when they must be used for a long time.

The secretory, motor, and absorptive condition of the stomach should be examined and defects corrected. C. Cleveland has reported favorable results in constipation treated by forcible dilatation of the sphincter ani. Fissure of the anus and hemorrhoids should have proper attention.

Of the large number of drugs used for this disease in its atonic form, 4 are chiefly to be relied on: viz., nux vomica, with its alkaloid strychnin, aloes, jalap, and cascara sagrada. The use of physostigma bean, ergot, and belladonna for this purpose should be discontinued. Phenolphthalein is a recent addition to the list. It is apparently harmless even in excessive dosage. Usually 1 or 2 grains at bedtime suffices, but as much as 5 grains 3 times a day is recommended. Various confections of sweetened chocolate, sugar and the like, medicated with phenolphthalein, may be obtained for children and are easily taken. The dose for a child of two years is 1/2 to 1 1/2 grains. In case of evident decrease of mucus as a result of atrophy of the glandular layers of the intestine, the action of the glands may be stimulated by sodium phosphate and ammonium chlorid. Belladonna seems to have a transient good effect in those cases of constipation that are due to excessive hyperacidity, but it cannot be given frequently. In this form the following formula is advised:

℞. Calcined magnesia, ℥ ss
Powdered rhubarb, ℥ ijss
Sodium carbonate, ℥ j
Extract of belladonna, } each, gr. ij.
Extract of nux vomica, }

One-half of a teaspoonful 3 times daily, half an hour after meals.

When atonic constipation is associated with absence of HCl or subacidity:

℞. Dilute hydrochloric acid, ℥ ss
Strychnin sulphate, gr. 1/3
Tincture of rhubarb, q. s. ad ℥ vj.

One tablespoonful in a wineglassful of water 3 times a day 1 hour after meals, through a glass tube.

Each group of the purgatives has an individual and peculiar action, and should be used according to special indications only; thus, when constipation is combined with acute indigestion and much intestinal sepsis, calomel, in doses of 1/2 of a grain, repeated every 2 hours, has no superior; in acute constipation without sepsis or pain, castor oil is advisable. In constipation of the adipose, with inclination toward passive congestion in the intestinal canal and hemorrhoids, the neutral salts, such as magnesium and sodium sulphate, sodium and potassium tartrate, sodium phosphate, and the purgative bitter waters have gained a reputation.

The following is a favorite pill with Nothnagel:

℞. Podophyllin, gr. ivss
Extract of aloes, } each, gr. xlvjss
Extract of rhubarb, }
Extract of taraxacum, q. s.

Make 40 pills; 1 pill at bedtime.

For constipation with flatulence the following pill, 2 or 3 times a day, is recommended:

℞. Compound extract of colocynth, gr. 1/3
Turpentine, gr. j
Powdered socotrine aloes, gr. jss
Extract of nux vomica, gr. 1/4
Extract of hyoscyamus, (English), gr. j.

With some persons the following electuarium of manna, as recommended by Strümpell, will for a long time be serviceable:

℞. Manna, } each, gr. xxx
Sugar, }
Fennel water, }
Powdered iris root, gr. ij
Oil of sweet almonds, gtt. xv.

Dose, a heaping teaspoonful.

The confection of scammony or of tamarinds, prepared according to the German or British Pharmacopeia, is sufficient in some cases. Senna and colocynth can only be used occasionally. The saline purgatives, sodium and magnesium sulphate, and the various purgative bitter mineral waters, such as the Hunyadi János, Friedrichshall, Homburg, Carlsbad, etc., in Germany; the Hathorn, Congress, and Kissingen Springs in Saratoga, N.Y.; the Estill and Irvine Springs in Kentucky, should not be used habitually.

The very drastic purgative waters, such as the Hunyadi János and the Rubinat-Condal, do more harm than good.

The Use of Mineral Waters.—These waters do not act curatively, but simply as all other purgatives do; they produce an evacuation the day they are used, and do not effect the underlying causative conditions of the constipation.

Injections.—These consist either of water, to which various medicines are added, of oil, or of glycerin. Injections of water to be effectual should always be slightly cooler than the temperature of the body—about 75° F. will answer. When there is much putrefaction in the colon, it is well to order the injections every day. They are best administered before breakfast in the morning or before retiring at night. The quantity to begin with should not exceed 1 liter (1 quart). It is sometimes advisable to follow the suggestion of Hühnerfauth, and produce an evacuation of fecal matter contained in the sigmoid and rectum by injecting 1 pint of water, and then follow it by a larger injection of about 2 pints of water, persuading the patient to retain it as long as possible. With excessive putrefaction disinfectants may be employed in the colon irrigation; the following may be recommended: Thymol 5 parts, lysol 1 to 2 parts, or boric acid 20 to 30 parts, to water 1000 parts.

Oil Injections.—Only the very best olive oil or cotton-seed oil is serviceable for this purpose. The oils of the poppy and rape seed are used in Germany. About 250 to 500 c.c. of this oil are warmed by placing the bottle in a vessel containing hot water. The rectal or Langdon colon tube is introduced into the sigmoid flexure, while the patient is either placed on the back with the pelvis elevated by several noncompressible pillows, or in the knee-elbow position. The injections must be repeated daily if benefit is to be derived from them. When the entire colon becomes coated with oil, the stools resemble those of the contents of the small intestines. In case abnormal putrefactive processes are to be combated, the addition of the same substances and in the same quantity as stated heretofore for the water injections is advised. The most desirable effect of the oil injection is the inhibition of the resorption of toxins from the intestinal contents. When the bowels have been brought to act several times daily, the number of injections may be reduced to 1 in every 2 or 3 days.

Glycerin injections have been recently replaced by suppositories containing about 80 percent of glycerin; they should only be used occasionally; sometimes, by their great dehydrating effect, they act as irritants upon the rectal mucous membrane.

Mechanic or Instrumental Methods.—When the rectum has become enormously dilated by hard impacted masses of fecal matter, it sometimes becomes necessary to remove them by manual or instrumental interference. Fecal colic caused by coproliths has been cured by manual kneading and breaking up of the fecal tumors, when injections of water and oil did not suffice to soften them. In constipation that has existed a long time, in which repeated attacks of fecal colic have recurred, one must bear in mind the possible existence of ulceration and friability of the intestine before manual interference is undertaken.

Psychic or Suggestive Treatment.—The treatment of constipation by hypnosis and suggestion has been proposed by Forel, but this method has found but few advocates.

CONSUMPTION.—See Tuberculosis (Pulmonary).

CONTRACTURE.—See Ankylosis.

CONTUSION.—A bruise or injury inflicted by a blunt weapon, or received in a collision, without breaking the skin or covering. See Wounds (Contused), Bruise.

CONVALESCENCE.—Restoration to health after the subsidence of a disease. The period of convalescence is that time during which progress toward recovery is made, and there is a returning state of health after illness. The word is most commonly associated with fevers, inflammatory diseases, and other acute affections. It may occur by crisis and be speedily established, but is generally slow and protracted, and interrupted by relapses, complications, and sequels. Careful watching and judicious treatment are necessary, or recovery will be delayed or the foundation for permanent disease laid. Injudicious administration of medicine inflicts much injury. Dietary precautions and general hygienic measures are most important. Sudden exposure and exertion must be guarded against.

CONVALESCENT SERA.—See Serum Therapy.

CONVALLARIA.—The dried rhizome and roots of *Convallaria majalis*, lily of the valley. The preparations in the market vary in action, according to the quantity of the resin present, it being emetocathartic. Convallaria contains two glucosids —namely, convallamarin, on which the cardiac action depends, and convallarin, a crystalline, purgative principle, insoluble in water; also an acrid resin which probably contains the latter glucosid. Dose, 2 to 10 grains. Convallaria is a decided cathartic and a prompt and powerful diuretic, but its cardiac action has excited attention, and it is considered a close analogue of digitalis, while free from the so-called cumulative action which makes the latter drug so frequently a dangerous remedy.

Preparation.—Fluidextractum convallariæ is the only official preparation, and probably contains convallarin, which is not present in aqueous preparations, being insoluble in water. Dose, 2 to 10 minims.

CONVOLVULIN.—See Jalap.

CONVULSIONS.—A convulsion may be defined as a general involuntary paroxysm of muscular contraction. It should have a comparatively abrupt beginning and an early termination, and may or may not be attended by a loss of consciousness. Convulsions are commonly divided into clonic and tonic forms, the former referring to more or less rhythmic contractions of opposing muscular groups, with a varying excursion of the affected limbs, the other to a simultaneous contraction of opposing muscles, with a rigid, fixed position of the limbs. In some cases these two types may be combined.

It is difficult to give an accurate definition of the term convulsion, as it has been loosely applied by writers and clinicians. It is sometimes use to designate tremor, contracture, or cramp; indeed, almost all varieties of disturbed muscular tension. Localized convulsions are more appropriately called spasms. Nothwithstanding these uncertainties, there is a fairly well-defined clinical use of the term, and physicians generally understand by it the typical forms as seen in uremia, hysteria, and epilepsy. The idea of a seizure or attack, and not a continuing state, is generally conveyed by the term. The voluntary muscles are always involved, though analogous conditions have been described under the name **internal convulsions,** in which the involuntary muscles are affected.

It is apparent that many classifications of convulsions, based on their varying clinical aspects, could be constructed; they could be divided into organic or functional, according to the organs involved or according to their etiologic relations. For convenience they will be divided into two groups—one in which consciousness is retained, and the other in which it is lost. Such a division is not strictly accurate, but is a practical one from the standpoint of diagnosis and treatment.

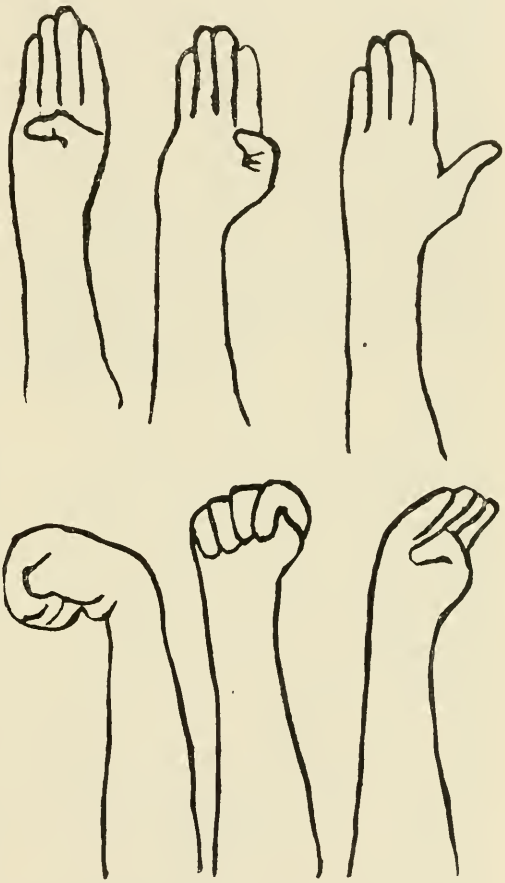
The next article considers the convulsions of childhood. The partial convulsions (tics), confined to a single muscle or group of muscles, and the recurring general tics, those included by French writers under the term **tic convulsif,** will not be considered. The attempt will not be made to describe every variety of convulsion, but only the more important, and those of most frequent occurrence. It is well to state at the outset that convulsions are symptomatic, having a widely varying pathologic basis; such being the case, but little can be said that is applicable to the causes of treatment of convulsions in general.

Diagnosis.—When the practitioner first sees a case of convulsions of sudden onset in an adult, if there is **loss of consciousness,** the condition, in the vast majority of cases, is epilepsy, including the status epilepticus, uremia, or apoplectiform convulsions. If consciousness is retained, the case is one of hysteria, tetanus, hydrophobia, or strychnin poisoning.

The diagnosis of the first group presents the greatest difficulties. In epilepsy consciousness is, with rare exceptions, completely abolished when there is a general convulsion. In other than the status epilepticus the convulsion is of short duration; but in cases in which the status is not fully developed there may be a succession of seizures without a full return of consciousness. A history of former attacks easily fixes the diagnosis of epilepsy. The position of the hand and relation of the thumb to the fingers is one of the most conclusive signs of epilepsy and of the status.

This position of the hand is also found in uremic and apoplectiform seizures. It is one of the most important diagnostic means of distinguishing between feigned convulsions and those of hysteria attended by apparent loss of consciousness.

Without a history it is impossible to distinguish some apoplectiform seizures from epilepsy. The history of antecedent brain-disease alone will guide us to a diagnosis. The apoplectiform convulsion is of longer duration and is usually attended



Positions of the Hand and Relations of the Thumb and Fingers in Convulsions.

by a marked rise in temperature. The latter may take place in the epileptic status if it lasts for several hours.

In uremia the condition of the heart is one of the most important available means of diagnosis. A hypertrophy without valvular lesion almost invariably points to uremia. Of course, an antecedent history of kidney-disease or an existing

dropsy would be quite as conclusive in fixing the diagnosis. The urine should be examined as soon as possible in all convulsions attended by loss of consciousness. The coexistence of pregnancy would point to the kidneys. Any convulsive seizure in pregnancy, however slight, should lead to the suspicion of uremia.

The diagnosis of convulsions not attended by loss of consciousness is much simpler. Hysteria presents the greatest difficulty. Convulsions in this disorder may imitate somewhat closely those of other disorders. They do not, however, present the characteristic position of the hand as shown in illustration. The fingers are usually extended; indeed, the whole attitude of the hysteric seizure is one of extension. Charcot has described the several attitudes of the hysteric attack—first the clonic, and then the tonic contractures with the opisthotonos. A brief inspection will show that there is only a pseudo loss of consciousness.

The convulsions of tetanus, of hydrophobia, and of strychnin poisoning are readily distinguished from other varieties by the history that the patient is able to give in the intervals of the paroxysm. The spasms of strychnin may be distinguished from those of tetanus by their intermittency (the latter being constant), by the meaningless smile, *i.e.*, the risus sardonicus, the less marked trismus, the absence of a wound, and the rapid course of the symptoms. In hydrophobia, trismus and opisthotonos are lacking and there are present laryngeal symptoms, and spasms on swallowing, and mental depression. If the patient is conscious and hysteria can be excluded, recurring convulsions are almost certainly due to one of these three conditions.

The treatment of convulsions necessarily depends upon the underlying pathologic conditions.

The emergency treatment largely includes that class that is attended by loss of consciousness. The first step is to place the patient in as comfortable a position as possible—a large wide bed. If this cannot be obtained, use the floor covered with a blanket. Constricting collars, bands, or corsets should be removed. Pillows, if thick, should be taken away, that nothing may obstruct respiration. Such restraint of the convulsed limbs should be used as will prevent the patient from injuring himself. A piece of soft wood or a cork should be placed between the teeth to prevent biting the tongue. The lower bowel should be immediately washed out, and a rectal injection of 30 grains of chloral administered. A drop or two of croton oil, rubbed up with sugar of milk, secures quick action of the bowels.

There are no forms of convulsions in which bleeding is contraindicated, excepting the apoplectiform seizures of advanced brain-disease, in which there is emaciation. These can hardly furnish an emergency case. There are practically none in which morphin is contraindicated. This should always be given hypodermically. Finally, if the convulsions are very severe, the tentative employment of chloroform inhalations is indicated.

CONVULSIONS, INFANTILE.—Convulsions are common during infancy, owing to the instability of the nerve-centers at this time. They occur as a symptom and as a result of many different disorders (perfectly healthy children not being subject to these seizures); the most frequent predisposing causes are nutritional disturbances, especially rickets, of which condition convulsions are often an early and a prominent symptom.

Etiology.—Among the **exciting causes** are meningeal hemorrhage, due to injuries of the brain during birth; organic diseases of the brain, as tumor, abscess, or meningitis. The onset of the acute infectious diseases is frequently marked by convulsions. Convulsions may be caused by poisons in the system, from uremia, ptomains in the digestive tract, lead-poisoning, etc. They are quite common during the paroxysmal stage of pertussis, and may arise in the course of any disease accompanied by high temperature or exhaustion.

Among the reflex causes are irritation from dentition, nasal obstruction, phimosis, worms, and severe injuries, as scalds or burns.

In seeking for the cause of an attack, it should be remembered that the most common exciting, reflex, or toxic cause is gastrointestinal disturbance.

Symptoms.—There may be prodromal symptoms, as restlessness, slight twitching of the hands, feet, eyelids, or face; or the convulsion may begin suddenly, and the first symptom noticed is that the face is pale and the eyes fixed, and perhaps rolled upward. In a moment after, this convulsive twitching will begin in the muscles of the eyes and face, or one extremity, and will rapidly extend until all the muscles of the body participate. At this time the thumbs are held in the palms of the hands, and the fingers are tightly clenched over them; there are opisthotonos and frothing at the mouth; the bowels and bladder may be evacuated involuntary; and in all true convulsions the patient becomes unconscious. After from a few minutes to a half hour the movements gradually cease, and there is a period of extreme prostration —the child usually sleeping heavily.

Except when due to the onset of the acute infectious diseases, the attacks are likely to be repeated, and may follow one another in rapid succession, as many as 40 or more a day occurring. It is not unusual for any of the causes mentioned to produce slight twitching of certain muscles only, without a complete convulsion. Especially may this condition be present as a symptom of tumors or injuries of the brain, when one side only of the body may be convulsed.

The prognosis depends upon the cause. Occurring during a severe illness, or when the child is weak and debilitated from malnutrition, a fatal issue is not uncommon; but when due to digestive disturbances, dentition, or other reflex causes in a fairly robust child, recovery may be expected.

Treatment.—Chloroform, or equal parts of chloroform and nitrite of amyl, should be given by inhalation during the convulsion. A few drops will almost immediately quiet the child, when the drug should be discontinued, but repeated whenever there are signs of a recurrence. Morphin (1/48 of a grain to a child 6 months old) may be

given hypodermically at the same time, and repeated in a half hour if the child does not become quiet; or, instead of this, 5-grain doses of chloral may be given by the rectum. The chloral may be conveniently given in milk, and should be introduced high up in the colon through a soft-rubber catheter, the colon having been previously cleared by irrigation. The dose may be repeated in an hour if the convulsive movements have not ceased.

The patient should be kept in a quiet room and disturbed as little as possible, and for several days, or until the danger of a repetition of the attacks has passed, he should be given chloral and bromid every 3 or 4 hours, either by the mouth or rectum, in sufficient doses to keep him quiet. For this purpose one of the following formulas may be used for a child 6 months old:

℞. Chloral hydrate, gr.xl
Sodium bromid, ʒ j
Syrup of acacia, ℥ j
Water, ℥ iij.

Give a tablespoonful, injected high up in the rectum, every 3 or 4 hours (half the amount by the mouth).

Or—

℞. Mixture of asafetida.

Two teaspoonfuls every 2 hours, as an enema.

Or—

℞. Musk, gr. xx
Chloral hydrate, gr. xxx
Camphor, ʒ jss
Syrup of acacia, ℥ j
Water, ℥ ij.

A tablespoonful every 3 or 4 hours by the rectum.

If there are symptoms of collapse, with weak pulse and a cold and cyanotic state of the skin during the convulsion or between the attacks, means should be used to restore the peripheral circulation and to increase the heart's action. Hot bathing would accomplish this to a certain extent, but would disturb and excite the child, and the ultimate result would be enervating. The mustard pack best meets the requirements, and is employed as follows: A towel is saturated in warm water, to which a tablespoonful of mustard to the quart has been added; the child is wrapped in the towel and then rolled up in a woolen blanket and allowed to remain thus for 10 or 15 minutes, or until the skin becomes red from the effects of the mustard. This may be repeated every 2 or 3 hours if necessary, in the intervals keeping the child's body warm with hot-water bottles. Cold applications should be kept on the head.

The cause of the attack must be ascertained. If due to the eruption of a tooth, lancing the gum may give relief; if to high fever, cool sponging or cool bathing should be employed to reduce it; and, finally, if it is due, as a majority of the cases are, to indigestion, appropriate measures should be instituted to relieve this condition and to prevent its recurrence. It is necessary to evacuate the contents of the stomach by lavage, to clear out the intestines with calomel in small frequently repeated doses, and to thoroughly irrigate the large bowel with warm water. Discontinue improper, and institute proper, feeding, and adopt general hygienic measures to improve the child's nutrition.

CONVULSIONS, PUERPERAL.—See ECLAMPSIA.

COPAIBA.—The oleoresin of one or more species of *copaiba*. It is a translucent, viscid liquid, of yellow color, aromatic odor, and acrid, bitter taste. It is soluble in alcohol, ether, and chloroform. It is not a balsam as it contains no cinnamic acid; but it is composed of a volatile oil and a resin, the latter containing about 99 per cent. of copaibic acid.

Therapeutics.—Copaiba is a stimulant, diuretic, diaphoretic, expectorant, and a gastrointestinal irritant. Its taste is bitter and nauseous. In the stomach it causes heat, unpleasant eructations, heaviness, frequently anorexia and diarrhea, and if continued for any length of time, gastrointestinal catarrh and desquamative nephritis may result. The various secretions have the odor of the drug, especially the urine. In moderate doses it increases the quantity of urine and its solid constituents, but large doses will cause scanty urine, containing albumin, casts, and blood, with pain in the loins, and other signs of renal congestion. It often produces itching and several forms of eruption on the skin. Copaiba has been largely used in gonorrhea after the acute symptoms have subsided, also in chronic cystitis, acute and chronic bronchitis, and in dropsies, particularly ascites.

In chronic urethritis:

℞. Oleoresin of copaiba, ʒ j
Oleoresin of cubebs, gtt. iv
Citrate of iron and ammonium, gr. xx.

Make into 10 capsules; 1 capsule 3 times daily, after meals.

In early acute gonorrhea:

℞. Citrate of potassium, } each, ʒ iij to vj
Balsam of copaiba, }
Fluidextract of hyoscyamus, ʒ ss to ij
Syrup of acacia, ʒ ss
Peppermint water, enough for ℥ iij.

Shake. Teaspoonful in water.

An emulsion in subacute gonorrhea:

℞. Balsam of copaiba, } each, ʒ j
Spirit of nitrous ether, }
Liquor potassæ, ʒ ij
Extract of licorice, ʒ ss.

Mix and add—
Oil of wintergreen, gtt. xvj
Syrup of acacia, ʒ vj.

One tablespoonful 3 times a day.

Preparations.—**Oleum copaibæ**, oil of copaiba. Dose, 5 to 15 minims. **Compound copaiba mixture**, also called **Lafayette Mixture** (unofficial), contains copaiba, spirit of nitrous ether, liquor potassæ, compound tincture of lavender, syrup, and mucilage of dextrin. Dose, 1 to 4 drams.

COPPER (Cuprum).—A reddish-brown metal, not used in medicine in its metallic form, but represented by several salts. These are gastro-intestinal irritants, producing nausea and emesis. Sulphate of copper, in from 2 to 5 grain doses, is a rapidly acting emetic. The dose should not be repeated, but the sulphate of zinc or mustard used in its stead. In phosphorus-poisoning, being the chemic antidote, it is the best emetic. In pill form it may be given in diarrheas in from 1/4 to 1/2 grain dose, combined with opium. In skin-diseases of the dry type and in persons of tubercular tendencies it acts better than arsenic. Locally applied, it is used in pencil form in chronic conjunctivitis, in tinea of the margin of the lids, and in weak solution of 1 to 3 grains to the ounce of water in subacute conjunctivitis. In relaxed sore throat, as a gargle, it is of service. It is a valuable stimulant to chronic ulcers everywhere.

Poisoning.—The more important salts from a medicolegal aspect are the sulphate (blue vitriol or blue stone), the acetates, constituting artificial verdigris, and the carbonates or natural verdigris. Half an ounce of the sulphate will probably cause death. The greenish or blue color of the vomited matters, which turn bright blue on the addition of ammonia, makes the diagnosis easy.

The stomach should be evacuated by vomiting or by the stomach-pump; and albumin, as in milk or the whites of eggs, given to precipitate the copper. Iron filings may be given for a like purpose. In chronic poisoning the cause must be discovered and removed, or the individual removed from the cause.

Preparations.—C. Sulphas, $CuSO_4.5H_2O$, blue vitriol, soluble in water, valuable as an emetic. Dose, as an emetic, 2 to 5 grains; as a tonic, 1/6 to 1/2 grain.

Alkaline Cupric Tartrate Volumetric Solution, *Fehling's Solution.*—The official reagent for glucose is prepared as follows: (1) Dissolve 34.64 grams of pure cupric sulphate in water, to measure exactly 500 c.c. (2) Dissolve 173 grams of potassium and sodium tartrate and 75 grams of potassium hydroxid in water to measure exactly 500 c.c. Keep the two solutions in small, rubber-stoppered bottles, separate; and for use mix exactly equal volumes of the two at the time required. One cubic centimeter of the mixed solution reduces 0.005 gram (1/12 grain) of anhydrous glucose.

COPREMIA.—A form of general blood-poisoning arising from absorption of unduly retained feces. This condition is occasionally met in chronic constipation. The symptoms are anemia, sallow complexion, anorexia, frontal headache, vertigo, nausea, flatulence, thirst, lithemia, fetid breath, lassitude, hypochondriasis, and irritability of temper. See Autointoxication. Constipation.

COPROSTASIS.—Fecal accumulation in the bowel. See Feces.

CORD.—See Spermatic Cord, Spinal Cord, Umbilical Cord, etc.

CORIANDER.—The fruit of *Coriandrum sativum,* an aromatic carminative and stimulant, used mainly to give flavor to other remedies and as a corrective to griping purgatives. Dose, 5 to 20 grains. **C., Ol.,** the volatile oil. Dose, 1 to 5 minims.

CORN.—A local induration and thickening of the skin from friction or pressure. Corns usually begin as callosities, but differ from these mainly in the involution or downward growth of the hypertrophied horny layer to form the so-called "root" in the center, which, pressing upon the subjacent papillæ, either cause their inflammation or atrophy. The underlying nerves undergo enlargement. Owing to their hygroscopic qualities, some corns give rise to pain in damp weather. When situated between the toes, corns are called "soft." The most usual sites for corns are on the dorsal surfaces of the phalanges, on the outer surface of the little toes, and over the heads of the first and fifth metatarsal bones.

By removal of the cause—*i. e.*, friction or intermittent pressure—the corn will soon disappear. The top of a corn may be peeled off, and a little nitric or glacial acetic acid applied on one or two occasions. In a few days the thickened cuticle may be peeled off and a fresh application made. A solution of caustic soda, well diluted, or one of bicarbonate of sodium, may be applied at night on lint or cotton-wool. Silver nitrate is painful and liable to be followed by inflammation and lameness.

The favorite remedy is salicylic acid, which is the basis of nearly all corn cures. The usual formula is:

℞.	Salicylic acid,	ʒ j
	Extract of cannabis indica,	gr. x
	Flexible collodion,	ʒ vj
	Ether,	ʒij.

To be painted over the corn daily.

The laminated corn, or callus, produced by pressure, congestion, and increased formation of epidermis, may be softened by moisture, as by soaking in warm water, by the application of a starch or soap poultice; and, being softened, the thick cuticle may be thinned by scraping with a blunt knife, or the albuminous epidermis may be dissolved by an alkaline solution with moderate friction. When the thickening has been reduced sufficiently, it may be kept down by daily washing with soap. The soft corn requires removal with the knife; if of moderate size, a single pinch with a pair of pointed scissors will effect its removal, while the hard callus will require patient digging with the point of not too sharp a knife. The "eye" of the corn may be always made visible by rubbing the part with eau de cologne or alcohol, and any remains of the core may be detected in this way, either during or after the operation; the corn should be covered with a piece of soft plaster for a day or two, and a perforated plaster of buff leather or amadou subsequently worn to keep pressure from the center of the growth. The removal of a corn may be very considerably aided by the use of the compound tincture of iodin painted on the swelling. When the corn is painful, this application subdues the

sensibility and renders the corn dry and pliable and easy of removal by means of a file. Soap and water are beneficial to feet afflicted with corns, and particularly when they are soft corns. Daily washing with soap, and the subsequent interposition of a piece of cotton-wool between the toes, may be considered a cure for a soft corn. In these cases the skin may be hardened by sponging with spirits of camphor after the washing. The cotton-wool should be removed at night. Properly fitting shoes and socks should be worn. In the case of intractable soft corns, the adjacent sides of the two toes have been freshened, and then stitched together, thus making one toe of them.

CORNEA, DISEASES.—Inflammations of the cornea demand special attention, as they are very liable to result in opacities, leaving irremediable optic disturbances. Since the cornea is inelastic and nonvascular, the ordinary signs of inflammation are not present, and the diagnostic sign is cloudiness of the tissue, resulting from a collection of leukocytes that have passed into the cornea from the adjacent blood-vessels. In corneal inflammation there is generally swelling and inflammation of the lids and congestion of the conjunctiva. *Pericorneal injection* is due to congestion of the deep conjunctival vessels arising from the ciliary arteries. Inflammations of the cornea may be divided into two classes—*superficial* and *deep*.

Pannus is a vascular growth of connective tissue on the superficial layer of the cornea; it may, however, extend and affect the deeper layers. It begins with an inflammation of the cornea in which large areas become clouded and infiltrated with superficial blood-vessels. The newly formed and tortuous vessels are largest at the periphery, and are directed toward the center of the cornea. There may be only one vessel, or the vascular formation may be so luxuriant that a great part of the corneal surface is transformed into a fleshy-looking mass having the appearance of raw beef. This condition is called *pannus crassus* or *pannus carnosus*.

The cause of pannus is generally the friction of roughened granular lids against the cornea, or there may be an extension of the trachomatous process into the cornea. See TRACHOMA. The upper half is the part usually affected. Prolonged irritation of the cornea by inverted lashes or entropion may cause pannus unassociated with ulcers. The eczematous variety of pannus is a sequence of a phlyctenular process.

The symptoms of pannus are pain, photophobia, lacrimation, swelling, and conjunctival and ciliary injection, together with the characteristic vascular appearance.

The prognosis depends upon the extent of corneal infiltration and destruction of the epithelium.

The important sequels are corneal opacities and, rarely, conic cornea and corneal staphyloma.

The treatment should be directed to the cure of the granular lids, or to remedying the trichiasis or entropion. Should the pannus outlast the causes of the disease, massage with yellow ointment or the application of such preparation as boroglycerid and blue stone should be tried. Eserin and iodoform, or one of its substitutes, and constant bandaging of the eye are of value. The extreme measures are **peritomy,** which consists in removal of a ribbon of conjunctiva about 2 mm. wide, parallel with the edge of the cornea, thus severing and obliterating the superfluous vessels (unfortunately, the vessels repullulate); or the induction of an acute inflammation of the conjunctiva with an extract of JEQUIRITY SEEDS (*q. v.*). For the relief of pain, atropin and hot-water applications are useful.

Interstitial or Parenchymatous Keratitis.—Diffuse inflammation of the substantia propria of the cornea.

Symptoms and Diagnosis.—In this disease the deeper tissues of the cornea become infiltrated by lymph-cells, which slowly increase until the whole cornea becomes more or less opaque. Without a lens the cornea presents the appearance of a piece of ground glass, but focal illumination shows that the parts are not uniformly affected, and sometimes unaffected portions may be seen between local opacities. Pericorneal injection is marked, but the conjunctival vessels may be but slightly affected. The epithelium may be partly destroyed. The iris may be affected sympathetically and posterior synechias formed; in fact, the whole ciliary region and the choroid may be affected and the nutrition of the vitreous disturbed. In very severe cases blood-vessels form in the interstices of the cornea. This disease is the result of general infection, and, according to Horner, in at least 80 percent of cases both eyes are attacked eventually. The disease occurs chiefly in hereditary syphilis, and is associated with the other signs of this malady, such as Hutchinson's teeth, thickening of the periosteum, glandular swellings, middle-ear disease, etc. A syphilitic history may be obtained from the parents. The mother may bear evidences of specific infection and may give a history of sickly children or recurring miscarriages. The chief subjective symptoms are dimness of vision and lacrimation; but there may be much pain or photophobia. Some cases may be of tuberculous origin. See TUBERCULOSIS, Ocular.

The prognosis is unfavorable, although complete loss of vision is seldom to be feared. The disease is of long duration, and restoration of the visual acuity is doubtful, especially if the patient is not very young.

The treatment is directed to the systemic condition, and consists in mercurials, iodids, cod-liver oil, and tonics, cleanliness, good food, and fresh air. The following is a good formula:

℞.	Mercury biniodid,	gr. ij
	Potassium iodid,	ʒ ij
	Syrup of sarsaparilla, q. s.	℥ iij.

A teaspoonful in water after meals.

The local treatment is by atropin, warm compresses, and protective glasses. When the disease has passed its climax, massage with yellow ointment or dusting with calomel is of advantage.

Phlyctenular Keratitis.—Although there is no especial reason for separating this disease from phlyc-

tenular conjunctivitis, it is usually also described under diseases of the cornea. It is in 85 to 90 percent of the cases, a disease of children of scrofulous diathesis or those suffering from improper nourishment, or who show signs of eczematous affections in other portions of the body. Adults and healthy children are also affected. It is characterized by one or more phlyctenules, or small cysts, formed on the limbus of the conjunctiva, and extending upon the cornea. These phlyctenules cause an opacity that may clear up or may be followed by the formation of a bundle of new vessels on the cornea. This leash of vessels may disappear, but the ulcer beneath them generally leaves an opacity.

Symptoms.—The chief symptoms are acute pain, photophobia, lacrimation, and the characteristic bundle of vessels, with a yellow crescent at the apex, its concavity toward the vessels. Every phlyctenule does not necessarily change to an ulcer, but may be dissolved under proper treatment. The photophobia may be so intense as to cause blepharospasm, as irritation of so highly nervous a tissue as the cornea gives rise to severe reflex symptoms. The belpharospasm may be so severe as to necessitate the administration of a general anesthetic before the cornea can be properly examined.

The treatment consists of an abundance of good food, improved hygienic surroundings (in fact the general treatment of tuberculosis, since the scrofulous diathesis, more properly called the tuberculous diathesis, is merely latent tuberculosis), and soothing local applications. Of the latter, atropin and warm compresses are advised. The eye should be douched with sublimate 1:5000. If an ulcer is already formed, the general treatment, as before described, should be instituted. When the ulcer is healed, it should be dusted with iodoform or calomel and massaged with yellow ointment. If this is ineffective a 2 percent. guaiacol ointment may prove valuable. It has been found that the instillation of eserin into the eye, followed by dusting fine iodoform over the cornea, and a constant application of a bandage, securing local heat, produces good results in promoting absorption of the vessels. See Tuberculosis, Ocular.

Herpes of the cornea is characterized by the formation of small blebs filled with a watery fluid. It may be the general accompaniment of herpes zoster or febrile herpes. The blebs should be treated with the gentlest measures, such as the instillation of atropin, disinfection, and a bandage. Should they form ulcers, they should be treated as such.

Neuroparalytic keratitis is an ulcerative condition of the cornea, due to some disturbance of the corneal nerve supply. The prognosis and treatment of the disease depend upon the cranial lesion causing it.

Bullous keratitis is characterized by the formation on the cornea of large vesicles filled with a clear fluid. The vesicles break after a few days and the symptoms of irritation subside. This condition has been seen associated with glaucoma, iritis, and inflammation of the uveal tract. The disease has been attributed to some affection of the corneal nerves and to malarial fever. A peculiar chronic form is sometimes seen after corneal injury. It is called **recurrent traumatic keratitis.** It is said that the recurrent attacks are preceded by a peculiar aura, and that they may be aborted by large doses of quinin. The vesicles should be incised early, and local treatment instituted.

Keratitis from lagophthalmos is a condition in which there is ulceration of the cornea, due to exposure from incomplete closure of the lids. The chief causes are lack of sensation in the cornea from paralysis of the peripheral nerves—a condition in which the patient lies comatose for a long time—and possibly some paralysis of the lid-muscles. Protection by anointing with vaselin or a bland oil is indicated.

Corneal ulcer is caused by an external wound leaving an opening for the entrance of a suppurative process, by intense conjunctival inflammation, or by some deep inflammatory process that leads to a destruction of the superficial layers and epithelium.

Diagnosis and Symptoms.—It is very important immediately to recognize any superficial loss of substance in the cornea. The ordinary optic aids, such as oblique focal illumination and high plus lenses, or the ophthalmoscope, are generally sufficient. In doubtful cases and in young children a drop of fluorescin placed on the conjunctival sac and at once washed out is a ready means of diagnosis; any spot of the cornea denuded of its epithelium will be colored green. If an ulcer is present, it is necessary to determine whether it is due to external infection, or whether it results from extension of some conjunctival disease, from nervous disease, or from some systemic affection, as the subsequent treatment depends much on the origin. However, if pain, photophobia, lacrimation, and attendant swelling of the lids and conjunctiva, together with extensive and progressive destruction of tissue, are present, it is necessary to proceed immediately, regardless of the mode of origin, which may be left to a subsequent examination. An ulcer with a ragged edge and a grayish, uneven base, with general cloudiness around the circumference, and with acute associate local disturbance and subjective symptoms, is probably in an active stage of inflammation. If the cloudiness is clearing up, the edge round, the ulcer looks clear and smooth, and the patient's symptoms are subsiding, the healing process has probably begun. As the ulcer becomes filled up the opacity becomes more dense; and the younger the patient, the sooner the scar will clear up. Central ulcers cause the most damage to vision.

The sequels of most importance are: *Corneal opacities; staphyloma,* or hernia of the cornea, due to weakening of its structure by scar formation which condition sometimes includes a staphyloma of the iris as well as of the cornea; *perforation,* followed by discharge of aqueous and prolapse of the iris, which may remain permanently adherent to the white corneal scar—a condition

called *leukoma adherens;* atrophy of the eyeball, called *phthisis bulbi,* following extensive destruction of the cornea; and prolapse of even the lens and vitreous.

The prognosis varies with the age of the patient, the location and extent of involvement, and the general systemic condition.

The treatment is, first, to put the eye at rest, which is best accomplished by a pressure-bandage and by atropin, which subdues pain and overcomes inflammation. If there is much congestion of the conjunctiva, leeches to the temple will give great relief and hasten the subsidence of symptoms. Disinfection is best accomplished by a sublimate solution 1:5000, or the ulcer may be dusted with iodoform. After dusting iodoform on the cornea the upper lid should be drawn down over the cornea and held in position for a few minutes; otherwise movement of the eye will brush all the powder off the cornea. If the ulcer progresses, stronger disinfection, preferably with sublimate 1:1000, boroglycerid 50 percent, or formalin 10 percent, will be needed. Finally, if the ulcer resists all treatment and is progressive, the whole of the infected surface should be cauterized by the direct heat of the galvanocautery. Moist heat, applied in the shape of mild antiseptic compresses, will lessen the pain, increase the development of blood-vessels, and arouse a general reaction in the affected parts.

If **perforation** seems probable, it is best to hasten it by puncture with a needle or a small cataract knife, as experience has shown that perforated ulcers heal spontaneously, and better drainage is established. After perforation, the eye should be carefully washed, eserin instilled, a pressure-bandage applied, and the eye allowed to remain undisturbed for at least 24 hours. If the iris prolapses, it must be drawn from the wound and excised. When the ulcer shows signs of healing, daily massage with a weak Pagenstecher ointment is advisable. The membrane of Descemet is very resistant, and sometimes, instead of perforating, it prolapses through the ulcer and prevents its healing, causing a **corneal fistula.** In such cases the edges of the ulcer should be stimulated or cauterized. The treatment of the sequels will be discussed separately. Constitutional treatment, particularly administration of tonics, should be inaugurated at the beginning of the disease, and any causal disease corrected. The patient should not be kept in a badly ventilated, dark room.

Abscess of the cornea may run its course without ulceration, or it may result in the formation of an ulcer—usually the ulcus serpens. Abscesses in the superficial layers of the cornea are most prone to ulceration.

The chief **causes** of abscess are infection through an abrasion or distinct wound, or infection through the blood, as seen in some acute exanthematous diseases, such as measles, scarlet fever, small-pox, etc.

The appearance presented is that of a yellowish, circumscribed opacity near the middle of the cornea, and surrounded by a grayish zone. It is usually round or crescentic in shape. The surface over the abscess appears elevated and dull, and the whole cornea may lose its luster and appear as if breathed upon. There is usually much conjunctival and ciliary injection. The abscess is attended by severe pain, photophobia, blepharospasm, etc. Hypopyon, onyx, and iritic involvement are usually constant attendants. The common termination is ulceration through the superficial corneal layers; but occasionally the abscess spreads through the corneal stroma, and gradually becomes absorbed without undergoing ulceration.

The treatment consists of atropin, warm fomentations, iodoform, and a light bandage. If these measures do not check the process, resort must be had to the cautery. Hypopyon is relieved by paracentesis, repeated if necessary. Compound tincture of cinchona in full doses is recommended. Stimulating diet should be instituted.

Ulcus serpens, or serpiginous ulcer, is a destructive inflammation of the cornea, usually attacking debilitated and aged persons. The typical form contains the pneumococcus alone or associated with other organisms. Disease of the lacrimal passages predisposes to it. Its chief characteristic is its remarkable inclination to extend and to destroy tissue. It most commonly results from some injury to the eye, often only a small scratch, through which some form of infecting germ is introduced. Infection may be derived from the article causing the injury, from some purulent discharge about the eye or its appendages, or from some article used to wipe the eye. At the posterior part of the ulcer there is generally seen a grayish cloud, which may extend into the anterior chamber. This is caused by a collection of pus-cells, either in the lamellæ of the cornea, called **onyx,** or in the anterior chamber, which renders the aqueous opaque, and, settling in the bottom of the anterior chamber, forms what is called **hypopyon.** The disease begins as a round, yellowish abscess near the center of the cornea, which breaks and forms an ulcer rapidly increasing in surface and depth. Serpiginous ulcer often follows severe infectious diseases, particularly small-pox.

The prognosis is unfavorable, as there is generally left an extensive opacity, and most likely anterior and posterior synechiæ.

The treatment is the same as for an ordinary severe ulcer or abscess. Occasionally, Saemisch's operation at the base of the ulcer is necessitated. Antipneumococcic serum has been recommended but is apparently beneficial only in beginning ulcers.

Ulcus rodens is a chronic inflammation, beginning on one margin of the cornea and slowly eating its way to the opposite margin, but rarely extending into the deeper layers. Its edges must be cauterized.

CORNEA, INJURIES.—Foreign bodies in the cornea, if not removed, are very apt to cause cell-infiltration and destruction of the adjacent tissue, thus inviting infection. However, the subjective symptoms so well known to everybody are usually so severe as to demand immediate treatment.

Although simple inspection may be sufficient, focal illumination and fluorescin, for the detection of the denuded area of epithelium, are sometimes necessary for locating the foreign body. In every case it is safer to examine the eye by focal and oblique illumination.

Foreign bodies in or on the cornea can generally be removed without the use of cocain and without instrumental aid. A wisp of cotton is wound on itself or on a small stick; the patient is told to look downward, and the cotton is pressed firmly against the cornea. The patient immediately rotates the eyeball upward, and the cornea is brushed against the fibers of cotton, which usually entangle the foreign body. This simple method has been found almost invariably successful, and is advised before resorting to the spud or needle.

The removal of a foreign body from the cornea by instrument is a procedure that should be carried on with especial caution. If the substance is embedded, the cornea should first be cocainized and rendered aseptic.

Under focal illumination, a small curet, chisel, or spud will generally accomplish the removal. If, however, the foreign body is close to the anterior chamber, it may be lost in the iritic angle. In such a case a small keratome should be introduced into the anterior chamber and pressed against the posterior surface of the cornea, thus preventing penetration of the foreign body into the anterior chamber. The electric magnet is often of great value in removing pieces of iron and steel. A boric acid wash or iodoform ointment should be used for at least 24 hours after the use of an instrument in the cornea.

Burns of the cornea are treated on the same principle as burns of the conjunctiva, (See CONJUNCTIVA, Burns of). Ulceration, opacities, and symblepharon are the important sequels to be feared.

Wounds of the cornea are always dangerous, not only from the destruction of corneal tissue and subsequent opaque cicatrix, but they are also often attended by sudden escape of the aqueous and prolapse of the iris. Results of infection through a corneal wound vary from the formation of an ulcer to the destruction of the eyeball.

The treatment is the application of a simple aseptic bandage. The eye should be kept clean, and if there is much irritation, atropin should be used. Should the iris become prolapsed, an effort must be made to replace it and to retain it in position by eserin, complete rest, and a bandage. If this treatment is not successful, the iris should be drawn out and excised. Very large prolapses should not be excised, as they will recur, and much iris tissue will be needlessly lost. In such cases no operative interference is indicated until the wound closes. The cornea and iris are cleansed, an attempt made to partially reduce the prolapse, atropin instilled, a pressure-bandage applied, and the patient placed on his back.

CORNEA, OPERATIONS.—Paracentesis of the cornea is an operation done for the purpose of emptying the anterior chamber of aqueous, and thus relieving any increased intraocular tension, or for evacuating hypopyon. It is best done with a paracentesis needle or a slender Graefe knife. The eye is thoroughly cleansed, and the point of an aseptic knife is *perpendicularly* introduced at the lower outer border of the cornea. If it is introduced at an angle, there is danger of splitting the layers of the cornea, and not directly perforating it. After perforation of the cornea the blade of the knife is turned horizontally, and a corneal wound of about 2 mm. in length made. The knife is then carefully withdrawn, allowing the aqueous to escape slowly. Depression of the lower edge of the wound by a curette will aid in the evacuation of hypopyon.

Saemisch's operation is performed for the relief of corneal abscess or serpiginous ulcer. It consists in introducing a Graefe knife through healthy corneal tissue at the margin of the involved area, carrying it into the anterior chamber, and making a counterpuncture in healthy tissue at the other side of the abscess. The cutting-edge is then turned forward and the abscess bisected. Any pus may be removed by irrigation or by a scoop. The wound must not be allowed to close completely so long as the disease is active.

Transplantation of cornea consists in removing, with a fine trephine, a piece of a rabbit's cornea and transplanting it over the denuded area. It is of doubtful value in any case.

Abscission of Staphyloma of Cornea and Sclera. —Critchett's operation is the simplest and most effective. Five threaded needles are inserted, equidistant and parallel with one another, through the base of the staphyloma; the involved tissues are then excised with a knife or scissors, and the needles drawn through and the sutures tied. This leaves a very desirable stump upon which to place an artificial eye. This operation is to be preferred to enucleation of the eye in children, as it favors symmetric growth of the face.

CORPULENCE.—See OBESITY.

CORROSIVE SUBLIMATE.—See MERCURY.

CORROSIVES.—See POISONING.

CORYZA (Cold).—Catarrh, or an acute inflammatory affection of the upper air-passages, resulting from cold, and attended by a discharge from the nostrils, soreness of the throat, hoarseness, and cough. In debilitated or delicate persons it is often difficult to get rid of a cold. Change of air may be most efficacious. The milder forms of cold require household remedies—the feet in hot water, a warm, diluent beverage, a diaphoretic, as Dover's powder, and a light diet for several days. In more serious cases a febrifuge medicine may be given, with an anodyne to relieve the cough, if troublesome, and to procure rest at night. A stimulating diet is given after a day or two of the cold, and tonics may be required.

Ferrier's snuff, for early-acquired colds:

℞.	Morphin hydrochlorid,	gr. ij
	Bismuth subnitrate,	ʒ vj
	Powdered gum acacia,	ʒ ij

From one-fourth to one-half may be taken in the course of 24 hours.

Eucain may be substituted for morphin in this

formula; this alkaloid is free from the objection of producing the drug habituation which contraindicates the routine use of cocain.

Inhalations of menthol will relieve the congestion of early colds in the head. A spray of cocain may precede, in order to reduce the congestion, followed by a spray of menthol, to hold the contracted vessels and to relieve the tumefaction of the turbinated bones.

Wunsche says that menthol, dissolved in chloroform, is the most efficacious of all remedies. A solution of 1 or 2 parts of menthol in 20 parts of chloroform will not only arrest the progress of a cold in its initial stage, but it is also an excellent influenza prophylactic. From 4 to 6 drops of the solution should be quickly rubbed between the hands, which should then be tightly pressed together and placed before the face, when the remedy is energetically inhaled alternately through the nose and mouth. It will immediately be noticed that the volatile parts of the solution thoroughly impregnate the mucous membranes of the nose, mouth, and throat, and even penetrate deep down into the air-passages. During the first 2 or 3 inhalations the sweetish chloroform vapor predominates. Afterwards, however, only menthol in attenuated condition is inhaled, odor and feeling remaining apparent for some time after the inhalation. As a rule, the first inhalation suffices to cure the severest tendency to sneezing, and often to arrest the progress of the cold altogether. Two further applications of the remedy in the course of the day suffice to suppress the attack completely. The first inhalation at first slightly increases the flow from the mucous membrane of the nose; afterwards, however, this symptom diminishes quickly. Pains in the pharynx and larynx may be quickly eased and often entirely relieved by the remedy.

Prophylaxis.—The modern toilet is not complete without rinsing the mouth and spraying the nasal passages and the throat with an alkaline antiseptic solution frequently. By these means the upper air-passages are kept in an antiseptic condition, unfavorable to the development of germs, and disease is prevented. Lemoine states that by these simple precautions numbers of persons have passed through the winter and rainy spring without once catching cold, although they had previously been extremely sensitive, and troubled with severe colds most of the time. He recommends to rinse the mouth with a glassful of 1 ounce of Labarraque's solution mixed with 1 pint of water, or the following:

℞.	Thymol,	gr. viij
	Alcohol,	℥ j
	Water,	O j.

With an ordinary toilet atomizer the nasal passages and upper part of the throat should be thoroughly sprayed with some solution like the following:

℞.	Phenolsalyl,	gr. viij
	Chlorid of sodium,	℥ j
	Distilled water,	O j.

He adds that the teeth should be well brushed, and the fingers never put in the mouth or nose. A few menthol drops should be carried in the pocket and dissolved in the mouth occasionally. He concludes with the remark that it may be possible to break up a cold in the early stages by taking, during the first day, from 4 to 6 capsules or pills of essence of turpentine in addition to the rinsing or gargling and spray, with a glass of purgative water the next day, followed in a few hours by 7 grains of quinin. See Rhinitis.

COSMETIC.—A remedy designed to improve or to hide defects of the skin or other external parts. It may be a white powder, such as starch, magnesic oxid, calcium carbonate (levigated), zinc oxid, mercurous chlorid, or bismuth subnitrate applied externally; it may be a white substance dissolved in dilute alcohol, which is left upon the face after the evaporation of the solvent; or it may be a stimulant to the skin used internally, such as arsenic.

A cosmetic operation is one performed to give a natural appearance to a defective or unsightly part. See Plastic Surgery.

COSMOLIN.—See Petrolatum.

COTARNIN HYDROCHLORID.—See Stypticin.

COTTON.—"The hair of the seed" of *Gossypium herbaceum* "and of other species of gossypium" (U. S. P.). The cotton contemplated by the United States Pharmacopeia is "absorbent cotton," or cotton freed from the oil and other impurities; it is usually prepared by boiling with a solution of an alkaline soap, washing this out thoroughly, possibly washing again with a weak solution of caustic potash or soda, washing this out, pressing, and drying. When dried absorbent cotton is thrown upon water, it should immediately absorb the latter and sink. From the seeds of the cotton-plant a fixed oil is expressed that is much employed for soap-making and as an adulteration of, and a substitute for, olive oil. The oil also is official and enters into the composition of the ammonia, lime, camphor, and subacetate of lead liniments. Cotton-seed oil is largely used, among other oils, as an adulterant to linseed oil. It is less innocent than any other agent so introduced, since it has a bad effect upon the skin.

Styptic cotton may be prepared by first passing the cotton through a 4 percent solution of soda; then washing, drying, and subsequently dipping 2 or 3 times in a weak solution of the chlorid of iron, and again drying. It is then teased out with the fingers, leaving a brown, cottony mass, thoroughly impregnated with the salt of iron.

Raw cotton is so familiar that description is unnecessary. Owing to the oil it contains it will not absorb water, and, consequently, is practically useless for washing or cleansing wounds. It is employed chiefly as a padding for splints, and for protecting the extremities and cutaneous surfaces from contact with the air. Raw cotton, laid over the chest in layers 2 inches thick, forms a good chest dressing in pneumonia. In the local treatment of erysipelas one of the best methods is to keep the part wrapped in raw cotton, for the temperature of the part should be as nearly uniform as possible, and the cutaneous functions as-

sisted. Painful and sensitive rheumatic joints in old persons are often relieved by being wrapped in raw cotton, which is retained by means of a bandage. Cotton is often employed as a protective dressing for burns with advantage, if the burn is of the first or second degree; but it may irritate if in contact with a vesicated surface. Yet it at times forms one of the best dressings for blistered surfaces, laid evenly over the part and retained by the clothing or a bandage.

Absorbent cotton is now employed extensively in the washing and cleansing of wounds in the place of sponges. Small pledgets on an aluminum applicator are constantly used in general surgery and in all the specialties.

See also Gossypium.

COUGH. Varieties.—(1) Dry and (2) moist.

Etiology.—Cough generally results from irritation somewhere in the respiratory tract. Thus, any irritation or inflammation of the nasopharynx, larynx, or bronchi may give rise to cough. The most common etiologic factors are: (1) Inflammatory diseases of the nasopharynx, larynx, bronchi, lungs, and pleura. (2) Inhalation of irritating particles, as dust. (3) Sudden changes in the temperature. (4) Reflex causes, as heart- and kidney-disease, which give rise to relaxation and edema of the respiratory mucous membrane; pressure of tumors upon the recurrent laryngeal nerve (aneurysm of thoracic aorta); pressure arising from abdominal tumors, as uterine fibroids. (5) Foreign bodies. (6) Infectious diseases, as tuberculosis, measles, whooping-cough, scarlet fever, and influenza. (7) Elongated uvula. (8) Nervousness, hysteria. (9) In children adenoid vegetations and hypertrophied tonsils are very common causes of cough.

Treatment.—Persistent effort should be made to find the source of irritation before drugs are used. Thus, in children it is found very frequently that removal of adenoid growths or hypertrophied tonsils may give rise to relief.

A thorough history of a case might develop the fact that the patient suffers from the abuse of tobacco, or lives in an atmosphere of dust. When the occupation is one that renders the patient subject to sudden changes in the temperature, a dry, "hacking" cough is very common. In the *moist* cough, or that accompanied by increased secretion, bronchitis is generally present, and treatment must be directed accordingly.

In acute "colds," when pharyngitis is present, an application of silver nitrate (15 grains to 1 ounce), glycerite of tannic acid, or menthol (3 grains to 1 ounce), to the nasopharynx once a day will frequently give relief. In certain cases inhalations do well:

℞. Chloroform, ♏ v
Menthol, gr. iij
Compound tincture of benzoin, enough to make ʒ j.

One teaspoonful to a pint of hot water, and inhale once or twice daily.

In using inhalants patients should be directed to remain in the room for an hour at least after the medicine has been used.

Internally:

℞. Codein sulphate, gr. iij
Glycerin, } each, ʒ ij
Syrup, }
Solution of potassium citrate, enough to make ʒ iij.

Two teaspoonfuls every 3 or 4 hours.

See Bronchitis, Tuberculosis, Pneumonia, Laryngitis, Whooping-cough, etc.

COUNTERIRRITATION.—A method of overcoming pain, inflammation, or other change in a part or organ by an effect produced upon the skin in the immediate neighborhood or at a distance. Three stages are recognized: (1) Rubefaction, or the mildest form; (2) vesication; and (3) the most severe, pustulation, or local destruction of tissue.

The best rubefacient is mustard; liquor epispasticus is one of the best vesicants; while a liniment of croton oil or antimony will produce pustulation.

Rubefacients produce local warmth and redness, are usually quick in action, and with trifling after-effects, such as peeling of the epidermis and local soreness. Mustard plasters and poultices, the volatile oil of mustard, and oils of turpentine and cajuput, tincture of iodin, and hot water, are most available rubefacients. Vinegar should not be added to mustard poultices, but oil of turpentine or a little powdered capsicum added to a mustard poultice will increase its rapidity as a stimulant. If gentle action is desired, with warmth and moisture, a linseed meal poultice may be sprinkled with mustard meal. For delicate skins a layer or two of muslin should be placed between the poultice and skin. Mustard foot-baths are effective revulsives and counterirritants, especially in brain congestions.

Rubefacients are used in many chronic inflammations, in bronchitis, in the troublesome cough of phthisis, for lingering irritation about a joint, in sleeplessness (applied to the nape of the neck), in gout, in lethargy or torpor from narcotic poisoning, alcohol, or febrile coma, in acute kidney inflammations, and commonly for the relief of pain.

A **mustard plaster** is made by mixing mustard flour with warm vinegar or water and adding flour. Half mustard and half flour may be employed for a child. A piece of muslin spread on a newspaper and smeared with the mustard, over which is a more or less thin piece of muslin, will prevent sticking to the skin and modify the burning. The edges of the newspaper may be folded so as to cover the plaster and aid in retaining its heat.

A **spice plaster** is made by mixing equal parts of allspice, cloves, cinnamon, and nutmegs, and adding 1/2 part of pepper. Warm brandy, whisky, or vinegar may be used to wet it. A turpentine stupe should not be allowed to remain very long lest it blister the cuticle.

Vesicants.—For blistering, the most common agent is cantharides, in the form of a plaster or in collodion. Glacial acetic acid will produce rapid vesication, but it must be watched lest it become

caustic and cause a sore. Aqua ammoniæ on lint, applied to the skin and covered with a watch-glass, will soon vesicate. Liquor epispasticus applied with a brush will blister, and blistering collodion is only slower in action.

Blisters should be applied to one side, not directly over an inflamed area, nor when the skin is loose, nor over any bony prominence, nor to the breast-bone in pregnancy. The absorption of cantharides may be prevented by sprinkling powdered camphor over the plaster or by interposing a piece of silver paper. If vesication is desired, a blister need not be left on continuously for 12 hours or more. It may be removed in 6 or 8 hours and a warm linseed poultice applied. A blister is opened by pricking the most dependent part with a disinfected needle. Sweet oil and cotton-wool make the best dressing.

Vesication is of service in brain affections attended by congestion, as in the chronic forms of hydrocephalus and tubercular meningitis. In pleuritic and pericardiac affections, in effusions into joints, in the joint affections of acute rheumatism, in obstinate acid vomiting, in pleurodynia or mastodynia, and for the removal of products of inflammations, vesication is serviceable.

In diseases of the eye a blister should be applied behind the ear; in abdominal neuralgia or pleurodynia, to the vertebral column where the disturbed nerve takes its exit; in early hip-disease, to the knee or ankle; in peritonitis, directly over the seat of tenderness; in cerebritis, to the nape of the neck; and in gleet, along the under surface of the penis or upon the perineum.

Pustulants.—The red-hot (not white-hot) iron and the use of escharotics, such as caustic potash or soda, may be resorted to for severe counter-irritation or pustulation. Antimonial ointment may be applied constantly until a slough forms, to accomplish the same purpose. Croton oil, tartrated antimony, and strong solutions of silver nitrate produce eruptions at first papular, but they soon become pustular. Tartrated antimony is used in the form of an ointment and in hot aqueous solution. Silver is seldom used. Burns from counterirritation may be treated by applying simple cerate, cosmolin, or sweet oil, to which carbolic acid in proportion of 1:100 may be added.

COWPOX.—See Vaccination.

COXA VALGA.—Coxa valga is the increase of the angle of the neck and shaft of the femur beyond 140°. It is an uncommon deformity which may occur after infantile paralysis or extreme atrophy from any condition, allowing the leg to hang down. The leg is abducted and lengthened and the trochanter lies *below* Nélaton's line. The deformity is corrected by osteotomy of the neck or subtrochanteric osteotomy. See Hip-joint Disease.

COXA VARA.—The lessening of the angle of the neck and shaft of the femur below 120°. It may be congenital or due to rickets, trauma, softening of the bony parts from any cause and constant standing while supporting heavy weight. It may occur in one or both hips.

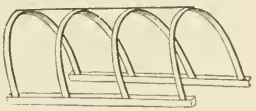
Symptoms.—Onset is slow, pain usually present early and increases, limping and interference with abduction, shortening and the location of the trochanter *above* Nélaton's line, but the head lies in the acetabulum. This fact and the absence of riding motion differentiate it from congenital dislocation of the hip.

Treatment.—Crutches and traction splint in the unilateral cases and recumbency for the bilateral ones. This method failing, forcible abduction should be tried with fixation in plaster of Paris. In the older cases, subtrochanteric osteotomy (Gant's) should be done and a plaster spica applied in corrected position. See Hip-joint Disease.

COXALGIA.—See Hip-joint Disease.

COXITIS.—See Hip-joint Disease.

CRADLE.—A wire or wicker frame so arranged as to keep the weight of the bed-clothing from an injured part of the body. It is employed in the treatment of fractures, wounds, etc.



Cradle for Supporting Bed Clothes.—(*From Fullerton.*)

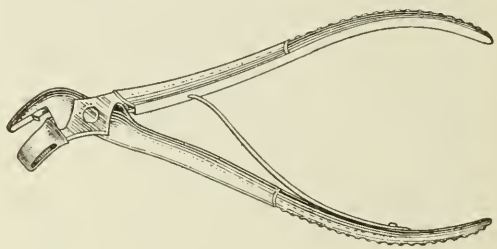
CRAMP.—A spasmodic tonic contraction of the muscles, attended with sharp pain. It is especially prone to attack the muscles of the calf of the leg. It occurs frequently in those of neurotic tendency, and is often the forerunner of epilepsy. **C., Auctioneers',** one of the professional neuroses affecting mainly the left side of the orbicularis oris muscle. **C., Ballet-dancers',** a neuralgic affection occurring in ballet-dancers, especially premières danseuses; characterized by pain and paralytic symptoms, affecting the muscles of the calf of the leg. It is the result of local strain upon the parts. **C., Blacksmiths'.** See C., Hammermen's. **C., Car-drivers',** a professional neurosis seen in car-drivers, and perhaps also in brakemen, characterized by spasm and weakness of the hand from the effort of tightening car-brakes. **C., Chisel,** a professional neurosis occurring in smiths, affecting the left hand, and produced by the continuous holding of the chisel or similar instrument. **C., Cigarmakers',** one of the rarer professional neuroses, consisting in a tonic contraction of the flexor muscles of the fingers, with pain. The painful sensations also extend up the arm and shoulders. **C., Cigaret-makers'.** See C., Cigarmakers'. **C., Clarionet-players',** a cramp of the tongue and of the laryngeal muscles, experienced occasionally by players on this instrument. **C., Coachmen's,** contraction of the palmar fascia, occasionally seen in coachmen. **C., Cornet-players',** a rare and peculiar neurosis of the tongue in cornet-players, in which certain notes cannot be sounded, from inability to direct the tongue for that purpose. **C., Dancers'.** See C., Ballet-dancers'. **C., Flute-players',** slight laryngeal spasms occurring occasionally in flute-players from excessive use of the instrument. Also a cramp of the flexors and extensors of the hand, from constant use of the instrument. **C., Glassblowers',** a painless, but decided and permanent, flexion of the fingers, the thumb excepted, due to the continuous grasping of the tube with which the glass is worked. **C.,**

Gold-beaters', a cramp of the muscles of the arm, due to excessive use in beating gold-leaf. **C., Hammer.** See C., Hammermen's. **C., Hammermen's**, a spasmodic affection of the muscles of the arm and shoulder, at times unattended by pain, due to the repeated act of hammering. **C., Knitters'**, a peculiar affection of the hands of those who knit, consisting in a contraction of extensor muscles, with numbness of the ends of the fingers. **C., Milkers'**, a spasmodic contraction of the extensors and flexors of the forearm in consequence of continuous exertion in milking. **C., Milkmaids'.** See C., Milkers'. **C., Musicians'**, a general term, including pianists' cramp, violinists' cramp, flutist's cramp, the cramp of clarionet-players, etc. **C., Nailsmiths'.** See C., Hammermen's. **C., Photographers'**, a rare professional neurosis. **C., Pianists'**, a neurosis of the hands and fingers of piano-players, characterized by fatigue, pain, and weakness. The pain extends up the arm to between the shoulders. **C., Piano-players'.** See C., Pianists'. **C., Sawyers'**, peculiar incoordinate movements of the saw-arm and corresponding side of the body, from excessive use. **C., Scriveners'.** See C., Writers'. **C., Seamstresses'**, a professional neurosis, consisting in a spastic condition of the flexors of the fingers, from constantly plying the needle. **C., Smiths'.** See C., Hammermen's. **C., Swimmers'**, a painful cramp of the muscles of the calf of the leg of swimmers, frequently causing death by drowning. **C., Tailors'**, a spasmodic affection of the muscles of the thumb, forefinger, hands, and arms, sometimes occurring in tailors, from overwork. **C., Telegraphers'**, a partial paralysis of the muscles of the hand and fingers with spasm, produced by fatigue from long continued use of Morse's instrument. **C., Treadlers'**, one of the professional neuroses; it is met with in treadlers, and consists in cramps of the leg-muscles from constant use of the machine. **C., Violinists'**, a painful cramp, most common in the left shoulder of violinists; it is due to the peculiar position assumed in holding the violin. **C., Watchmakers'**, a cramp in which there is a flexion of the metacarpophalangeal joints, with extension of the other joints of the hand. Also, an inability to retain the glass in the eye-socket. **C., Writers'**, scriveners' palsy; a difficulty in writing, due to spasmodic action of the muscles of the hand and arm, to pain, to tremulousness of these muscles, or to fatigue and weakness of the extremity. These constitute the 4 forms: *spastic*, *neuralgic*, *tremulous*, and *paralytic*.

CRAMPS.—See Colic.

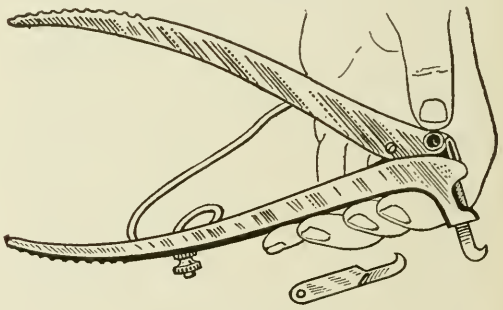
CRANIAL INDICES.—Altitudinal, the height of a skull multiplied by 100 and divided by its length. **Alveolar**, the degree of prominence of the jaws, measured by the basialveolar length multiplied by 100 and divided by the basinasal length. When the alveolar index is less than 98, the skull is *orthognathic;* when more than 103, *prognathic;* when intermediate, *mesognathic*. **Cephalic**, the breadth of a skull multiplied by 100 and divided by its length. When this is below 75, the skull is called *dolichocephalic;* when above 80, it is called *brachycephalic;* between these limits, *mesaticephalic*. **Cephaloorbital**, the ratio of the solid contents of the two orbits to the contents of the cranial cavity, multiplied by 100. **Cephalospinal**, the ratio of the measure of the foramen magnum in square millimeters to that of the cranial cavity in cubic centimeters, multiplied by 100. **Cerebral**, the ratio of the greatest transverse to the greatest anteroposterior diameter of the cranial cavity, multiplied by 100. **Gnathic**, the ratio of the distance between the basion and the alveolar point to the distance between the basion and the nasal point, multiplied by 100. **Vertical Index of Height**, the ratio of the vertical diameter of the skull to the maximum anteroposterior diameter, multiplied by 100.

CRANIECTOMY.—Craniectomy for Microcephalus.—On the theory that certain forms of idiocy are due to a premature closure of the skull preventing development of the brain, Lane, Fuller, and Lannelongue advised that portions of the skull be removed by operation (craniectomy).



Keen's Forceps.

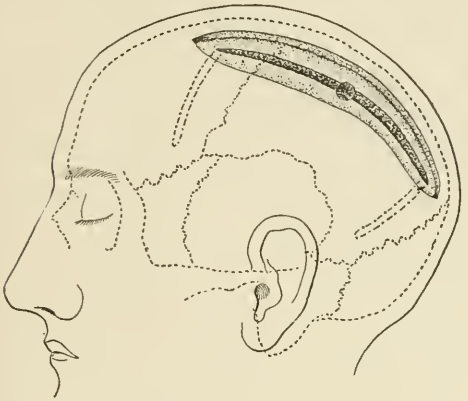
The Operation.—*Step* 1. Make an incision down to the bone from the anterior margin of the hairy scalp backward to the occipitoparietal suture.



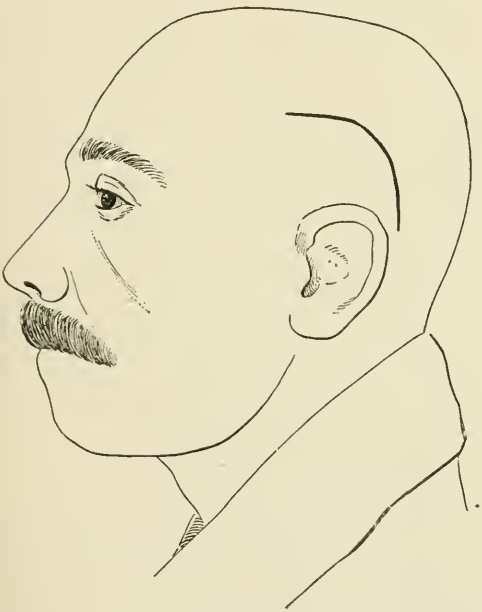
De Vilbiss' Forceps.

This incision is parallel to and about 1/2 inch to the side of the sagittal suture. Stop the bleeding, and separate the scalp and pericranium outward from the incision for a distance of 3/4 inch so that the osseous incision (to be made in the next step) will not lie under the line of the cutaneous incision. *Step* 2. With a Doyen burr or a small trephine, penetrate the skull at any point along the line selected for section of the bone. Through the opening in the skull introduce a dural separator and separate the dura from the bone for a short distance along the line of proposed section. *Step* 3. Introduce the blade

of a proper rongeur forceps (Keen's or De Vilbiss') through the opening in the skull and cut away a narrow strip of bone along the line of section. The longitudinal resection may be supplemented by the removal of transverse strips of



bone at one or both ends. This of course requires corresponding incisions through the scalp. Bleeding from the bone may be arrested by the application of hot pads, by slightly crushing the bone with forceps, or better by pressing Horsley's wax

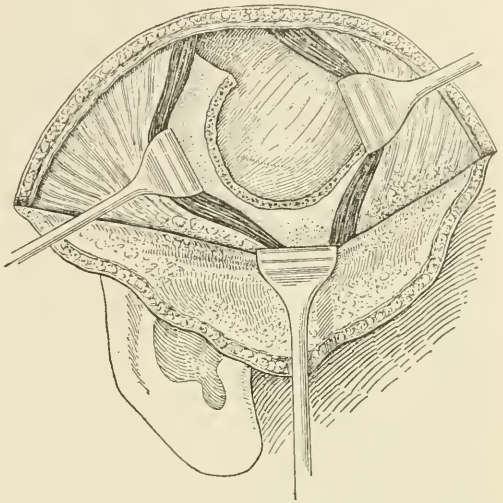


Line of Incision in Cushing's Subtemporal, Decompressive Operation.

(bees wax 7; almond oil 1; salicylic acid 1) against the cut surface of the bone. *Step* 4. The scalp wound is closed and dressings are applied.

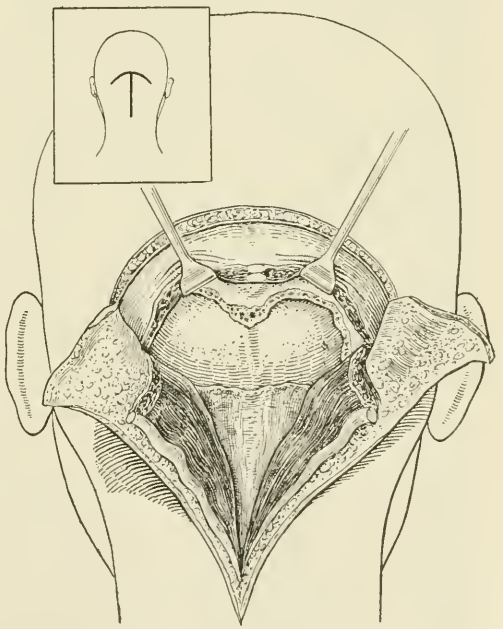
Craniectomy for microcephalus has proven most unsatisfactory and has been practically abandoned.

Decompressive Craniectomy.—Apart from the injuries inflicted on important structures, the principal dangers incident to fractures of the base of the skull are due to hemorrhage and to infection. If the bleeding can be stopped and the extravasated blood removed; if infection can be treated at



Cushing's Intermusculo-temporal Operation.

its inception or its products drained away, then the patient has much better chances of recovery. An attempt may be made to attain these results by



Occipital Craniectomy.—(*Cushing.*)
(Note the high transverse cut of the "cross-bow" incision.)

opening the skull near the junction of its lateral walls and floor.

A similar operation is of great value in treating the results of compression when the cause of the

compression (tumors, etc.) cannot be localized or, if localized, cannot be removed. The distressing symptoms of compression which may be relieved by decompressive operations are vomiting, headache, choked disc, etc.

Subtemporal Craniectomy.—(Cushing's subtemporal decompressive operation.) *Step* 1. Make a curved incision about 1/2 inch within the line of origin of the temporal muscle at the temporal ridge. This cut should be entirely within the hairy scalp. Cut through the skin and subcutaneous tissue alone. Reflect the skin flap downward. Do not injure the temporal fascia. An additional flap may then be made of the aponeurotic layer. *Step* 2. Split the temporal fascia in the direction of its fibers where these run downward and forward. (If the fascia is split where its fibers run vertically less room is obtained.) Carefully retract the edges of the wound in the fascia. *Step* 3. Split the temporal muscle between the bundles of its fibers, taking care not to cut any muscular fibers transversely. Divide the periosteum corresponding to the wound in the muscle. Separate the periosteum from the bone in front of and behind the wound. Retract the edges of the wound so as to expose the bone as thoroughly as possible. *Step* 4. Penetrate the skull, preferably with a Doyen burr. With rongeur forceps remove as much of the skull as possible from under the elevated soft parts. Before attacking any portion of the bone be sure to separate the underlying dura from it. Bleeding from the bone may be controlled by Horsley's wax. An opening 2 1/2 to 3 inches in diameter is easily made and is usually sufficient. *Step* 5. Open the dura and incise it radially to the margin of the defect in the bone. The anterior incisions should be made parallel to the posterior branch of the meningeal artery which may need ligation. *Step* 6. Close the muscle wound with a few fine interrupted sutures. Carefully close the wound in the temporal fascia with fine sutures each of which takes as small a bite of tissue as is possible. Accurate approximation is most important. Close the aponeurotic layer and finally the skin wound.

Cushing makes use also of the above method for explorations of the temporal lobe for abscess, etc., for cases of meningeal (extradural) hemorrhage, for drainage in cases of fracture of the base of the skull. Under such circumstances both sides of the skull may be opened and the removal of bone need not be so extensive.

Occipital Craniectomy.—(Decompressive operation over the cerebellum.) It is doubtful whether this method has any advantage over the subtemporal method as a decompressive measure in cerebellar tumors. The difficulties and dangers of the operation are considerable. Hemorrhage from the bone and dura, and especially from the veins leading into the midoccipital sinus may be hard to overcome. *Step* 1. Make a curved incision a little above the superior curved line of the occiput. Make a longitudinal median incision running downward from the middle of the curved incision. The two triangular flaps of skin thus outlined are reflected downward and outward until the upper portion or origin of the flap superficial cervical muscles is exposed. Divide the muscles parallel to and about 3/4 inch from their line of origin. Make a median vertical incision between the muscles down to the spines of the upper cervical vertebræ and divide the ligamentum nuchæ in the middle line. Retract the soft parts. Expose the base of the occiput by separating the periosteum from it and with the periosteum separate the attachments of the deep muscles. *Step.* 2. Open the skull on each side through the prominent thin bosses of the occiput. Enlarge the openings with rongeur forceps. The ridge of bone in the middle line must be attacked with great care because of the occasional midoccipital sinus and emissary veins. Cushing finds it helpful "to crowd wisps of sterile cotton ahead of the dural separator when freeing the membranes from this midridge, a procedure which necessarily ruptures and blocks these emissary vessels in case they are present." *Step* 3. When the bone defect is large enough, ligate the median occipital sinus and excise the dura corresponding to the opening in the bone. *Step* 4. Close the wound preferably without drainage. On account of oozing of blood a drain of folded rubber tissue or of oil silk may be employed but it should be withdrawn within forty-eight hours.

CRANIOCEREBRAL TOPOGRAPHY.—See Brain (Injuries).

CRANIOTABES.—An atrophy of the cranial bones occurring in infancy, with the formation of small, shallow, conic pits in the bone-substance. These pits are granular within, and present a worm-eaten appearance around the margin. They are most usually found in the posterior inferior region of the parietal bone, but may be seen in any of the other cranial bones. They form from within outward, so that they are not often found in living subjects. Craniotabes is probably a result of Rickets, Syphilis, or Marasmus (*q. v.*). The craniotabetic pits are in some way associated with the rapid growth and development of the brain; they may be due to a premature formation of the markings of the convolutions on the skull. They are only encountered during the first months of life—that is, up to the sixteenth month. This disease is not a serious one as regards danger to life. See also Skull (Diseases).

CRANIOTOMY.—See Embryotomy.

CRANIUM.—See Skull.

CRAW-CRAW.—See Filariasis.

CREOLIN.—A dark brown liquid obtained from the distillation of coal-tar, of alkaline reaction, and forming a milk-like mixture with water. It mixes with alcohol, ether, and chloroform. The dose is 1 to 3 minims in capsule. It is a powerful antiseptic and disinfectant, superior to phenol. It is also hemostatic, and is chiefly used in obstetric and gynecologic practice. Its solution is opaque and somewhat unstable, but it is unirritating and free from astringency.

Creolin was highly vaunted by von Esmarch and other authorities as the ideal antiseptic for external use, being possessed of great germicidal power, and a most efficient deodorant and disinfectant,

while its absorption caused no toxic results whatever. Experience has justified these claims in the main, but the drug has given rise to serious symptoms when used to excess. As a vaginal wash, in puerperal cases, the 2 percent solution is reported as fully equal to sublimate solutions, while better as a deodorant, and free from danger by absorption. The weaker solutions have given satisfaction as local applications in the treatment of otorrhea, nasal ulcers, rhinitis (1 : 1000), blepharitis, keratitis, etc.; and in female cystitis a 1 percten solution as a vesical wash, gradually increased to 2 percent, is highly praised by Parvin. The ointments and gauze are used for wounds and other solutions of continuity, in the same manner as carbolized preparations, and with better satisfaction, creolin being less volatile than phenol, and of a more agreeable, though powerful, odor. Internally, it has been employed in gastric fermentation, dysentery, and typhoid fever.

CREOSOTE.—A mixture of phenols, chiefly *guaiacol* and *creosol*, obtained during the distillation of wood-tar, preferably of that derived from the beech. It occurs as an almost colorless, or pinkish, inflammable, oily liquid, of smoky odor, caustic taste, and neutral reaction; soluble in about 150 parts of water, and in all proportions in absolute alcohol, ether, chloroform, benzin, carbon disulphid, acetic acid, and fixed and volatile oils. Much of the commercial creosote is an impure carbolic acid, or a heavy oil distilled from coal-tar, and containing carbolic and cresylic acids. Dose, 1 to 5 minims, well diluted in wine or whisky. Morson's beechwood creosote is the best for internal use. There is only one official preparation, viz.: **Aqua Creosoti** (*creosote water*). This is a 1 percent solution, containing nearly 5 minims of creosote in each fluidounce. Dose, 1 dram to 1 ounce. Creosote carbonate (creosotal) is said to be nonirritant and nontoxic. Dose, 5 to 20 grains (or more) in milk, wine, coffee, or cod-liver oil.

Therapeutics.—Creosote is expectorant, astringent, antiseptic, styptic, escharotic, anesthetic, and narcotic. Its action is practically the same as that of Carbolic Acid (*q. v.*). Creosote has been almost entirely supplanted by carbolic acid for external use, and by guaiacol for internal administration. In intestinal hemorrhage, in gonorrhea, and in gleet it has been used as an antiseptic and astringent. In eczema, pruritus, ulcers, and scaly skin-diseases, and in toothache from an exposed nerve, it is serviceable. In inhalation in chronic bronchitis and gangrene of the lung, in abnormal fermentative processes in the stomach and intestines, and in reflex nausea and vomiting, it is a good agent. In pulmonary tuberculosis, when well borne by the stomach and continued for a long time, it is most efficient.

In diarrhea:

℞. Morphin sulphate, gr. j
Creosote (beechwood), gtt. vj
Bismuth subnitrate, ʒ ss.

Make into 12 powders; give one every 2 or 3 hours.

As an inhalation in phthisis:

℞. Creosote,
Spirit of chloroform } each, ʒ ij.
Alcohol,

Ten to 20 drops in inhaler several times daily.

See Guaiacol.

CRESOL.—Trikresol. A mixture of the three isomeric cresols derived from coal-tar, freed from phenol, etc. It is said to be a more powerful antiseptic than phenol, and less irritant and toxic. A 1 percent solution may be used in surgical work instead of phenol.

CRETINISM.—An endemic disease characterized by goiter and a condition of physical, physiologic, and mental degeneracy and nondevelopment.

The typical cretin is stunted in growth; his skin is of a tawny yellow hue, thickened and wrinkled; the tongue is large and thick, and often hangs from the mouth; the face is large, the lower jaw drooping; the eyes often strabismic, the lids puffy; the belly pendulous; the lower limbs short and deformed and the gait waddling; the forehead is retreating, the top of the head flat, the occipital region ill developed; the nose is broad and flat. The cretin is often unable to speak, and his hearing is often defective. Few live over 30 years. Sexual functions are abnormal; masturbation is frequent, although the subjects of cretinism are often impotent.

The treatment of cretinism consists in early removal to a locality where the soil is dry and porous. Frequent baths should be given; the diet must be nutritous, and consist chiefly of animal food. Cod-liver oil, lactophosphates of iron and lime, and thyroid extract are indicated.

Sporadic cretinism is a name given to a congenital form of myxedema, characterized by absence of the thyroid gland, diminutiveness of size, thickness of neck, shortness of arms and legs, prominence of abdomen, large size of face, thickness of lips, large and protruding tongue, and imbecility or idiocy. It is popularly supposed that coitus during intoxication is a cause of this condition. See Myxedema.

CROTON OIL. Oleum Tiglii.—The fixed oil of the seed of *C. tiglium*, native of India. The oil is of a pale or brownish-yellow color, somewhat viscid and slightly fluorescent, of fatty odor, acrid taste and slightly acid reaction; soluble in 60 of alcohol, freely in ether, chloroform, or carbon disulphid. Its composition is very complex and has not been thoroughly made out, but it is known to contain the glycerids of several fatty acids, also a peculiar acid named *tiglinic acid*, which is isomeric with angelic acid. Dose, 1/3 to 2 minims in pill, emulsion or tincture. Externally it is a powerful irritant, producing pustular eruptions. It is useful as a counterirritant in various chronic inflammatory conditions: *e. g.*, ovaritis, bronchitis, rheumatism, glandular swellings, etc. Internally, it is a drastic, hydragog cathartic; its use is indicated when prompt evacuation of the bowels is required, as in apoplexy, impaction of the intestines, dropsy, lead constipation and paralysis. It is contraindicated when either debility, organic obstruction or an in-

flammatory condition of the stomach or bowels exists.

CROUP, MEMBRANOUS. **Synonyms.**—Pseudomembranous laryngitis; membranous laryngitis; laryngeal diphtheria.

Definition.—An acute laryngitis characterized by the formation on the mucous membrane of a pseudomembrane similar in nature to diphtheritic exudate elsewhere.

Etiology.—In the great majority of cases this affection is caused by the Klebs-Loeffler bacillus. When the disease is secondary to pseudomembrane formation on the nares, tonsils, or pharynx, as a complication of scarlet fever, measles, or influenza, it is usually caused by other microorganisms, as the streptococci.

Symptoms.—The onset is gradual, and at first only the symptoms of simple acute laryngitis, with hoarseness and cough, are noticed; the early constitutional symptoms are not severe. In the course of 24 hours the condition becomes rapidly worse, the voice is lost, dyspnea is constant and very marked, with all the accessory muscles of respiration brought into active use; the face is pale and anxious; the breathing is noisy and stridulous; the pulse is rapid and weak; the child is evidently suffering greatly, and tosses about in bed; cyanosis is present, and the skin is covered with a clammy sweat; the temperature, which at first was slightly raised, now increases, and may reach 104° to 106° F. In fatal cases the child usually passes into a stupor before death occurs.

The course is usually rapid in infants, death ensuing in from 36 to 48 hours after the first symptoms. Older children may suffer for a week or 10 days from the attack.

Diagnosis.—From simple catarrhal laryngitis or catarrhal croup it is differentiated by the more gradual onset, the history of infection with diphtheria, the presence of membrane in the throat higher up, and the presence on the mucous membrane of the larynx of the false membrane, as shown by the laryngoscope. In some cases pieces of the exudate are coughed up, making the diagnosis easier.

The Prognosis is grave; the mortality rate among infants is especially high.

Treatment.—The hygienic and general treatment is the same as for pharyngeal diphtheria; and in the beginning of the attack, when there may be difficulty in differentiating it from a catarrhal laryngitis, or when there may be doubt as to the nature of the infection, in order to be on the safe side the case should be isolated and a curative dose of diphtheria antitoxin administered without delay.

It is important to keep the air in the room moist with the steam-kettle, and early in the attack an emetic, as syrup of ipecacuanha in teaspoonful doses, or the yellow subsulphate of mercury in a dose of 2 to 5 grains, may relieve the symptoms.

Hot-water applications externally to the throat are beneficial; but local applications to the larynx should not be attempted. Calomel fumigation is very beneficial when dyspnea is severe. A tent is constructed over the bed, and inside of this is placed a wash-bowl or other vessel, across the top of which is laid a strip of tin, and under this is set an alcohol lamp; the calomel is placed over the spot where the flame strikes the tin. Ten or 15 grains is the customary quantity used, and the child is allowed to inhale the fumes for 15 minutes, after which the tent should be opened and the room well aired. This process should be repeated every 1 to 3 hours, according to the severity of the symptoms. Children are seldom salivated by these inhalations, but the attendant is in danger of infection if care is not used.

In a large majority of cases of laryngeal diphtheria INTUBATION (*q. v.*) is necessary, and has been the means of saving many lives.

Antitoxin Treatment.—In these cases antitoxin has been most useful, and it should be given early when there is a suspicion of the larynx becoming involved.

See DIPHTHERIA.

CROUP, SPASMODIC.—Spasmodic or false croup is an acute catarrhal inflammation of the larynx, causing a peculiar cough and symptoms of severe dyspnea. It occurs most commonly in children between 6 months and 3 years of age, and is rare after the fifth year. It may be caused by exposure to wet or cold, by indigestion, or by extension of inflammation from the nose or pharynx. The tendency in many cases seems to be hereditary. Boys are more frequently affected than girls, and one attack predisposes to others.

Symptoms.—For a few hours previous to the attack there are usually present the symptoms of a mild laryngitis or a common cold, with perhaps some hoarseness and an occasional cough. These symptoms grow slightly worse during the evening, and toward the middle of the night suddenly become more severe. The child sits up in bed and struggles for breath, the breathing is noisy and difficult, and all the accessory muscles of respiration are brought into play. There is present a constant loud, hoarse, and metallic cough, but the voice may be nearly or entirely lost. After a short time in mild cases, or in a few hours in severe attacks the symptoms gradually diminish, and the child falls asleep. During the next day the child may appear as well as usual, except for a slight cough and hoarseness, but during the night a repetition of the attack of croup is to be expected. An attack rarely occurs on the third night, but when it does, it is likely to be but a mild one. Some cases, however, go on for a week or longer, with daily remissions and nightly exacerbations.

In children subject to croup the attacks may recur every few weeks during changeable weather.

Diagnosis.—

CROUP.	DIPHTHERIA.
Premonitory hoarse, metallic cough, without illness.	Premonitory illness, marked by shivers, fever, and sore throat, without cough.
A child's disease.	Attacks adults as well.
Tenacious mucus covering the swollen membrane.	Distinguished by a false membrane.
A local disease.	A blood poison; great general depression.

The prognosis is favorable, although the symptoms are so severe at times as to greatly alarm the parents or attendants.

Treatment.—Exposure to damp and cold should be guarded against in a child subject to these attacks. The diet should be carefully regulated, woolen clothing worn next to the skin, and the hygienic condition improved if faulty. If nasopharyngeal catarrh is present, it should be treated; enlarged tonsils or adenoid growths should be removed. Syrup of hydriodic acid in half-teaspoonful doses, or 5-drop doses of the syrup of the iodid of iron, given 3 times a day and continued for several months, are very useful in removing the tendency to croup. For the attack give an emetic: 1/2 of a teaspoonful of syrup of ipecacuanha, repeated in 20 or 30 minutes, if necessary. If constipation or symptoms of indigestion exist, the colon should be washed out with warm water, and, following the attack, calomel should be administered in doses of 1/12 of a grain every 2 hours until the bowels are freely moved.

A hot foot-bath is useful to shorten the spasm, and steam should be generated under a tent over the patient. The tent may be constructed with sheets over the bed or crib.

One of the following recipes may be found useful in the treatment of croup:

℞.	Chloral hydrate,	gr. xx
	Potassium bromid,	gr. xxx
	Syrup of acacia,	ʒ ij.

Teaspoonful every 1 or 2 hours until quiet.

Or—

℞.	Tincture of belladonna,	gtt. iv
	Paregoric,	ʒ j
	Powdered alum,	gr. vj
	Syrup of acacia,	ʒ iv
	Water,	ʒ ss.

A teaspoonful every 2 or 3 hours to a child 6 months old.

CRYOSCOPY.—The estimation of the freezing-point of an organic fluid by means of which it is determined how many solid molecules it holds in solution. The freezing-point of the fluid examined is compared with that of distilled water. The greater the molecular concentration of a fluid the greater is the degree of cold required to freeze it. This method is applied to urine and blood and is considered useful in determining the functional capacity of the kidneys. When renal activity is normal the freezing-point of the blood varies but slightly, ranging from 0.55° and 0.57° C. below zero, the latter being equivalent to that of distilled water. The freezing-point of healthy urine is not so constant, varying from 0.9° to 2.3° C. below zero. When the freezing-point of the blood is 0.6° C. below zero and that of the urine 1° C. it is maintained that the functional capacity of the kidneys is such that operation is contraindicated. Taken in connection with other methods of ascertaining the functional capacity of the kidneys, cryoscopy is undoubtedly of value.

CUBEB.—The dried unripe but fully-grown fruit of *Piper Cubeba*, cultivated in Java. It contains a volatile oil, which is official, an acrid resin composed in part of cubebic acid, also a fatty oil, gum, and cubebin, which is an insoluble, neutral, odorless and tasteless body. The volatile oil may be separated into cubebene, a camphor, and cubeben, a liquid portion. The active principles are the volatile oil and cubebic acid, both of which are contained in the oleoresin. Dose of the powdered drug, 10 to 60 grains.

Cubeb is an aromatic stimulant, diuretic in small doses, and is particularly useful in affections of the bladder and urethra. It is employed in the acute stage of gonorrhea, in chronic cystitis, prostatorrhea, and chronic bronchitis with excellent results. The powder is a useful application in hayfever, chronic nasal catarrh, and follicular pharyngitis, blown upon the mucous membrane by an insufflator. It may also be smoked in cigarets with temporary relief in cases of acute nasal catarrh with "stuffed" nasal passages. In some subjects the continued use of cubeb produces nausea, hemorrhoids, hematuria, and severe headache. Troches are useful preparations in chronic irritability of the fauces, pharynx, and air-passages, and are much employed by singers and public speakers for their tonic effect on these parts, and for the relief or prevention of hoarseness.

Preparations.—C., Fluidextract. Dose, 5 to 30 minims. **C., Oleoresina.** Dose, 5 to 20 minims. **C., Ol.**, the volatile oil. Dose, 5 to 20 minims. **Trochisci, C.,**—each contains of the oleoresin 2 grams, oil of sassafras 1 c.c., extract of glycyrrhiza 25 grams, acacia 12 grams, and syrup of Tolu q. s. to form 100 troches. Dose, 1 to 3.

CUPPING.—A method of blood-derivation by means of the application of cupping-glasses to the surface of the body.

A cupping-glass is a small, bell-shaped glass, capable of holding 3 or 4 ounces, in which the air is rarefied either by heat or exhaustion, and the glass then applied to the skin, either with or without scarification.

Dry cupping is chiefly employed in inflammatory affections of the bronchi, lungs, or kidneys; also in sthenic cerebral congestion, applied to the nape of the neck, in hyperemia of the spinal cord, and especially in renal ischemia. It is performed as follows: The site selected is moistened with a warm sponge, the contained air of the cupping-glass is exhausted by the flame of a spirit-lamp, and the glass is then placed evenly on the part to be cupped. The soft tissues within the rim should swell and project into the glass-cavity. After about a minute the glass is removed by tilting, the scarifier is applied, and the blades sprung, making a number of small cuts, from which the blood flows. Two or 3 ounces may be obtained from one application.

In wet cupping the skin is cut in several places previous to the application of the cup.

Situations available for cupping are regions that are smooth and fleshy: the nape of the neck, the loins, and the buttocks. Parts to be avoided are bony prominences; irregular surfaces of all kinds, as over the intercostal spaces; regions over

sensitive organs, as the breasts and the immediate neighborhood of inflamed skin or cellular tissue. See Bleeding.

This treatment, formerly popular has fallen into disuse, being largely supplanted by boric acid fomentations subsequent to punctures or incisions. Bier, however, has recently advocated the use of vacuum suction cups for chronic inflammation. See Bier's Hyperemic Treatment, Inflammation, Joints.

CUPRUM.—See Copper.

CURETTAGE.—See Uterus (Inflammation).

CURRENT.—See Electricity.

CUSSO (Kousso, Brayera).—The female inflorescence of *Hagenia abyssinica*, an Abyssinian tree. It contains tannic acid, a volantile oil, and a crystalline principle named *Koussin* which by itself is apparently inert. Dose, 2 to 8 drams.

Cusso has little or no effect except the nausea, vomiting, colic and slight diarrhea produced by large doses. Its chief action is anthelmintic against both varieties of tapeworm, but it rarely expels the head of the parasite, and is very nauseous to the taste and difficult of retention by the stomach in the large doses necessary to efficiency. Two drams to 1 ounce of the flowers infused in 4 ounces of boiling water is the usual dose, which should be taken on an empty stomach and followed by a castor-oil or saline purge after 3 or 4 hours. An emulsion of a 6 percent infusion with castor-oil, yolk of egg, a few drops of ether and oil of anise with 10 to 20 drops of the oleoresin of aspidium, is more agreeable and efficient than the infusion alone.

CUTANEOUS REACTION IN TUBERCULOSIS.—See Tuberculin.

CUT-THROAT.—The great majority of wounds of this nature are transverse and their most frequent situation is between the thyroid cartilage and the hyoid bone. The blood-vessels frequently escape injury. A wound of the common carotid artery or of the internal jugular vein usually proves fatal in a few minutes from loss of blood or from the suffocation that follows its entrance into the air-passages.

The first steps are to stop hemorrhage and to provide for free ingress of air to the lungs. The finger may be introduced at once to compress any large vessels. The patient should be placed upon his back, and after cleaning out the clots from the orifice of the glottis, breathing may be naturally resumed; or, if not, artificial respiration may be resorted to. The head and neck should be extended to find the source of hemorrhage. All bleeding points should be secured and all ligatures cut short. Divided tissues must be replaced, so as not to interfere with respiration. The divided trachea should be accurately conjoined with sutures; a warm moist atmosphere and the same precautions as after tracheotomy are indicated. In some cases a tracheotomy tube should be inserted below the true vocal bands. If edema of the glottis threatens, laryngotomy or tracheotomy may be performed. If the esophagus is wounded, chromicized catgut should be employed to bring its edges together. Food should be given by an esophageal tube through the mouth or nose, and especial care is to be observed that it does not enter the trachea. One or two sutures may be put in the extremities of the external wound to lessen the gaping and to prevent inversion of the skin, but it is of great importance that the external wound should be open, so that any blood or food that may get into its deeper cavities may escape.

The patient's neck should be kept slightly flexed by means of pillows and sand-bags. Carbolic or aseptic gauze should be secured over the wound by a few loose turns of a bandage, and thus the air may be to some extent purified. Constant watching by an attendant is advisable. Later on the wound is likely to become very foul, and some antiseptic will be necessary to cleanse the parts and to prevent the passage of discharges into the lung. Abscesses must be opened and drainage established. Quinin is to be used to combat the tendency to septicemia. Fistulous openings may persist, but will require secondary operations. See Neck (Injuries).

CYANIDS.—Compounds of cyanogen with a metal or radical. They are chiefly active poisons.

Potassium cyanid is the most common. It is one of the most dangerous of chemic compounds. It is a white, opaque salt, of alkaline reaction, bitter-almond taste, and a peculiar odor; soluble in 2 parts of water. Dose, 1/20 to 1/2 grain. Locally, a solution of 1 to 5 grains to the ounce is as strong as should be employed. It is used to allay pruritus, and in solution as a wash to remove stains of silver nitrate. In doses of 1/6 to 1/4 grain it is a useful ingredient of cough mixtures when opium or its alkaloids are inadmissable.

In **poisoning** by potassium cyanid, ferrous sulphate should be given after evacuation of the stomach. The nitrate of cobalt is also an antidote. Ammonia intravenously, digitalis, strychnin, and alcohol may be employed, and artificial respiration, galvanism, and general friction may be necessary.

Pure **hydrocyanic or prussic acid** is never used in medicine. The acid, however, is official in a 2 percent aqueous solution—a colorless liquid of acid reaction, with an odor and a taste of bitter almonds. The dose is 1 to 3 minims of a recent preparation. It gives rise to vertigo when inhaled in minute amounts, and to death when the fumes are concentrated. It should be kept in dark, tightly stoppered bottles. It is one of the most rapidly lethal poisons known. It is absorbed with great rapidity, and is eliminated almost immediately afterward. The drug is used almost solely to allay irritation of the peripheral nerves, and is given internally for the cough of phthisis and chronic bronchitis, for gastralgia, for obstinate vomiting, and externally to subdue the itching of pruritus, eczema, or urticaria. For the cough it is best administered with morphin or codein.

The following may illustrate:

℞.	Codein sulphate,	gr. iij
	Dilute hydrocyanic acid,	♏ xx
	Syrup of tolu,	ʒ j.

Give a teaspoonful 3 or 4 times daily.

In **poisoning** the drug is an active paralyzant, and exerts a lethal influence over every part of the body; the nervous system, the heart, respiration, brain, and all parts die at once if much of it is taken; hence, the survival of a patient 20 or 30 minutes after taking a poisonous dose is indicative of recovery. The poisoning by nitrobenzol or essence of mirbane, which has a similar odor, but one more permanent, produces symptoms resembling those of prussic acid poisoning. If given in time, ferrous sulphate will produce inert Prussian blue with the lethal acid. The stomach should be evacuated and artificial respiration performed. Ammonia may be given by intravenous injection. Cobalt nitrate is said to be an efficient antidote.

As the result of physiologic experiments, Lang found that nontoxic doses of cyanids were eliminated in the urine as relatively harmless sulphocyanates, the albumin of the living body furnishing the source of the sulphur. He also found that when sodium thiosulphate (hyposulphite) was given as an antidote, the effects of from 1 1/2 to 5 times the lethal dose of hydrocyanic acid were counteracted. When poison and antidote were simultaneously injected subcutaneously, no results were obtained, as the sodium thiosulphate is more slowly absorbed than the hydrocyanic acid. Beyond this, the method or means of administering the substances appeared to exert no influence on the result.

The use of oxycobaltous salts, more recently advocated, appears to show that these salts are even more powerful in their effects than sodium thiosulphate. Hydrogen dioxid and potassium permanganate were found to be valueless. A 5 to 10 percent solution of sodium thiosulphate should be kept constantly in readiness with a Pravaz syringe, although the usually rapid effects of hydrocyanic acid appear to render such provision useless.

CYANOSIS.—A bluish discoloration of the skin from nonoxidation of the blood, caused by local or general circulatory disease. It may be due to admixture of arterial and venous blood, as when a deficiency exists between the auricles and ventricles of the heart. It is seen in various diseases of the lungs and heart, in suffocation, and locally when an important vein is obstructed or compressed. It is commonly associated with certain forms of congential malformation of the heart. See Asphyxia.

CYCLITIS. Definition.—Inflammation of the ciliary body; the iris usually and the choroid often are simultaneously involved.

Varieties.—The **serous,** which is comparatively benign, and develops like a serous iritis; the **plastic,** which is the worst form, and produces a total posterior synechia; and the **suppurative** which is distinguished from the others by the presence of a purulent exudate in the chambers of the eye.

Symptoms and Diagnosis.—This is always a serious, and often a dangerous, affection, and should be differentiated from a rheumatic or benign iritis. Pain, photophobia, lacrimation, and visual disturbance are signs common to all. The characteristic symptoms of cyclitis are some sensitiveness to pressure in the ciliary region; cloudiness in the anterior portion of the vitreous, and the noticeable changes in the intraocular tension, which is increased at first and diminished later. The aqueous is also turbid, and may contain pus in the suppurative variety.

Causes.—Generally some injury to the ciliary body or adjacent tissues. Foreign bodies in the eye are almost certain to destroy the eye by a plastic cyclitis. Cyclitis may be due to inflammation of the tissues in continuity with the ciliary body, or to sympathetic ophthalmia. Idiopathic cases are said to result from syphilis, tuberculosis, and uterine disease.

Treatment is virtually the same as that for iritis, although atropin must be used with caution, as it is often very poorly borne. Plastic and purulent cyclitis must be rigorously treated with mercurial inunctions. For the reduction of tension, the local use of cocain, diaphoretics, and paracentesis are indicated. In purulent cyclitis, especially after operations, antiseptic douches are indicated. On account of the uncertain prognosis, the possibility of relapses, disorganization of the vitreous, and sympathetic ophthalmia, the patient must be carefully watched, and expectant treatment continued after the symptoms have subsided.

See Iritis.

CYCLODIALYSIS.—See Glaucoma.

CYCLOPLEGICS.—Agents effecting paralysis of the ciliary muscle. See Mydriatics.

CYPRIPEDIUM (Lady's-slipper).—The roots of *C. pubescens* and *C. parviflorum*, American valerian, with properties due to a volatile oil and an acid. It is an antispasmodic and stimulant tonic, used instead of valerian, which it resembles. **C. Fluidextractum.** Dose, 10 to 30 minims.

CYSTICERCUS.—The scolex of the tape-worm. A hydatid. **C. Bovis,** a form of hydatid existing in the muscles of the ox (chiefly in the calf). Its progenitor is the Tænia mediocanellata of man. It produces the disease called *beef measles.* **C. Cellulosæ,** the hydatid found inhabiting the intermuscular connective tissue of the pig, producing the condition known as "measles." Its progenitor is the Tænia solium of man. **C. Cellulosæ Cutis,** a hydatid, or immature form of Tænia solium, which is sometimes parasitic in the subcutaneous tissues of the skin. **C. Ovis,** a hydatid of uncertain origin, found in sheep in the condition called *mutton measles.* **C. Pisiformis,** a hydatid found mainly in the abdominal cavity of the rabbit and of the hare, and, in its immature state, in the liver of these animals. Its progenitor is the Tænia serrata of the dog. **C. Tenuicollis,** a slender or long-necked hydatid found in the abdominal and pelvic cavity of the sheep, the pig, the ox, and the fowl. Its progenitor is the Tænia marginata of the dog. See Worms (Tape-).

CYSTITIS. Etiology.—The more usual causes of inflammation of the bladder are foreign bodies, such as stone, obstruction to the outflow of urine by enlarged prostate or stricture of the urethra, and pathogenic organisms variously introduced, but especially by unclean catheters. Of acknowledged bacterial origin is also gonorrheal

cystitis, which, succeeding an attack of gonorrheal urethritis, is due to the invasion of the bladder by simple extension by continuity. Among organisms capable of exciting inflammation are the streptococcus pyogenes, staphylococcus pyogenes aureus, diplococcus, bacterium coli commune, tubercle bacilli, and perhaps others. See COLON BACILLUS INFECTION. Virulent causes are the bacteria contained in decomposing urine retained in the bladder.

Cold was formerly recognized as a cause of cystitis, especially in women and children, but it may be subject to the same conditions as the causes just named. On the other hand, substances introduced into the blood, as cantharides and capsicum, are capable of producing cystitis. Even the ingestion of certain articles of food has been followed by cystitis. Traumatic causes may be classed among predisposing causes rather than exciting, furnishing the conditions favorable to the action of bacteria.

Symptoms.—While a division of cystitis into acute and chronic is justified by the suddenness and severity of symptoms in certain cases, as contrasted with their slow development in others, yet the conditions so constantly verge into one another that a separate consideration of the two forms is not necessary. The first symptom of cystitis is usually frequent desire to urinate. Such frequency is often attended by painful straining. In severe cases there is always tenderness over the region of the bladder above the pubes, and in some there is constant pain. In these, tenderness may also be elicited by pressure from within the rectum, while catheterization is especially painful. In calculous cystitis pain is excited or aggravated by motion, especially such as is communicated to one riding in a wagon over a rough road.

As a rule, there is not often fever with cystitis. Even when there is fever, the temperature does not exceed 100° to 102° F., though it may be higher. In certain acute diphtheric cases of great virulence there are chills, sweats, and high fever. In advanced stages there may be sepsis, due to absorption of retained putrid matters from the bladder.

The *urine* presents striking changes, from which alone the diagnosis may be made. It contains pus in varying quantities, but it is especially characteristic of the pus of cystitis that it is associated with mucus, imparting a glairy, stringy character to the urine, which increases the difficulty of its discharge from the bladder. The reaction of the urine when passed is commonly either alkaline or faintly acid, and if acid, it promptly becomes alkaline. The pus, under the circumstances, is loaded with amorphous phosphates of lime and glistening crystals of ammoniomagnesium phosphate. It is so viscid that it will not rise in the pipet, and must be cut with scissors to be manipulated for microscopic study. Blood is an almost constant constituent of the urine in calculous cystitis, and in the grave diphtheritic forms shreds of gangrenous bladder tissue may be discharged.

Diagnosis.—Ordinarily the diagnosis of cystitis is easy. Yet there sometimes occur mild forms that it is difficult to differentiate from mild degrees of interstitial nephritis, while it not very rarely happens that the two conditions are associated. In contracted kidney numerous leukocytes are sometimes present. The presence of hyaline casts, even when scanty, points to nephritis, while hypertrophy of the left ventricle and increased arterial tension settle the question. Still more emphatic is the diagnosis if there is retinitis albuminurica.

The question as to whether there is pyelitis, separate or associated with cystitis, is still more difficult. Even spasm of the bladder, commonly regarded as peculiar to cystitis, may be present in pyelitis. It is better to rely upon tenderness in the neighborhood of the kidney. Marked intermission in the purulent discharge, especially if associated with attacks of nephritic colic, which imply an obstruction of the ureter, point to pelvic involvement.

Calculous cystitis may be suspected when pain in the region of the bladder is excited by motion, as in riding over a rough road, or when there is pain at the end of the penis after micturition; and when there is blood in the urine, or when the stream of urine is suddenly interrupted. These symptoms should immediately suggest the use of the sound, negative results with which must not, however, be accepted without qualification, as the stone may be concealed in a diverticulum.

Treatment. Acute Cystitis.—Of this form the treatment is far more satisfactory—at least so far as the removal of the acute symptoms is concerned—than that of the chronic form. Rest in bed is a primary and essential condition. Leeches to the perineum should be more frequently applied than they are. A poultice to this region and over the lower abdominal region is always useful, while a brisk saline cathartic should never be omitted.

As the feverish state that always accompanies cystitis is more or less constantly associated with a scanty urine, concentrated and irritating to the inflamed mucous membrane, it is desirable at once to increase the secretion and thus dilute it. Copious libations of pure water, to which the citrate or acetate of potassium is added, in from 15- to 20-grain doses for an adult, should be allowed. The ordinary spirit of nitrous ether, in dram doses every 2 hours, is an admirable adjuvant, and may be combined with the official liquor potassii citratis, which contains about 20 grains of citrate of potassium to 1/2 of an ounce. Formerly, the mucilage of flaxseed or flaxseed tea was much used as a diluent menstruum for the diuretic alkalies indicated, but it is doubtful whether it is any more efficient than a like quantity of water. When there are much pain and straining, as is often the case, especially when cantharides are the cause of the inflammation, opium is indispensable, always in the shape of a suppository, 1/2 of a grain to 1 grain of the extract, or a corresponding amount of morphin. Ice-water injections into the rectum, or pieces of ice similarly applied, are very efficient in allaying the pain and irritation when additional measures are needed. Injections of cocain into the bladder are useful in subduing the intense irritation.

Not more than 2 grains of cocain should be introduced into the bladder at one time (Tyson).

Chronic Cystitis.—The successful treatment of chronic cystitis is a much more difficult task, for 3 evident reasons: (1) The constant presence in the bladder of the urine with its irritating qualities, especially to an inflamed mucous membrane; (2) the difficulty in getting remedies to reach the inflamed surface; and (3) the pent up inflammatory products, which in their decomposition often make the urine still more irritating by exciting in it ammoniacal changes.

First, the irritating qualities of the urine may be diminished by the use of diluents, already recommended in the treatment of acute cystitis. Almost any of the negative mineral waters, so highly recommended by their owners, are useful for this purpose. Just as good is pure spring water, and even better is distilled water. From 1 to 2 quarts should be taken daily. If the kidneys are healthy, a large quantity of light-hued urine, of low specific gravity, and relatively weak in solids, will be secreted.

The indication is to render the urine acid, if possible, although the means to this end are unsatisfactory. Benzoic acid has the reputation of doing this, and it probably is true of it when administered in sufficient doses. It may be given in the shape of a 5-grain capsule, of which at least 6 must be given in a day to produce any effect. The same property has been assigned to citric acid, but this is a mistake, as all of the vegetable acids, when ingested, are eliminated as alkaline carbonates.

The second indication is to medicate the inflamed surface. Two ways suggest themselves—(1) by the internal administration of drugs, and (2) by the injection of medicated liquids into the bladder.

To carry out the first method an enormous number of infusions, decoctions, and fluidextracts of vegetable substances has been suggested, the vast majority of which are absolutely useless, except as they serve by the quantity administered to act as diluents. Among the best known of these are buchu, pareira brava, uva ursi, and triticum repens.

The only class of remedies Tyson has found of service in cystitis, through their internal administration, are the balsams. Of these, the balsam copaiba is practically unavailable, for it is rarely well borne in sufficient doses or for long enough time to permit it to be of any use. Sandalwood is easier borne, and is also an efficient remedy. It is best administered in capsules containing 10 minims. Contrary to the usual custom of giving these and like remedies after meals, Tyson has given them on an empty stomach before meals. They are as well, and even better, borne than when given after food, and they pass into the blood much more quickly. It is desirable to impregnate the blood and to impart to the urine a balsamic odor. This is scarcely possible with less than 8 capsules a day—2 before each meal and 2 at bedtime. Both boric acid and benzoic acid are useful adjuvants to the treatment of chronic cystitis, through their antiseptic effect on the urine, each in 5-grain doses, rapidly increased to 10 grains. Resorcin in 5- to 10-grain doses and naphthalin in 2-grain doses are recommended for the same purpose. Salol has become a popular remedy, very large doses being advised—15 to 30 grains every 3 hours; but in Tyson's experience these doses are not well borne, 10 grains being a maximum dose.

The application of remedies to the bladder by injections is best considered in connection with the third indication—the riddance of inflammatory products, the pus and mucus, and the matters resulting from their decomposition. The latter are not always present, but all who have had much experience with cystitis are familiar with the tenacious, glairy, mucoid matter that will not drop or rise up in a pipet, glistening with large crystals of triple phosphate, and exhaling a stinking, ammoniacal odor that quickly contaminates an entire apartment. There is only one way to get rid of this, and that is to wash out the bladder, and often this is too long deferred. Tepid water should be first used, and the injection made through the soft, flexible catheter. Four ounces may be used with entire safety; and after the capacity of the bladder has been determined, even more may be thrown in, because it is sometimes useful to distend the viscus slightly in order to reach the depressions and inequalities always present in advanced bladder inflammations. These simple injections, practised once a day, or in severe cases twice a day, often result most happily. After a few injections with plain water some medication may be added. Salicylate of sodium, in the proportion of a dram to the pint, is one of the best. Its disinfecting qualities are undoubted. Boric acid, in the proportion of a dram to the pint, is also very satisfactory. Sir Henry Thompson's soothing solution—of biborate of sodium 1 ounce, glycerin 2 ounces, water 2 ounces, and of this mixture 1/2 of an ounce to 4 ounces of tepid water—may also be used. Nitrate of silver of the strength of 1/4 of a grain to the ounce, increased to 1/2 of a grain, is often very efficient in diminishing pus. The bladder, if previously washed out by boric acid solutions, should be irrigated with plain warm, sterilized water, in order to avoid chemic reaction between the nitrate of silver and the boric acid.

When there is a foul odor present, the bichlorid of mercury may be used in exceedingly dilute solution—not more than 1 :25,000 at first, gradually increasing the strength if it is well borne. Carbolic acid may also be used in weak solution, 1/4 to 1/2 percent; also peroxid of hydrogen, 1 part to 4 or 5 parts of water.

Anodynes are indispensable in many cases of cystitis, to relieve the patient of extreme pain and of the frequent desire to urinate, which are the result of the same cause. Opium and its alkaloids are the most efficient, and they are best introduced by the rectum. There appears to be no absorbing power in the bladder for opium, and an attempt to administer anodynes by that channel will be useless. Cocain, from which so much might reasonably be expected, has been disappointing.

When there is greatly enlarged prostate, catheterization is indispensable, and is often attended with the most happy results. It is often too long deferred because of the natural repugnance to the use of the instrument. The patient or his friends should be taught to use the catheter and to wash out the bladder. The extremest precautions should be taken to cleanse the catheter after its use, in order to avoid sepsis. See CATHETER, PROSTATE. An absolute and total cure in chronic cystitis is a rare event; on the other hand, a life of suffering may be converted into one of comparative comfort (Tyson).

CYSTITIS IN WOMEN.—It may occur either as an acute or chronic condition; the latter variety is a very common disease in women.

Causes.—The principal cause of cystitis in women is infection at catheterization. See COLON BACILLUS INFECTION. It may be caused by urethritis, traumatism, constitutional diseases, displacements of the uterus, and the ingestion of certain drugs.

Symptoms.—In the acute stage there are pain, tenesmus, and frequent urination. These symptoms are all increased by exertion of any kind. There may be elevation of temperature. As the acute condition subsides, the symptoms become less marked. In the chronic stage there may be dull pain or a feeling of fulness in the pelvis, and some increased frequency of urination. Pressure upon the base of the bladder causes pain. Examination of the urine will show pus, blood at times, epithelial cells, and débris. In doubtful cases direct inspection of the bladder should be practised by means of the endoscope.

Treatment.—Mild cases of cystitis will usually yield to constitutional treatment. The patient should be placed in bed and the bowels and diet carefully regulated. An exclusive milk diet will be found advantageous. Rochelle salts should be given to the point of mild purgation. If the urine is acid, it should be neutralized by the administration of 1 to 2 drams of citrate of potassium daily; if alkaline, boric acid, in 10-grain doses, should be given 4 times daily. Large quantities of water should be taken in order to dilute the urine and thus render it less irritating. If the symptoms are very acute, suppositories of opium may be given.

As the acute symptoms subside, cubebs, copaiba, oil of sandalwood, or eucalyptus may be administered. These drugs have a stimulating effect upon the mucous membrane of the bladder.

If the foregoing plan of treatment fails, it should be supplemented by local treatment, which consists in irrigation of the bladder, applications to the mucous membrane, and finally cystotomy.

Irrigation of the bladder is a most effective treatment in chronic cystitis. A small two-way catheter should be introduced, and the bladder washed until the fluid returns perfectly clear. Sterile normal salt solution, at a temperature of 100° F., should be used for this purpose. This may be followed by the injection into the bladder of a weak solution of nitrate of silver—1 grain to 1 fluidounce. Not more than an ounce of this solution should be used. Daily irrigations should first be tried, the interval being lengthened, as the case improves, to 5 or 6 days.

Applications directly to the mucous membrane are of value when the disease is limited to localized areas. These applications are made through the endoscope. They should be made every 3 or 4 days, the best solution being nitrate of silver—10 grains to 1 fluidounce.

When extensive ulceration has occurred, and when the disease has resisted other treatment, cystotomy will be necessary. This consists in making an incision into the bladder through the anterior vaginal wall. To prevent closure of the incision, the mucous membrane of the bladder is stitched to the mucous membrane of the vagina around the edges of the fistula. The bladder should be irrigated daily, free drainage being secured through the incision. After the disease has subsided. the fistula may be closed.

CYSTOCELE.—Protrusion of the anterior wall of the vagina, accompanied by prolapse of the base of the bladder. The condition is caused by injury to the perineum during childbirth, which destroys the support of the anterior vaginal wall. A cystocele may vary in size from that of a walnut to that of a small orange; it is pale in color and easily reduced; it becomes more prominent as the patient coughs or strains, and it is associated with relaxation of the perineum. The displacement of the bladder causes the retention of a small amount of urine, which may decompose and cause a mild form of chronic cystitis. Frequent urination and vesical tenesmus are therefore usual accompaniments of this condition.

Treatment.—In moderate degrees of cystocele repair of the perineum will effect a cure. Perineorrhaphy restores the support to the anterior vaginal wall, and the relaxed tissues will gradually contract. In well-marked cases, however, an operation that removes redundant tissue from the anterior vaginal wall should supplement the perineal operation. Numerous operations have been devised for this purpose. The ordinary procedure is known as *anterior colporrhaphy.* An incision is made through the anterior vaginal wall into the connective tissue between it and the bladder wall. The relaxed tissue is removed and the wound closed with sutures of chromic catgut inserted in a vertical line. When the vaginal walls are markedly relaxed, the excision may be circular and the edges brought in apposition by means of Stolz's purse-string suture; or Martin's method may be used. In the latter procedure an oval denudation is made in the anterior vaginal wall extending from the position of the internal urinary meatus to just below the cervix. The broad end of the oval is toward the cervix, and the width of the denudation, at its widest part, varies from 2 to 3 inches. The wound is brought together by 3 tiers of running catgut stitches: the first tier bringing together the central part of the wound, the second the outer part, and the third the mucous membrane.

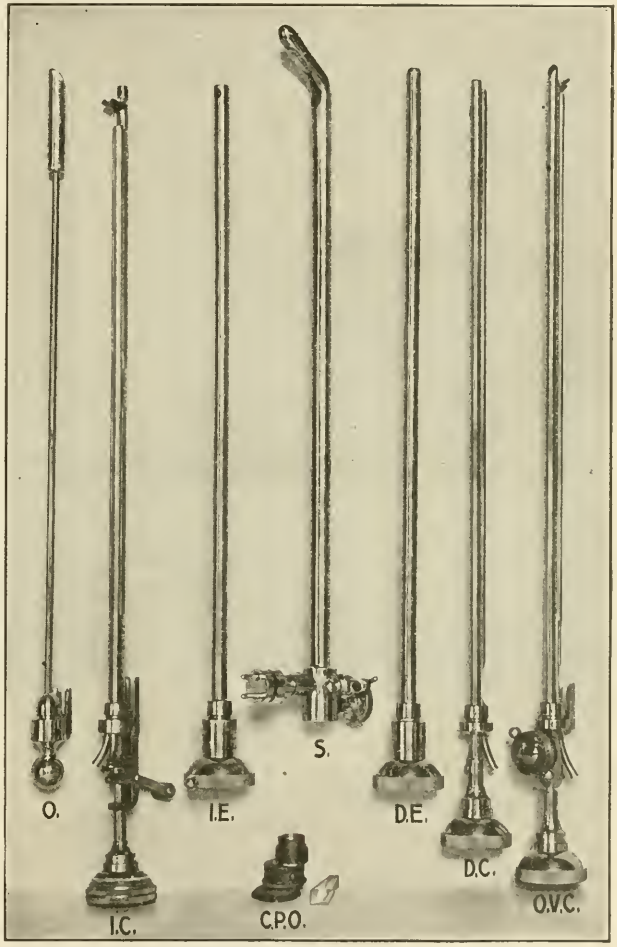
CYSTOSCOPE.—An instrument for examining the interior of the bladder. It consists of a hollow

shaft, of as large a caliber as the urethra will take, with a short beak set on the end at an angle.

Leiter's Cystoscope.

At the end of the beak is a miniature incandescent electric lamp; in one form of the instrument this is unprotected, in another it is covered in by a cap of metal with a rock-crystal window. At the junction of the beak and the shaft is a second window, closed by a prism, so that the rays of light entering it are reflected down the tube toward the eye of the observer. In the tube are lenses for the purpose of magnifying the image. For the anterior surface of the bladder (when the beak is turned up) the two windows are on the concavity; for the trigone and base, on the convexity of the curve. The current is turned on and off as required by means of a small key in the circular handle. Burned in air, the cap of the instrument becomes exceedingly hot, in water (and urine) it remains perfectly cool, and so long as it is prevented from touching the mucous membrane it causes no inconvenience. For this reason the bladder is partly filled with clear water, and the current is not turned on until the instrument is in position. For women a larger tube may be employed.

In addition to the simple examining cystoscopes various instruments have been devised for the purpose of catheterizing the ureters and performing endovesical operations. An instrument for catheterizing the ureters must be applicable to both sexes and so constructed as to permit the introduction of both catheters at a single sitting. The catheters, too, must be pliable and remain in the ureters when the metal instrument is withdrawn. These requirements are met in the instruments of Albarran, Casper, and Bierhoff. Chief among the operative cystoscopes may be mentioned the instruments of Nitze, Casper, and Bransford Lewis. In addition to intravesical operative work the last named instrument permits intraureteral manipulations for the removal of calculi and the dilatation of strictures, as well as irrigation of the pelvis of the kidney. The composite and universal cystoscopes are very ingeniously constructed instruments combining direct and indirect view, retrograde view, ureteral catheterization and operative manipulations. The principal instruments of this kind are the F. Tilden Brown composite cystoscope and the Bransford Lewis universal cystoscope. See Endoscope.



F. Tilden Brown's Composite Cystoscope. 1908 Model.

S., Common sheath for various telescopes; O., obturator; I.C., indirect vision (double catheter) telescope; I.E., indirect vision examining telescope; D.E., direct vision examining telescope; D.C., direct vision (double catheterizing) telescope; O.V.C., oblique vision (double catheterizing) telescope; C.P.N., correcting or compensating prism ocular, interchangeable with the ocular on I.C., and I.E.

CYSTOTOMY.—See Bladder (Stone).

CYSTS.—A cyst consists of a connective-tissue membrane or supporting wall lined by epithelium or endothelium, and forming a cavity the contents of which may be fluid or semifluid, uniform in composition, or made up of a mixture of similar or dissimilar substances.

When the wall of the cyst is passive and influenced by the retained or extravasated contents in a mechanical way only, the cyst is said to be *simple* or *unilocular*. When several similar cysts occur together, all arising from the same cause, and identical in structure, they are called *multiple cysts*. When one cyst springs from the wall of another and thus gives rise to a second or a third cyst, the process resembling proliferation, the resulting cysts are known as *proliferous cysts;* the cyst walls may be destroyed by pressure (reciprocal), and thereby many of the cyst cavities communicate. When the cysts remain distinct, they are spoken of as *multilocular*. When the cysts communicate, they are sometimes said to be *cavernous*. When the lining membrane of the cyst develops papillomatous masses, the process is called *papilliferous*.

For **classification of cysts**, see under *Tumors*.

Dermoid cysts are always of congenital origin, and arise as the result of cutaneous inclusion, or in consequence of the inclusion of a blighted ovum. The wall may contain all the elements of the cutis, may be thick or thin, and not uncommonly shows a slight growth of hair; the cells lining the interior of the sac are, of course, epithelial. The contents are usually sebaceous matter and a varying amount of hair; occasionally, teeth are found. When situated in the ovary, testicle, brain, eye, throat, or abdominal cavity, developing bone or cartilage may be contained within the cyst cavity; these distinctly connective-tissue products indicate the possibility of such cysts arising from fetal inclusion. Occasionally, dermoid cysts contain fat the melting-point of which is below the normal temperature of the body. Dermoids containing distinct connective-tissue bodies, such as cartilage and bone, are termed *compound dermoids*, thereby distinguishing them from dermoids containing no connective-tissue elements; the latter are called *simple dermoids*. The most common sites are near the orbit, the root of the nose, the angle of the jaw, the floor of the mouth, around the sheath of the carotid vessels, near the anus, and the sacrococcygeal and ovarian regions (Coplin).

CYTOLOGY.—The study of the cellular contents of exudates and transudates, more especially of the nonpurulent form. By such investigation, known as cytodiagnosis, differential diagnosis is made.

Technic.—The fluid is shaken up in a large sterile flask with small sterile glass beads in order to obtain a clot if there were none at first, or if a clot be present in order to disintegrate the clot and set free the cells. The fluid is then separated and centrifuged 10 minutes. The supernatant fluid is then poured off by means of a long pipet or by quickly inverting the tube. After the residue is shaken thoroughly, a smear is made of a drop and stained with Wright's stain and examined under the immersion lens. Webster prefers the eosin-hematoxylin method along with the Wright in order to differentiate clearly the nuclear structures. When it is desired to study the bacteria also, it is well to treat the slide first with eosin-hematoxylin then after washing it, with Gram's stain, or to make 2 slides, staining one with methylene-blue and the other with Gram's stain.

Lymphocytosis and endotheliosis are indicative of tuberculous or typhoid pleurisy, the endothelial cells, however, being arranged in large groups in typhoid. In malignant pleurisy tumor cells may be recognized in the specimen. Tuberculous peritonitis may be diagnosed from ovarian cyst and ascites by lymphocytosis and polynucleosis, few cells being found in ascites and ovarian cyst except endothelial cells, these being large and vacuolated in the latter condition. In tuberculous meningitis there is lymphocytosis in contradistinction to the polynucleosis of the epidemic type due to the meningococcus and the type due to the pneumococcus.

D

DACRYOCYSTITIS.—See LACRIMAL DISEASE.

DAKIN'S SOLUTION.—See WOUNDS.

DANDELION.—See TARAXACUM.

DANDRUFF.—See SEBORRHEA.

DATURA.—See STRAMONIUM.

DEAFNESS, CAUSES.—Deafness is mostly due to extension of inflammation of the nasopharynx into the middle ear. It is not infrequently the result of adenoids, hypertrophied tonsils, or nasal stenosis from any cause. Polypi and growths or swellings in the auditory canal are also causes. Sudden deafness is generally due to impacted cerumen, hysteria or syphilis of the internal ear. Nervous deafness, *i. e.*, the result of lesions in some part of the nerve, its nucleus or cortical center, is infrequent.

DEAFNESS, TESTS.—See EAR (Examination).

DEAF MUTISM.—Inability to hear and speak is a congenital condition, or acquired before the power of speech.

DEATH, CAUSES (International List of).—The Bureau of the Census of the Department of Commerce and Labor has issued the following list. Its use will tend toward scientific accuracy as well as increased value of vital statistics.

In naming the disease causing death it is urgently recommended that the exact names printed in bold-faced type in the List below be employed, whenever they are applicable, and that no other terms be used instead. Thus, *always* write **Typhoid fever**; not sometimes *Typhoid fever*, sometimes *Enteric fever*, or *"Continued fever," "Typho-malarial fever,"* etc. Of course many diseases are not given in the terms in bold-faced type below, but only the most important ones. *Terms printed in italics are indefinite or otherwise undesirable, and should never be used when a more definite statement can be given. "Heart failure,"* for example, is simply equivalent to cause of death unknown. *"Convulsions," "Marasmus," "Debility," "Old age,"* are terms of this character.

(I.—GENERAL DISEASES)

1. **Typhoid fever.**
2. **Typhus fever.**
3. **Relapsing fever.** [Insert "(spirillum)."]
4. **Malaria.**
5. **Small-pox.**
6. **Measles.**
7. **Scarlet fever.**
8. **Whooping-cough.**
9. **Diphtheria** and *croup.*
10. **Influenza.**
11. **Miliary fever.** [True Febris miliaris only.]
12. **Asiatic cholera.**
13. *Cholera nostras.*
14. **Dysentery.**
15. **Plague.**
16. **Yellow fever.**
17. **Leprosy.**
18. **Erysipelas.** [State also cause; see Class XIII.]
19. Other epidemic diseases:
    Mumps,
    German measles,
    Chicken-pox,
    Rocky Mountain spotted (tick) fever,
    Glandular fever, etc.
20. **Purulent infection and septicemia.** [State also cause; see Classes VII and XIII especially.]
21. **Glanders.**
22. **Anthrax.**
23. **Rabies.**
24. **Tetanus.** [State also cause; see Class XIII.]
25. **Mycoses.** [Specify, as **Actinomycosis of lung,** etc.]
26. **Pellagra.**
27. **Beriberi.**
28. **Tuberculosis of the lungs.**
29. **Acute miliary tuberculosis.**
30. **Tuberculous meningitis.**
31. **Abdominal tuberculosis.**
32. **Pott's disease.** [Preferably **Tuberculosis of spine.**]
33. *White swellings.* [Preferably **Tuberculosis of—joint.**]
34. **Tuberculosis of other organs.** [Specify organ.]
35. **Disseminated tuberculosis.** [Specify organs affected.]
36. **Rickets.**
37. **Syphilis.**
38. **Gonococcus infection.**
39. **Cancer**[1] of *the buccal cavity.* [State part.]
40. **Cancer**[1] **of the stomach, liver.**
41. **Cancer**[1] **of the peritoneum, intestines, rectum.**
42. **Cancer**[1] of *the female genital organs.* [State organ.]
43. **Cancer**[1] **of the breast.**
44. **Cancer**[1] of *the skin.* [State part.]
45. **Cancer**[1] of *other or unspecified organs.* [State organ.]
46. Other *tumors* (tumors of the female genital organs excepted.) [Name kind of *tumor* and organ affected. Malignant?]
47. **Acute articular rheumatism.**
48. **Chronic rheumatism** and **gout.** [Preferably **Arthritis deformans.**]
49. **Scurvy.**
50. **Diabetes.** [Diabetes mellitus.]
51. **Exophthalmic goiter.**
52. **Addison's disease.**
53. **Leukemia.**
54. **Anemia, chlorosis.** [State form or cause.]
55. Other general diseases:
    Diabetes insipidus,
    Purpura hæmorrhagica, etc.
56. **Alcoholism** (acute or chronic).
57. **Chronic lead poisoning.** [State cause. Occupational?]
58. Other chronic occupation poisonings:
    Phosphorus poisoning (match factory),
    Mercury poisoning (mirror factory), etc.
59. Other chronic poisonings:
    Chronic morphinism,
    Chronic cocainism, etc.

(II.—DISEASES OF THE NERVOUS SYSTEM AND OF THE ORGANS OF SPECIAL SENSE)

60. *Encephalitis.*
61. *Meningitis:*
    Cerebrospinal fever or **Epidemic cerebrospinal meningitis,**
    Simple meningitis, [State cause.]
62. **Locomotor ataxia.**
63. Other diseases of the spinal cord:
    Acute anterior poliomyelitis,
    Paralysis agitans,
    Chronic spinal muscular atrophy,
    Primary lateral sclerosis of spinal cord,
    Syringomyelia, etc.
64. **Cerebral hemorrhage, apoplexy.**
65. *Softening of the brain.* [State cause.]
66. *Paralysis without specified cause.* [State form or cause.]
67. **General paralysis of the insane.**

[1] "Cancer and other malignant tumors." Preferably reported as **Carcinoma of —, Sarcoma of —,** Epithelioma of —, etc., stating the exact nature of the neoplasm and the organ or part of the body first affected.

68. Other forms of mental alienation. [Name disease causing death. Form of insanity should be named as CONTRIBUTORY CAUSE only *unless* it is actually the disease causing death.]
69. Epilepsy.
70. *Convulsions (nonpuerperal).* [State cause.]
71. *Convulsions of infants.* [State cause.]
72. Chorea.
73. Neuralgia and neuritis. [State cause.]
74. Other diseases of the nervous system. [Name the disease.]
75. Diseases of the eyes and their annexa. [Name the disease.]
76. Diseases of the ears. [Name the disease.]

(III.—DISEASES OF THE CIRCULATORY SYSTEM)

77. Pericarditis. [Acute or chronic; rheumatic (47), etc.]
78. Acute endocarditis. [Cause?]
79. Organic diseases of the heart: [Name the disease.]
    Chronic valvular disease, [Name the disease.]
    Aortic insufficiency,
    Chronic endocarditis,
    Fatty degeneration of heart, etc.
80. Angina pectoris.
81. Diseases of the arteries, atheroma, aneurysm, etc.
82. Embolism and thrombosis. [State organ. Puerperal (139)?]
83. Diseases of the veins (varices, hemorrhoids, phlebitis, etc.)
84. Diseases of the lymphatic system (lymphangitis, etc.) [Cause? Puerperal?]
85. *Hemorrhage;* other diseases of the circulatory system. [Cause? *Pulmonary hemorrhage* from Tuberculosis of lungs (28)? Puerperal?]

(IV.—DISEASES OF THE RESPIRATORY SYSTEM)

86. Diseases of the nasal fossæ. [Name disease.]
87. Diseases of the larynx. [Name disease. Diphtheritic?]
88. Diseases of the thyroid body. [Name disease.]
89. Acute bronchitis. } [Always state as acute or chronic.]
90. Chronic bronchitis. }
91. Bronchopneumonia. [If secondary, give *primary* cause.]
92. *Pneumonia.* [If lobar, report as Lobar pneumonia.]
93. Pleurisy. [If tuberculous, so report (28).]
94. *Pulmonary congestion, pulmonary apoplexy.* [Cause?]
95. Gangrene of the lung.
96. Asthma. [Tuberculosis?]
97. Pulmonary emphysema.
98. Other diseases of the respiratory system (tuberculosis excepted). [Such indefinite returns as "*Lung trouble,*" "*Pulmonary hemorrhage,*" etc., vitiate statistics. Tuberculosis of lungs (28)? Name the disease.]

(V.—DISEASES OF THE DIGESTIVE SYSTEM)

99. Diseases of the mouth and annexa. [Name disease.]
100. Diseases of the pharynx. [Name disease. Diphtheritic?]
101. Diseases of the esophagus. [Name disease.]
102. Ulcer of the stomach.
103. Other diseases of the stomach (cancer excepted). [Name disease. Avoid such indefinite terms as "*Stomach trouble,*" "*Dyspepsia,*" "*Indigestion,*" "*Gastritis,*" etc., when used vaguely.]
104. Diarrhea and enteritis (under 2 years).
105. Diarrhea and enteritis (2 years and over).
106. Ankylostomiasis. [Better, for the United States, Hookworm disease or Uncinariasis.]
107. Intestinal parasites. [Name species.]
108. Appendicitis and typhilitis.
109. Hernia, intestinal obstruction. [State form and whether strangulated. Include only organic intestinal obstruction.]
110. Other diseases of the intestines. [Name disease.]
111. Acute yellow atrophy of the liver.
112. Hydatid tumor of the liver.
113. Cirrhosis of the liver.
114. Biliary calculi.
115. Other diseases of the liver. ["*Liver complaint*" is not a satisfactory return.]
116. Diseases of the spleen. [Name disease.]
117. *Simple* peritonitis (nonpuerperal). [Give cause.]
118. Other diseases of the digestive system (cancer and tuberculosis excepted). [Name disease.]

(VI.—NONVENEREAL DISEASES OF THE GENITOURINARY SYSTEM AND ANNEXA)

119. Acute nephritis. [State cause, especially if due to Scarlet fever, etc.]
120. Bright's disease. [Better, Chronic Bright's disease, Chronic interstitial nephritis, Chronic parenchymatous nephritis, etc. Never report mere names of symptoms, as "*Uremia,*" "*Uremic coma,*" etc.]
121. Chyluria.
122. Other diseases of the kidneys and annexa. [Name disease.]
123. Calculi of the urinary passages. [Name bladder, kidney.]
124. Diseases of the bladder. [Name disease.]
125. Diseases of the urethra, urinary abscess, etc. [Name disease. Gonorrheal (38)?]
126. Diseases of the prostate. [Name disease.]
127. Nonvenereal diseases of the male genital organs. [Name disease.]
128. Uterine hemorrhage (nonpuerperal.)
129. Uterine tumor (noncancerous). [State kind.]
130. Other diseases of the uterus. [Name disease.]
131. Cysts and other tumors of the ovary. [State kind.]
132. Salpingitis and other diseases of the female genital organs. [Name disease. Gonorrheal (38)?]
133. Nonpuerperal diseases of the breast (cancer excepted.) [Name disease.]

(VII.—THE PUERPERAL STATE)

NOTE.—The term puerperal is intended to include pregnancy, parturition, and lactation. Whenever parturition or miscarriage has occurred within one month before the death of the patient, the fact should be certified, even though childbirth may not have contributed to the fatal issue.

Abscess of the breast,	*Metroperitonitis,*
Albuminuria,	*Metrorrhagia,*
Cellulitis,	*Pelviperitonitis,*
Coma,	*Peritonitis,*
Convulsions,	*Phlegmasia alba dolens,*
Eclampsia,	*Phlebitis,*
Embolism,	*Pyemia,*
Gastritis,	*Septicemia,*
Hemorrhage (uterine or unqualified),	*Sudden death,*
	Tetanus,
Lymphangitis,	*Thrombosis.*
Metritis,	

Physicians are requested always to write Puerperal before the above terms and others that might be puerperal in character, or to add in parentheses (Not puerperal).

134. Accidents[1] of pregnancy: [Name the condition.]
    Abortion, [Term not used in invidious sense, Criminal abortion should be so specified (184).]
    Miscarriage,
    Ectopic gestation,
    Tubal pregnancy, etc.
135. Puerperal hemorrhage.
136. Other accidents[1] of labor: [Name the condition.]
    Cesarean section,
    Forceps application,
    Breech presentation,
    Symphyseotomy,
    Difficult labor,
    Rupture of uterus in labor, etc.
137. Puerperal septicemia.
138. Puerperal albuminuria and convulsions.
139. Puerperal phlegmasia alba dolens, embolus, sudden death.
140. Following childbirth (*not otherwise defined*). [Define.]
141. Puerperal diseases of the breast.

(VIII.—DISEASES OF THE SKIN AND CELLULAR TISSUE)

142. Gangrene. [State part affected, Diabetic (50), etc.]
143. Furuncle.
144. *Acute abscess.* [Name part affected, nature, or cause.]
145. Other diseases of the skin and annexa. [Name disease.]

(IX.—DISEASES OF THE BONES AND OF THE ORGANS OF LOCOMOTION)

146. Diseases of the bones (tuberculosis excepted): [Name disease.]
    Osteoperiostitis, [Give cause.]
    Osteomyelitis,

[1] In the sense of *conditions or operations dependent upon,* pregnancy or labor, not "accidents" from external causes.

Necrosis. [Give cause].
Mastoiditis, etc. [Following Otitis media (76)?]

147. Diseases of the joints (tuberculosis and rheumatism excepted). [Name disease; always specify **Acute articular rheumatism** (47), **Arthritis deformans** (48), **Tuberculosis of — joint** (33), etc., when cause is known.]
148. *Amputations.* [Name disease or injury requiring amputation.
149. Other diseases of the organs of locomotion. [Name disease.]

(X.—Malformation)

150. **Congenital malformations** (stillbirths not included:) [Do not include **Acquired hydrocephalus** (74) or **Tuberculous hydrocephalus (Tuberculous meningitis)** (30) under this head.]
Congenital hydrocephalus,
Congenital malformation of heart,
Spina bifida, etc.

(XI.—Diseases of Early Infancy)

151. *Congenital debility*, **icterus**, and **sclerema**: [Give cause of *debility*.]
Premature birth,
Atrophy. [Give cause.]
Marasmus. [Give cause.]
Inanition, etc. [Give cause.]
152. Other diseases peculiar to early infancy:
Umbilical hemorrhage,
Atelectasis,
Injury by forceps at birth, etc.
153. **Lack of care.**

(XII.—Old Age)

154. *Senility.* [Name the disease causing the death of the old person.]

(XIII.—Affections Produced by External Causes)

Note.—Say whether the death was due to **Accident Suicide**, or **Homicide**; and then state the **Means or instrument of death.** The qualification "*probably*" may be added when necessary.

155. **Suicide by poison.** (Name poison.]
156. **Suicide by asphyxia.** [Name means of death.]
157. **Suicide by hanging** or strangulation. [Name means of strangulation.]
158. **Suicide by drowning.**
159. **Suicide by firearms.**
160. **Suicide by cutting** or piercing instruments. [Name instrument.]
161. **Suicide by jumping from high places.** [Name place.]
162. **Suicide by crushing.** [Name means.]
163. **Other suicides.** [Name means.]
164. **Poisoning by food.** [Name kind of food.]
165. **Other acute poisonings.** [Name poison; specify **Accidental.**]
166. **Conflagration.** [State fully, as **Jumped from window of burning dwelling, Smothered—burning of theater, Forest fire**, etc.]
167. **Burns** (conflagration excepted). [Includes **Scalding.**]
168. Absorption of deleterious gases (conflagration excepted):
Asphyxia by illuminating gas (accidental),
Inhalation of — (accidental). [Name gas.]
Asphyxia **(accidental).** [Name gas.]
Suffocation **(accidental)**, etc. [Name gas.]
169. **Accidental drowning.**
170. **Traumatism by firearms.** [Specify **Accidental.**]
171. **Traumatism by cutting or piercing instruments.** [Name instrument. Specify **Accidental.**]
172. **Traumatism by fall.** [For example, **Accidental fall from window.**]
173. Traumatism in mines and quarries:
Fall of rock in coal mine,
Injury by blasting, slate quarry, etc.
174. Traumatism by machines. [Specify kind of machine, and if the Occupation is not fully given under that head, add sufficient to show the exact industrial character of the fatal injury. Thus, **Crushed by passenger elevator; Struck by piece of emery wheel (knife grinder); Elevator accident (pile driver)**, etc.]
175. Traumatism by other crushing:
Railway collision,
Struck by street car,
Automobile accident,
Run over by dray,
Crushed by earth in sewer excavation, etc.
176. Injuries by animals. [Name animal.]
177. **Starvation.** [Not "inanition" from disease.]
178. **Excessive cold.** [Freezing.]
179. **Excessive heat.** [Sunstroke.]
180. **Lightning.**
181. **Electricity** (lightning excepted). [How? Occupational?]
182. **Homicide by firearms.**
183. **Homicide by cutting or piercing instruments.** [Name instrument.]
184. **Homicide** by other means. [Name means.]
185. *Fractures* (*cause not specified*). [State means of injury.
186. Other external causes:
Legal hanging,
Legal electrocution,
Accident, *injury*, or *traumatism* (unqualified). [State Means of Injury.]

(XIV.—Ill Defined Diseases)

187. Ill defined organic diseases:
Dropsy. [Name the disease of the heart, liver, or kidneys in which the dropsy occurred.]
Ascites, etc.
188. *Sudden death.* [Give cause. Puerperal?]
189. Cause of death not specified or ill defined. [It may be extremely difficult or impossible to determine definitely the cause of death in some cases, even if a postmortem be granted. If the physician is absolutely unable to satisfy himself in this respect, it is better for him to write **Unknown** than merely to guess at the cause. It will be helpful if he can specify a little further, as **Unknown disease** (which excludes external causes), or **Unknown chronic disease** (which excludes the acute infective diseases), etc. Even the ill-defined causes included under this head are at least useful to a limited degree, and are preferable to no attempt at statement. Some of the old "chronics," which well-informed physicians are coming less and less to use, are the following: *Asphyxia; Asthenia; Bilious fever; Cachexia; Catarrhal fever; Collapse; Coma; Congestion; Cyanosis; Debility; Delirium; Dentition; Dyspnea; Exhaustion; Fever; Gastric fever; HEART FAILURE; Laparotomy; Marasmus; Paralysis of the heart; Surgical shock;* and *Teething.* In many cases so reported the physician could state the disease (not merely symptom or condition) causing death.]

DEATH, SIGNS.—It is not always easy to determine when life is extinct. The conditions of syncope, asphyxia, and trance most resemble death. It is safest not to rely exclusively on any one sign, but to combine several. The most reliable sign of death is proof of the cessation of the heart's action. Pulselessness is not conclusive. The use of the stethoscope requires technical skill. If a tight ligature is bound about a finger or toe, no change in its color will occur if circulation has ceased; but if there is a heart-beat, however feeble, a livid tint will, in a longer or shorter period, be observable. If it is absolutely established that there is cessation of the heart's action, other indications are unnecessary. Respiration may not be obvious, yet be going on. A cold mirror held before the mouth and nostrils may collect moisture from the breath, and a fleck of cotton-wool placed on the lips may indicate the existence of an air-current and of life. A cup of water placed on the chest will show any movement. The ashy color of the skin, the absence of the pink tint in transparent parts when examined under strong light, the diminished tension of the eyeball, the opacity of the cornea, the cessation of reaction

of the pupil to light, or the absence of vital reaction in the skin on the application of irritants are additional means by which death may be determined.

Subsequent changes in a dead body indicate not only the fact of death, but also the probable time when death occurred. These changes are (1) cooling of the body, (2) hypostasis, or gravitation of the blood to the most dependent parts, (3) rigor mortis, or cadaveric rigidity, and (4) putrefaction.

Dr. Richardson summarizes the more important tests of death as (1) absence of the pulsation of the heart, (2) absence of the respiratory murmur, (3) pressure on veins (*fillet test*), (4) electric test for muscular irritability, (5) the ammonia hypodermic test (*Monteverde's sign*), (6) coagulation of the blood in the veins, (7) rigor mortis, (8) decomposition.

The various tests are as follows: **Balfour's test:** A test for the action of the heart in apparent death. He proposed sticking into the skin over the heart needles having little paper flags fixed in their blunt ends. Should there be contraction of the heart-muscle, movement would be communicated to the paper flags. **Cloquet's needle-test:** A bright needle plunged into the body of the biceps muscle and left there for a time; then examined for signs of oxidation. If found, life is present. **Davis' (Leon) sign:** After death the arteries are pale or yellowish, and void of blood, while during life the vessels pulsate, and have the color of surrounding tissues. **Diaphanous test:** The scarlet-red color of the fingers' edges when held toward the light, due, if life exists, from the blood circulating through the tissues. The scarlet tint does not appear if life is extinct. The test is not to be relied on in all cases, as in syncope the red coloration may be absent. **Fillet test** (*Richardson's test*): A fillet applied to the veins of the arm will not cause filling of the veins on the distal side of the fillet if death is present. **Foubert's test** consists in cutting through one of the intercostal spaces and feeling the heart with the point of the finger. **Laborde's sign:** Same as Cloquet's Needle-test (*q. v.*). **Larcher's sign:** Soon after death the conjunctivæ exhibit externally gray, cloudy discolorations that rapidly become black. They are due either to the formation of films of mucus, or to cadaveric imbibition dependent on putrefactive changes. **Levasseur's sign:** The application of a scarficator and cupping-glass will fail to draw blood if life has been extinct for some hours. **Magnus' sign:** If a finger is tightly bound round with a ligature, the part beyond the constriction will, if the person is living, become bright red, the tint increasing in depth until it finally assumes a uniformly bluish-red color. At the spot, however, where the ligature is applied a narrow white ring becomes visible. No change results from the application of the ligature if life is extinct. **Monteverde's sign:** The injection subcutaneously during life of a little ammonia solution will be followed by a port-wine congestion in surrounding parts, which does not take place in case of death. **Ripault's sign:** During life the circular shape of the pupil is influenced by external pressure only during its actual application. After life, however, external pressure is capable of permanently affecting the normal roundness of the pupillary aperture.

DEATH, SUDDEN, CAUSES OF.—The main causes of sudden death are: Cerebral hemorrhage; rupture of a gastric ulcer; valvular disease of the heart, especially aortic; angina pectoris; rupture of an aortic aneurysm; suffocation during an epileptic fit; shocks of electricity; sunstroke; mental or physical shocks; diabetic coma; uremia; exertion on an overloaded stomach.

DEATH-RATE.—A term arbitrarily expressing the mortality of a place, based upon the number of deaths for each 1000 of population during a period of one year. To determine the death-rate, multiply the number of deaths by 1000 and divide the product by the population.

Death-rate in the Principal Cities.—From the report on Mortality Statistics of 1913, the following death rates for 1913 are taken. In the *United States:* Seattle, Wash., 8.4; Spokane, Wash., 8.9; Portland, Oreg., 9.5; St. Paul, Minn., 11.0; Minneapolis, Minn., 11.6; Oakland, Cal., 12.5; Milwaukee, Wis., 12.7; Grand Rapids, Mich., 13.3; Cambridge, Mass., 13.5; Paterson, N. J., 13.5; Denver, Colo., 13.7; Omaha, Nebr., 13.9; Cleveland, Ohio, 14.2; New York, N. Y., 14.3; Newark, N. J., 14.4; Jersey City, N. J., 14.6; Rochester, N. Y., 14.6; Scranton, Pa., 14.8; Kansas City, Mo., 14.8; Bridgeport, Conn., 14.9; St. Louis, Mo., 14.9; Los Angeles, Cal., 15.0; Chicago, Ill., 15.1; Providence, R. I., 15.2; Columbus, Ohio, 15.3; Philadelphia, Pa., 15.7; Syracuse, N. Y., 15.7; Indianapolis, Ind., 15.7; Worcester, Mass., 15.8; Buffalo, N.Y., 15.8; San Francisco, Cal., 15.9; New Haven, Conn., 15.9; Lowell, Mass., 15.9; Dayton, Ohio, 16.0; Toledo, Ohio, 16.2; Louisville, Ky., 16.2; Boston, Mass., 16.4; Cincinnati, Ohio, 16.9; Pittsburg, Pa., 17.1; Fall River, Mass., 17.2; Washington, D. C., 17.3; Detroit, Mich., 17.3; Atlanta, Ga., 17.4; Birmingham, Ala., 17.4; Nashville, Tenn., 17.8; Baltimore, Md., 18.5; Albany, N. Y., 19.8; New Orleans, La., 19.9; Richmond, Va., 20.4; Memphis, Tenn., 20.8. *Foreign Cities* (Death rate in 1912): The Hague, 10.9; Amsterdam, 11.2; Rotterdam, 11.3; Sydney, 11.4; Toronto, (1911), 12.6; Turin, 12.9; Dresden, 13.1; Christiania, 13.4; Brussels, 13.5; London, 13.6; Hamburg, 13.6; Melbourne, 14.0; Copenhagen, 14.1; Stockholm, 14.2; Berlin, 14.4; Munich, 14.7; Vienna, 15.4; Edinburgh, 15.7; Prague, 15.8; Milan, 15.8; Paris, 16.3; Glasgow, 17.6; Belfast, 18.1; Breslau, 18.4; Budapest, 18.5; Montreal, 20.0; Dublin, 20.5; Venice, 20.9; Trieste, 21.1; Rio de Janeiro, 21.3; St. Petersburg, 21.9; Moscow, 24.3; Bucharest (1911), 26.1.

DECAPITATION.—See Embryotomy.

DECIDUA, DISEASES.—The hypertrophied mucous membrane that lines the uterus during pregnancy. This hypertrophy is accomplished mainly by proliferation of connective-tissue cells (decidual cells) lying above the uterine glands.

Three different varieties of decidua are described: The decidua *serotina*, which forms the

maternal part of the placenta; the decidua *reflexa*, which grows about the ovum and completely envelops it; and the decidua *vera*, which lines the remaining part of the uterine cavity.

Apoplexy.—This not infrequently occurs during the early weeks of pregnancy, and is usually due to nephritis, excessive coitus, or traumatism. It is a very common cause of early abortions, particularly those occurring in newly married women.

Inflammation.—This is usually chronic in character, and comprises the various forms of *endometritis gravidarum:* the *hyperplastic*, the *polypoid*, the *catarrhal*, and the *cystic*. In the last two a thin mucous fluid is secreted, which accumulates between the membranes, and is finally expelled with a gush (*hydrorrhœa gravidarum*). Several such gushes of fluid, varying in quantity from a few drams to a pint or more, may occur throughout pregnancy. Abortion or miscarriage commonly results.

Acute inflammation of the decidua is very rare; it sometimes occurs as a complication of the exanthematous diseases.

Tumors.—The usual variety is the *deciduoma*, which may remain for a long time in the uterus, giving rise to hemorrhage, leukorrhea, and sometimes sepsis. It is due to hyperplasia of a retained portion of the decidua, and should be removed with the curet or placental forceps.

These growths occasionally become malignant in character (*deciduosarcoma*).

DECIDUOMA.—See Decidua (Diseases).

DECOCTIONS, Decocta.—Liquid preparations made by boiling vegetable substances with water. As very few drugs contain active ingredients which are not injured by heat, these preparations have never obtained favor with scientific physicians. The official general formula for decoctions prescribes that when the strength is not directed by the physician, nor specified by the Pharmacopeia, they shall be prepared in the proportion of 5 grams of the substance with 100 c.c. of water; but that the strength of decoctions of energetic or powerful substances should be specially prescribed by the physician.

DECOMPRESSION.—See Craniectomy, Trephining.

DECUBITUS.—A term denoting a recumbent or horizontal position. Also, the position of a patient in bed. It is the German name for Bed-sore (*q. v.*). In cardiac and pulmonary diseases, in consequence of interference with the cardiac or respiratory functions, a patient is obliged to be propped or to sit up in bed, to assume the erect posture, or to bend forward. In unilateral lung-disease or in pleurisy the patient lies on the affected side. In heart affections inability to lie on the left side may exist. In acute peritonitis the patient lies on his back, the knees well drawn up and bent to relax the abdominal muscles. In spasmodic affections of the abdominal regions the patient is often doubled up, making pressure upon the abdomen. In cerebral meningitis the patient lies curled up, all the limbs bent toward the body. In spinal meningitis the head is involuntarily bent backward to relax the muscles behind. In tetanus the body is in various fixed positions, according to the muscles affected. The position voluntarily assumed by a limb may give important information as to local disease or injury, especially of the joints. The whole body may be distorted in diseases of the articulations.

DEFECATION, DISORDERS.—In some injuries and diseases of the spinal cord or brain the controlling action of volition is annihilated, and the power to restrain or induce defecation is lost. The sphincter may be irritable or subject to spasm, the muscular fibers of the rectum may lose their tone and be incapable of extruding the feces. Overdistention often results in an atonic condition of the rectum, and fecal accumulations ensue.

The treatment of fecal accumulation requires that the masses be first broken up and scooped out, since injections have no effect in softening the indurated mass, acting only on the surface and immediately returning. After the breaking up and extraction of the larger portions, injections of soap and water will be sufficient to remove the remainder.

Involuntary defecation may be caused by violent contraction of the expiratory muscles, by increased peristaltic action of the intestines, or by abnormal relaxation of the sphincter ani muscle, either reflexly, from cerebral disease, disease of the spinal cord, or local lesions. Reflex inhibition may also arise from the presence of worms, from fissure of the anus, or from vesical calculus.

The treatment is of no avail beyond removal of the cause. Worms and fecal impaction require direct treatment. Diseases of the nerve-centers are too frequently incurable, but cleanliness and such measures as permit of the escape of the discharges will relieve much distress. See Constipation, Diarrhea, Feces.

DEGENERATION, REACTION.—Decrease and loss of faradic excitability in both nerves and muscles, the galvanic excitability of the muscles remaining unimpaired, sometimes notably increased, and always undergoing definite qualitative modifications. It is due to a degenerative atrophy in the nerves and muscles, eventually in the muscles only, whose origin is always nervous, paralytic, or atrophic, and whose seat is in the peripheral nerves, motor roots, or central gray substance. Strict cerebral disease is excluded. The lesion is either in the peripheral nerves or spinal cord. This reaction is of special value in prognosis. When there is only partial reaction of degeneration,—*i. e.*, slight diminution of both galvanic and faradic excitability, "a less maximum contraction rather than a later minimum"—the disease will probably last 1 or 2 months; if complete, it will last much longer.

The reaction of degeneration embraces the following modifications of irritability: (1) Disappearance or diminution of nervous irritability to both galvanic and faradic currents; (2) disappearance of faradic and increase of galvanic irritability of muscles, generally associated with an increase of mechanic irritability; (3) disappearance of faradic and increase of galvanic mus-

cular irritability, associated generally with increased mechanic irritability; (4) tardy, delayed contraction of muscles, instead of the quick reaction of normal muscles; (5) marked modification of normal sequence of contraction.

A special variety is the so-called reaction of exhaustion, which is a condition of nervous and muscular irritability to electric excitation, in which a certain reaction produced by a given current strength cannot be reproduced without an increase of current strength.

See Electricity, Motor Points, Nervous Diseases (Examination).

DEGLUTITION, DISORDERS.—See Dysphagia.

DELIRIANTS.—Drugs that excite the functions of the higher brain to such a degree as to disorder the mental faculties, producing intellectual confusion, loss of will-power, delirium, and even convulsions. They are all narcotics (though all narcotics are not deliriants), and may be listed as follows: Belladonna, stramonium, hyoscyamus, turpentine, alcohol, chloral, ether, chloroform, cannabis indica, lupulus (at first), opium (at first), nitrous oxid gas.

DELIRIUM.—According to a well-known neurologist, delirium is a general disturbance or perversion of consciousness, characterized by an apparent exaltation of mental processes, which close examination, however, shows to be in reality a diminution or restriction in apperception, although association may be accelerated, and in consequence seemingly enriched. It manifests itself in detail by some degree of mental irritation and confusion, by more or less transitory delusions and fleeting hallucinations, by disordered, senseless speech, and by motor unrest. It varies in intensity from the slightest so-called "flightiness" to a most intense maniacal condition. The term is not to be used synonymously with insanity.

The following is the classification of Collins:

Classification.—Primary delirium—delirium acutum, delirium grave—is not a disease *sui generis*. In other words, it is not an individual affection, but a condition of varying mental disturbance, which occasionally attends different states of bodily disorder, such as collapse, intoxication, katatonia, etc., although it is often, if not always, dependent upon, or at least associated with, demonstrable changes in the cortex of the brain.

Secondary delirium is by far the more common and the least understood. It may be subdivided into the delirium of (1) infection, (2) intoxication, (3) exhaustion, (4) irritation (peripheral and central), and (5) senility.

The deliriums of infection are more common in the young and in the able-bodied. They occur particularly with the diseases that are dependent upon specific organisms, such as typhoid fever, pneumonia, scarlet fever, yellow fever, puerperal fever, pyemia, etc., although delirium occurs with analogous diseases that have not yet been proved to be dependent upon specific organisms.

Deliriums of intoxication may be subdivided into endogenous and exogenous. The endogenous comprise those dependent upon septic intoxicants, and are included under the head of sapremia, uremia, cholemia, diabetes, autointoxication, insolation, etc., while the exogenous include those due to alcohol, the drugs constituting the group of mydriatics, morphin, cocain, mineral poisons, iodoform, and the like.

The deliriums of exhaustion may be subdivided into those due to inanition; to acute anemia, such as results from hemorrhage, or from the presence in the blood of some powerful hemic dissociation substance, such as exalgin; the plasmodium of malignant forms of malaria; wasting diseases; excessive lactation, and the like.

The deliriums of central or peripheral irritation may be subdivided into those due to local injury of the brain—such as blood-clot from accidental trauma or surgical operation—to meningitis, to acute encephalitis, or to other central diseases. The peripheral irritation or excitation that may be associated with delirium is pain, a condition that could not be manifested without central interpretation. Delirium may also be due to, or associated with, states of central depression, such as those of epilepsy, hysteria, etc.

The delirium of senility requires no subdivision, for although it occurs under the apparent auspices of different exciting factors, it in reality is associated with the pathologic state of the vascular system incident to old age.

Collins summarizes the points in the treatment of delirium somewhat as follows:

Treatment.—The general indications in the treatment of delirium are (1) to secure sleep; (2) to overcome motor unrest; (3) to prop and maintain the patient's vitality by contributing to his nutrition; and (4) to discover and remove the cause upon which the delirium is dependent.

To meet the first indication hypnotics are almost always required, although it should never for a moment be forgotten that an hour's sleep induced by measures taken to fulfil the third condition is far more salutary than 3 hours' sleep obtained by the use of a hypnotic. Moreover, that in many forms of asthenic delirium, whether the asthenia is induced by infection, intoxication, exhaustion, senility, etc., sleep is more readily induced and maintained by measures directed immediately against the asthenia than against the insomnia. In the selection of a hypnotic the one least depressant to the patient's vitality, and least likely to be followed by depression, should always be given preference. The motor depressants should never be used in the delirium accompanying the asthenic state, except as the very last resort. In certain forms of sthenic delirium, and especially those in which a sedative effect cannot be produced by the external application of water, drugs that are motor depressants, and at the same time hypnotics may be used with the greatest benefit. Of these, the alkaloids of hyoscyamus are the most available. Bromids and other sedatives are used too frequently and too indiscriminately, apparently in forgetfulness of the fact that they may, by adding to the vascular depravity that is so often at the bottom of the delirium accompanying

asthenic states, intensify and prolong the duration of the symptoms for which they are given.

The second principle is that great care should be exercised in the application of mechanic restraints in all forms of asthenic delirium, lest the encroachment on respiratory capacity lead to pulmonary complications that jeopardize the life of the patient. Whenever possible, physical restraint is very much less dangerous.

The third principle is that of maintaining the patient's vitality. Alcohol and strychnin are of great value. A factor of great importance in the early stages, and much more so in the later, is the careful, judicious administration of partially or readily digested food in small quantities and of a temperature equal to that of the body. Oftentimes it is necessary to indulge in forced feeding. As in all acute asthenic conditions, stimulants must be given early.

The meeting of the fourth indication—viz., the discovery and removal of the cause of the delirium—is, after all, the most essential procedure in the treatment of this symptom.

The treatment of the secondary deliriums is further discussed under the special headings of the exciting diseases. See Alcoholism, Typhoid Fever, etc.

DELIRIUM TREMENS.—See Alcoholism.

DELIVERY.—See Labor, Fetus, etc.

DELUSION.—False judgment of objective things, as distinguished from illusion and hallucination. It is the result of an abnormal condition of the brain. An *insane delusion* is a false belief for which there is, or may be, no reasonable foundation and which would be incredible under the given circumstances to the same person if of sound mind, and concerning which his mind is not open to permanent correction through evidence or argument. A delusion may be systematized or unsystematized, the former being the more serious, and occurring in the chronically insane. See Insanity.

DEMENTIA.—A mild form of insanity marked by imperfect conception, illogic sequence of expression, loss of reflection, and impaired perception. There is partial loss of self-control and self-respect. Dementia is often a final stage of other forms of insanity. It is described under the various forms of **secondary, senile, organic,** and **alcoholic.** There is a general atrophy of the brain-substance, with a compensatory thickening of the brain membranes, and an increase of the fluid of the brain and of the neuroglia. See Insanity.

DEMENTIA PRÆCOX. (Adolescent Insanity).—This is essentially a disease, as the name indicates, associated with the time of puberty and adolescence. While it may occur spasmodically in an otherwise healthy family, heredity plays an important part in its etiology. It frequently develops in families with an insane taint, and not infrequently two or more children of the same family may be affected. While it may develop on a basis of deficient mental power it may on the other hand occur in those of unusual mental power. In the latter group of cases, the mental precocity may be ill-balanced with a tendency to an over-development of the imaginative processes. In the dull or stupid child a differentiation should be made between dementia præcox and the mental break the result of an exceptional mental stress or strain in high grade imbeciles. It is important from the medico-legal standpoint that severe physical and mental shock, hemorrhages, infection, and the mental stress following seduction and desertion may determine the onset in a predisposed individual. In addition to the infectious and toxic processes, the disturbance of metabolism associated with perversion of the internal secretions has been given as a cause for the disease.

The essential symptom of this disease is dementia. While the majority of these cases present this symptom progressively from a relatively early stage of the disease, it may become manifest in some cases only after several months or even late in the disease. Twenty to thirty percent of cases may go on to relative recovery, with, however, as a rule, some mental reduction.

Boys or girls who have previously not shown mental symptoms at the same time of adolescence begin to manifest lack of interest in themselves, their work and their surroundings. This is associated with inability to concentrate on their studies, failure or lack of attention, or abnormal, pathological moodiness. The memory is usually faulty for recent events, which may be partly due to lack of attention, or may on the other hand be the manifestation of a progressive dementia. In the latter event, there is in addition to failure of memory, a general failure of mental tone manifested by a failure of the reasoning power and the judgment. There is in addition to this a partial or usually a complete loss of emotional expression. There is no manifestation of joy or sorrow or, as far as can be determined, no expression of it. The patients usually understand what is said to them and if their attention is aroused some show a fairly normal appreciation of time, place and personality. Five different varieties have been described depending upon slight additions to or variations of the above picture:

1. Simple dementia.
2. Hebephrenia.
3. Catatonia.
4. Paranoid præcox.
5. Mixed forms.

In the *simple* forms in addition to the above symptoms delusions based on hallucinations of sight or sound may be present. These patients not infrequently present negativism—a resistance in thought and action to the commands and desires of those about them.

In the *hebephrenic* form the onset may be relatively sudden with marked mental depression, disagreeable hallucinations and delusions and a tendency to self destruction. The individuals are silly in manner and action and the delusions not infrequently center about the neurosexual sphere. Periods of depression may alternate with periods of marked excitement, which in some

cases advances to maniacal form with both homicidal and suicidal impulses.

The *catatonic* form represents a fairly definite clinical picture of mental depression followed by catatonic stupor, with marked negatism, mutism and muscular hypertension interrupted by periods of catatonic excitement. Catalepsy is frequently seen in this form.

In the *paranoid* form progressive dementia is associated with exaltation of the ego, delusions of personal grandeur, without, however, the systematized logical reasoning of the true paranoic.

Legal Relations of Dementia Præcox—Prosecution of individuals suffering with dementia præcox for incorrigibility, forgery, breach of contract, homicide and attempts at suicide not infrequently occur. In homicide cases the paranoid form presents much difficulty both as to diagnosis and the question of responsibility. In the fully developed cases, the individual is subjected to the same tests as is paranoid and other forms of insanity (Reese).

DEMULCENTS.—Substances administered for their soothing effects on mucous membranes. Their action is usually mechanic, and they are of a mucilaginous character. Applied to the skins demulcents are called emollients. The demulcents, in ordinary use are: Acacia, cetraria, barley, licorice, starch, glycerin, flaxseed, gelatin, honey, marsh-mallow, white of egg, almond, olive oil, isinglass, tragacanth, bland oils.

DENGUE (Break-bone Fever; Neuralgic Fever; Dandy Fever).—An acute, epidemic, tropical and subtropical febrile disease, consisting of 2 paroxysms of fever with an intermission. The first paroxysm is characterized by high fever, distressing pains in the joints and muscles, and a peculiar eruption; the second paroxysm is characterized by a milder fever, an eruption of different character, attended by intense itching, by some recurrence of the joint pains, and by debility. The specific cause, probably a microorganism, is as yet unknown, but it is evident that a peculiar condition of the atmosphere has some influence in its development. According to Graham, who made a study of 500 cases in Beyrout, Syria, the direct cause is a hemameba resembling the malarial plasmodium, the infectious agent being the intermediary host of the parasite, the culex fatigans, the common mosquito of Beyrout. The time of incubation is from 2 to 6 days.

Symptoms.—The onset is sudden—fever, 103° to 105° F., intense headache, burning pains in the temples, backache, severe aching and swelling of the joints and stiffness of muscles, nausea, vomiting, constipation, and the appearance of a rash resembling scarlatina, from which the disease has been mistaken for scarlatinal rheumatism. After some hours to 2 or 3 days a distinct intermission obtains, of 1 or 2 days' duration. The onset of the second paroxysm is also sudden, but the symptoms are much less severe, although the patient is greatly debilitated; it is at this time that the characteristic eruption appears, being either erythematous or rubelous, and attended by intense itching, remaining for about 2 days, when desquamation occurs and convalescence is established, but is prolonged by great debility of the patient. The average duration of the disease is 8 days. Relapses are common.

Diagnosis.—It is most likely to be mistaken for acute articular rheumatism, especially during the first paroxysm; but the course of the disease and the epidemic influence should prevent such an error. The eruption might be mistaken for scarlet fever or measles were it not for the severe joint and muscular pains and the absence of the angina of scarlet fever and the coryza of measles. It is also to be distinguished from influenza by the absence of catarrhal symptoms and the presence of the skin eruption, by the definite and intense character of the pains, by the absence of the bacillus of influenza in the nasal and bronchial secretions, and from malaria by the absence of the malarial parasites in the blood.

From yellow fever dengue is distinguished by the absence of the slow pulse with rising temperature characteristic of the former disease, by the pronounced joint pains, by the absence of jaundice, albuminuria (except rarely and then only temporarily), and black vomit. See YELLOW FEVER.

Prognosis.—Deaths practically never occur.

Prophylaxis.—This depends upon the destruction of all mosquitoes, and screening the houses and patients.

Treatment.—There is no specific. The fever must be controlled, pain relieved, and prostration combated by stimulants. See MALARIAL FEVERS.

DENTAL ANODYNES.—Substances employed locally in toothache due to caries exposing a nerve filament; such as *aconite*, *opium* and *cocain salts*, also creosote, phenol, and potassium chlorate. A solution, containing the three first named, applied on a pledget of cotton, will promptly relieve whenever the nerve is accessible.

DENTIFRICES.—Medicated powders or pastes used to cleanse the teeth and gums. Finely-powdered chalk is the basis generally used; orris-root is very popular; antiseptics, such as borax, quinin, oil of wintergreen, carbolic acid, etc., are incorporated, tincture of myrrh is an excellent ingredient, being an aromatic, stimulant, and disinfectant. All dentifrices should be slightly alkaline.

DENTITION.—The eruption of the teeth. Dentition is *primary*—that is, the cutting of the temporary or milk-teeth; and *secondary*, or that of the permanent teeth. The primary teeth are described under DENTITION (Disorders) (*q. v.*). Secondary dentition commences about the sixth year. The permanent teeth consist of 2 *incisors*, 1 *cuspid* or *canine*, 2 *premolars* or *bicuspids*, and 2 *molars* in each lateral half of each jaw. The last molar of each half-jaw is cut at an age of from 18 to 25 years, and is therefore called a *wisdom-tooth*. The upper canine teeth are popularly called *eye-teeth*; the lower canines, *stomach-teeth*. The upper central incisors are sometimes called *butter-teeth*. In structure the tooth consists of a hard *enamel*, incasing the crown, the *dentin*, within the enamel, constituting the whole of the root and

interior of the crown; and the *pulp*, a bulbous prolongation of the mucosa of the gums, which is traversed by blood-vessels and nerve filaments. The dentin of the root is surrounded by the cement or *crusta petrosa*. The exposed part of the tooth is the *crown*, the middle part the *neck*, and the part within the alveoli the *fang* or *root*. See TEETH.

DENTITION, DISORDERS.—The eruption of the temporary teeth (20 in number) begins at about the sixth or seventh month, and continues until about the twenty-fourth month.

They are usually erupted in the following order:

	Months after Birth (Approximately).
Lower central incisors	7
Upper central incisors	8
Upper lateral incisors	9
Lower lateral incisors	12
First molars	14
Canines	18
Second molars	22

The eruption of the PERMANENT TEETH in the *lower jaw* is shown in the following table, the corresponding teeth in the *upper jaw* appear a little later:

	Years.
First molars,	6
Central incisors,	7
Lateral incisors,	8
First bicuspids,	9–10
Second bicuspids,	9–10
Canines,	11
Second molars,	12
Third molars (wisdom teeth),	17–25

Variations in Temporary Dentition.—In children in other respects perfectly healthy and normal the 3 following variations are noticed as to the time and order in which the teeth appear—viz.:

1. **Early Dentition.**—A child may be born with one or more teeth. They may appear any time prior to the sixth month—in the fourth or fifth quite frequently.

2. **Late Dentition.**—The first tooth may not appear until the ninth or tenth month, or as late as the twelfth or fourteenth month.

3. **Irregular Dentition.**—They may be erupted out of the regular order.

Late or irregular dentition is very suggestive of rickets and always shows a condition of malnutrition.

The first permanent teeth (4 molars) appear at the sixth year, and the last (the wisdom teeth), completing the set of 32, the eighteenth to twenty-fifth year.

The disturbances incident to teething may be divided into:

1. **Local.**—The gums may be hot, painful, and tender. There may also occur a catarrhal stomatitis, with increased salivary secretions that, by dribbling, excoriate the chin, and may by wetting the chest cause a bronchitis.

2. **Sympathetic or Reflex.**—Any of the following complications may occur: *Eye:* More or less severe inflammation. *Ear:* Catarrhal or purulent otitis media. *Digestive tract:* Gastrointestinal disturbances. *Respiratory tract:* Bronchitis, cough, etc. *Skin:* Erythema, urticaria, eczema. *Nervous system:* Restlessness, disturbed sleep, convulsions.

Treatment.—Cleansing the mouth with boiled water or with a solution of borax, 10 grains to the ounce of water, before and after feeding, clean nursing-bottles and nipples, good hygiene, proper food, and attention to the child's general condition will usually be sufficient to prevent most, if not all, of these difficulties. When, in spite of the best care, or from carelessness or other causes, such complications do arise, they require careful treatment.

Locally, an antiseptic mouth-wash, as sodium salicylate, 10 grains to the ounce of rose-water; or, in mild cases, a borax solution should be applied with a soft cloth every 3 hours.

Internally, for digestive disturbances or bronchitis, the following powder should be given every 2 or 3 hours until the bowels are freely acted upon:

℞. Mercury with chalk,		gr. 1/6
Sodium bicarbonate, Sugar of milk,	each,	gr. j.

There may be added with benefit, if there is fever or restlessness, 1/2 grain of phenacetin or acetanilid.

When the pain is severe, the nervous symptoms prominent, and sleep impossible, chloral and the bromids will be found among the safest and most efficient anodynes.

℞. Chloral hydrate,		gr. xvj
Sodium bromid, Sodium bicarbonate,	each,	gr. xxx
Syrup of lactucarium, Water,	each,	ʒ iv.

Give one-half of a teaspoonful every hour until quiet. This amount may be given to a child 6 months old.

In exceptional cases, when the gums are swollen and inflamed from the irritation of the tooth that has not yet come through, lancing the gums may reduce the congestion and hasten the appearance of the tooth. The teeth should not be "rubbed through," nor the child given hard substances to bite upon, as is frequently done.

DEODORANTS.—Agents that destroy foul odors The *volatile deodorants* are chiefly oxidizing and deoxidizing substances, acting chemically on the obnoxious gases; while the *nonvolatile deodorants* are mainly absorbents that condense and decompose the effluvia. The deodorants in general use are the following: Formaldehyd, chlorin gas, sulphurous acid gas, hydrogen dioxid, potassium permanganate, coffee (freshly roasted), charcoal, earth, lime, and ferrous sulphate.

For removing the fetid exhalations emitted by the feces, the following powder is a very efficient and cheap deodorizing and disinfecting agent: Zinc sulphate, 2 pounds; sulphuric acid, 1 1/2 to 2 1/2 drams; essence of mirbane, 1 dram; indigo blue, 2 grains. About a dessertspoonful of this salt is placed in the bed-pan or chamber utensil before it

is used. Contact with urine or with a liquid stool causes its prompt solution, deodorization is instantaneous, the liquid excreta are at once sterilized, and the fetor is changed to a rather agreeable odor. Oil of eucalyptus has the property of spreading rapidly over water in a thin film, and if a few drops are sprinkled over the water in the pan of a water closet before using the latter, no fecal odor will arise therefrom. See FECES.

DEPILATORY.—A substance used to destroy the hair, usually a caustic alkali. The agents most commonly used are arsenic, calcium sulphid, barium sulphid and quicklime. See ELECTROLYSIS, HYPERTRICHOSIS.

DEPLETION.—The process of diminishing the quantity of any tissue or fluid of the body, especially the blood. It is practised in such affections as cerebral congestion, uremia, acute poisoning with lead, acetanilid and other blood poisons, venous turgescence, engorgement of the portal system, pulmonary congestion, renal ischemia, aneurysm, or general plethora. The agencies are blood-letting, general and local; purging; vomiting; sweating; and abstinence from food and drink. General blood-letting is the most powerful, and is serviceable in engorgement of the right heart and venous system, from disease of the heart or of the lung, or from impaired respiratory movement, and also in visceral congestion and arterial turgescence. See VENESECTION. Local blood-letting is accomplished by CUPPING, LEECHING, AND SCARIFICATION (*q. v.*).

Free purging by hydragog cathartics relieves the turgid vessels. Elaterin, scammony, jalap, senna, magnesium, sodium sulphate, croton oil, gamboge, mercury, antimony, and resin of podophyllin are useful. See CATHARTICS.

Antimony, used as an *emetic*, has depressant as well as depletory effects; and when emetics are used as depletents, this depressant action should be borne in mind.

Sweating will reduce arterial tension, and is of especial service in renal disease. Active exercise, hot air, Turkish bath, vapor bath, wet packing, pilocarpin nitrate, antimony, Dover's powder, and spirit of nitrous ether, or a judicious combination of these measures with copious drafts of hot liquids, are measures of depletion through the action of the skin. Depletion through abstinence is employed in the treatment of aneurysm.

DEPRESSANTS.—Medicines that retard or depress the physiologic action of an organ; sedatives. Cardiac depressants lower the action of the heart. Cerebral depressants arrest the functions of the cerebrum. Motor depressants lower the activity of the spinal cord and motor apparatus.

Cardiac depressants.—See CARDIANTS.

Cerebral depressants include the NARCOTICS, ANESTHETICS (General), and several ANTISPASMODICS (*q. v.*).

The principal **motor depressants** are curare, physostigma, conium, gelsemium, opium, morphin, apomorphin, belladonna, atropin, stramonium, hyoscyamus, muscarin, pulsatilla, grindelia, phytolacca, pilocarpus, quebracho, aconite, veratrum, tobacco, lobelia, digitalis, arnica, ailanthus, saponin, spartein, ergot (at last), quinin (large doses), camphor, alcohol (large doses), ether (large doses), chloroform (large doses), chloral, bromids, potassium salts, many metallic salts, amyl nitrite, nitroglycerin, hydrocyanic acid, potassium cyanid, methylstrychnin, many methyl compounds, ammonium cyanid, ammonium iodid, many compound ammonias, galvanism, and cold.

Hepatic depressants are agents that lower the functional activity of the liver, reducing the quantity of bile secreted, and lessening the production of glycogen and urea. They are as follows (Potter)—viz.:

Lessening Bile.—Lead acetate, atropin, calomel, chloral, castor oil, gamboge, magnesium sulphate.

Diminishing Glycogen.—Opium, morphin, codein, phosphorus, arsenic, antimony.

Lessening Urea.—Opium, morphin, codein, colchicum, alcohol, quinin.

Many purgatives act as hepatic depressants and diminish the secretion of bile by lowering the blood pressure in the liver, and by carrying off the materials from which bile might be formed.

Renal depressants directly diminish the activity of the renal cells, and lessen or suspend the secretion of urine. Morphin, quinin, and ergot act in this way through the circulation, and digitalis may arrest the renal circulation by contracting the vessels. Strychnin and caffein in large doses have similar action, and it is well to combine with them drugs that dilate the renal arteries, such as alcohol or nitrous ether.

Respiratory depressants are cold, opium, physostigma, muscarin, lobelin, gelsemium, aconite, veratrin, hydrocyanic acid, conium, alcohol, ether, chloroform, chloral, saponin, caffein, colchicin, nicotin, quinin, camphor, and carbolic acid.

Uterine depressants lower the activity of the nervomuscular apparatus that controls the uterine contractions. The most important are opium, bromids, cannabis, viburnum prunifolium, chloral, chloroform, tartar emetic, tobacco, copper sulphate, emetics, and piscidia erythrina.

DERMATITIS. Definition.—Dermatitis, or inflammation of the skin, is a cutaneous disorder characterized by heat, redness, pain, and swelling; in other words, by the ordinary phenomena of inflammation. The term is restricted to acute inflammations the result of known irritants. It is classified as follows:

DERMATITIS CALORICA.—See BURNS, FROST BITE, etc.

DERMATITIS EXFOLIATIVA (Acute General Dermatitis; Pityriasis Rubra).—A rare inflammation of adults, especially men, often ushered in with some constitutional disturbance. After a more or less general erythema with more or less infiltration has been present several days, exfoliations appear, grayish-brown scales on a red shiny skin. More or less itching is present. The disease may be grafted upon a squamous eczema or psoriasis. Gout, rheumatism, tuberculosis and certain drugs seem to be predisposing factors. The disease lasts from several weeks to a few months and tends to recur. The acute type is very similar to erythema scarlatinoides, but the

latter is markedly acute and shows no infiltration of the skin. General treatment is symptomatic and local, and consists of soothing applications. There are two varieties that are probably infectious:

(1) **Dermatitis exfoliativa epidemica** has been observed in institutions chiefly among elderly men. It is accompanied by loss of hair and nails and conjunctivitis.

(2) **Dermatitis exfoliativa neonatorum** (Ritter's disease) occurs during the first weeks of life. The disease may take on a suppurative form and death may occur from septicemia or marasmus.

DERMATITIS GANGRENOSA INFANTUM. Synonyms.—Varicella gangrenosa; multiple disseminated gangrene of the skin in infants, pemphigus gangrenosus, ecthyma gangrenosa.

A gangrenous eruption of infants and young children following usually varicella and also frequently vaccinia, measles or pemphigus, and sometimes arising spontaneously in debilitated infants. The disease is undoubtedly due to some microorganism, such as the streptococcus pyogenes or the bacillus pyocyaneus, each of which has its advocates. When it follows a vesicular or pustular eruption the lesions of the primary disease persist, become crusted and ulcerate. These ulcers are "punched out" in appearance and may coalesce. Constitutional symptoms may be severe. There may be high fever, vomiting, diarrhea, heart and lung complications, and septicemia. Indelible scars are left.

The prognosis is guarded, depending upon age, number of lesions, and character of complications.

The treatment is supportive. The general health should be built up by proper nourishment, fresh air, tonics. Crocker advises quinin in 1- or 2-grain doses, in milk every 4 hours. Complications should be treated as they arise. Locally, antiseptics are necessary, such as bichlorid solution (1 to 5000) or ichthyol ointment (5 to 10 percent).

DERMATITIS HERPETIFORMIS. Synonyms.—Duhring's disease; hydroa; herpes gestations.

Definition.—Dermatitis herpetiformis is an inflammatory disease of the skin, characterized by grouped erythematous, papular, vesicular, pustular, and bullous lesions occurring in varied combinations. It is accompanied by burning and itching, and runs a chronic course with remissions.

Symptoms.—In severe cases there are elevation of temperature, malaise, chilliness, etc. The eruption may appear gradually or suddenly.

The erythematous, vesicular, bullous, pustular and multiform eruptions are the common varieties of the disease. There is a distinct tendency for one variety to pass into another variety—for, instance, for the vesicular to become pustular or bullous, or the reverse. Burning and itching are practically always present, and in some cases are intense.

Erythematous Variety.—This form occurs in marginate patches or in diffuse efflorescences, resembling erythema multiform. Urticaria-like edematous infiltrations may also occur. The color may be raspberry-red, mottled and tinged with yellowish, brownish, or variegated, with later a variable degree of pigmentation. Erythematopapular and vesicular lesions often coexist. Itching and burning are marked.

Vesicular Variety.—This is the most common form. It is marked by pinhead- to pea-sized, flat or raised, irregularly shaped or stellate, distended vesicles, frequently without an inflammatory areola. They are usually aggregated in clusters of 3 or 4 lesions. They often tend to coalescence, but not to rupture. Itching is severe, often intense, but abates considerably upon rupture or laceration of the vesicles. The eruption appears in crops.

Bullous Variety.—The lesions consist of distended, irregular-shaped, angular bullæ, occurring in groups of 3 or more, often without areola. Small pustules frequently appear in the neighborhood, and erythematous and vesicular lesions may likewise be present. Itching and burning are severe.

Pustular Variety.—Two kinds of pustules appear: the one small (miliary), pin-point to pinhead-sized, and perfectly flat; the other large, elevated, rounded or acuminate, and situated upon an inflammatory base. There is a tendency to arrangement in clusters of 3 or 4 pustules. Vesicles and blebs may complicate the eruption, although the pustular type often remains as such, even throughout successive outbreaks.

Papular Variety.—Rare. It is the mildest expression of the disease. More commonly papulovesicles, resembling an abortive herpes zoster, develop.

Multiform Variety.—In this form erythematous patches, papules, vesicles, blebs, pustules, and pigmentation are commingled in various combinations.

The course of dermatitis herpetiformis is variable, but in nearly all cases is chronic, lasting for years in the form of relapses; or, indeed, at times continuously.

Etiology.—The disease occurs generally between the ages of 30 and 60. It is due to various causes, among which may be mentioned physical and psychic nerve shock, pregnancy, disordered menstruation, puerperal septicemia, and renal insufficiency; the nervous system, however, is directly responsible for the cutaneous manifestations. There is, in most cases, a lowering of the general nerve tone.

Pathology.—There is an acute inflammation of the papillary layer of the corium, with the formation of vesicles between the corium and epidermis, and the exudation of large numbers of polynuclear leukocytes and eosinophiles. The epidermis is but secondarily involved.

Diagnosis.—The polymorphism and herpetiformity of the eruption, the intense itching, and the history, course, and chronicity of the disease will aid in distinguishing it from pemphigus, erythema multiforme, and impetigo herpetiformis—diseases that it at times closely resembles.

The vesicles and blebs of dermatitis herpetiformis are peculiar in that they are of marked irregular outline—sometimes stellate, quadrate, or oblong, etc. In drying they are likely to present a puckered appearance.

They are herpetiform in that they occur in

groups, have inflammatory bases, and do not tend to spontaneous rupture, resembling in these respects herpes zoster.

Prognosis should be guarded. The disease is persistent and is refractory to treatment. In addition there is a strong tendency to recurrence. In rare cases the pustular or bullous type may prove fatal.

Treatment.—The first effort should be directed toward the removal or modification of the underlying cause, if ascertainable. The nervous system is, in most cases, at fault, and remedies should be administered with a view of restoring the normal nerve tone. There are no specifics, but arsenic often acts in a gratifying manner. In other cases, however, it is of no value. Phenacetin, cannabis indica, and belladonna may be tried; and such tonics as quinin, strychnin, and iron are sometimes of value.

Local Treatment.—Blebs should be incised or punctured, and the contents evacuated. Lotions containing tar, carbolic acid, ichthyol, and resorcin are useful. These may be followed by an ointment of salicylic acid. In the vesicular and pustular forms (particularly the chronic) Duhring advises the use of a strong sulphur ointment, well rubbed in.

DERMATITIS MEDICAMENTOSA.—See DRUG ERUPTIONS.

DERMATITIS REPENS.—A spreading dermatitis generally on the upper extremities starting from an injury or surgical operation. Beginning as it usually does on the finger or hand it may gradually involve the whole arm and even the trunk. It may possibly be due to a peripheral neuritis associated with parasitic infection. The disease is readily differentiated from eczema rubrum and pompholyx.

Treatment.—After removal of the loose skin, applications should be made of a saturated boric solution containing 2 to 5 grains of resorcin to the ounce.

DERMATITIS TRAUMATICA.—See BRUISE, WOUNDS (Contused), etc.

DERMATITIS VENENATA.—See IVY-POISONING.

DERMATITIS, X-RAY.—Repeated exposure to X-rays has resulted not infrequently in a chronic dermatitis. Some observers believe that not the rays but the current has been responsible. The best treatment is prophylaxis. With the care and the means for protection of both patient and operator that are now employed X-ray dermatitis should now be a thing of the past.

DERMATOL.—Dermatol is a trade name for bismuth subgallate, a substitute for iodoform. It forms a fine, yellow powder, without odor or hygroscopic properties. It contains about 55 per cent of bismuth oxid. It is practically insoluble. It is employed pure as a powder, united with other desiccants, or exhibited in the form of an ointment or collodion (1.5 : 10). Dermatol is protectant, desiccant, and antiseptic. See BISMUTH.

DERMOID CYSTS.—See CYSTS.

DESCEMETITIS.—See IRITIS (Serous).

DETERGENTS.—Substances that cleanse the skin. They are used to remove dirt or epidermal scales. The principal detergents are water, soap, alkalies, ox-gall, milk, vinegar, alcohol, charcoal, sand, oatmeal, sawdust, pumice-stone, oil, and borax. Warm water is the chief detergent, greatly aided by soaps and chemicals, or by mechanically acting substances, such as oatmeal and sand. Oil or alcohol aids in the removal of resinous deposits adhering to the skin after the removal of plasters. Borax and elderflower water are preferable to irritating soaps to remove scurf, when the skin is tender.

DIABETES INSIPIDUS.—Diabetes insipidus is the term applied to simple continued polyuria unassociated with glucose. It is to be distinguished from simple polyuria, which is a temporary condition often occurring in nervous people.

Its **etiology** and **pathology** are as little understood as are those of diabetes mellitus. It has even more rarely been found associated with lesions of the nervous system, or, indeed, of any part of the body, though associate tumors and other new formations in the brain have been described. It is a much less serious condition than diabetes mellitus. It occurs in the adolescent, the adult, and the middle-aged, rather than in the very old or very young, and is about three times as frequent in males as in females. Heredity is also a recognized factor and syphilis has caused diabetes insipidus. Nervous shock is an acknowledged exciting cause. This may be sufficient to account for the effect of blows and falls. Pregnancy has been assigned as a cause.

Of **symptoms**, there is little to add to thirst, occasional dryness of the skin, and polyuria. As in diabetes mellitus, weakness and emaciation ensue, though they are not so marked or so rapid as in the latter disease. The quantity of water ingested and passed even exceeds that in diabetes mellitus. The specific gravity of the urine is sometimes as low as 1000, often 1002 to 1005, and it contains neither albumin nor sugar. The 24 hours' urea is commonly increased, owing to the polyuria. Often the health is very slightly impaired. Intermissions occur, during which the quantity of urine is diminished, while the effect of intercurrent disease is also to diminish the flow of urine.

The diagnosis is commonly easy. The persistent polyuria, with absence of sugar and albumin, belongs to no other disease.

The prognosis is uncertain as to recovery, but the condition is not incompatible with long life and attention to business. It sometimes disappears spontaneously, and occasionally in response to remedies administered. A patient rarely dies of its effects.

Treatment.—Water should be allowed in reasonable amount, as no advantage is derived from its restriction. Indeed, such a course increases the discomfort, and hence tends to exhaust and weaken the patient. Potassium iodid is without doubt an efficient remedy; at least as long as its administration is continued. The dose must be determined by its effect: 10 grains and upward to adults, less to children. Valerian is, however, the remedy that has the best reputation. It may be

combined with the bromids. Any one of the preparations may be used, as the fluidextract in 10-minim doses, or the valerate of zinc in 15-grain doses, or valerate of ammonium. The last is the most suitable preparation, in combination with the bromid of ammonium. Ergot, in the form of the fluidextract, gallic acid, and antipyrin are said to have cured cases. Belladonna, either alone or in combination, has some reputation. Tonics are useful aids, especially iron and strychnin. Opium does not appear to be so useful in diabetes insipidus, nor is its use so safe.

DIABETES MELLITUS.—Diabetes mellitus is a constitutional disease, characterized especially by hypersecretion of urine highly charged with sugar. Allen has defined diabetes as a "specific deficiency of the power of assimilating food."

The pathology is still obscure; for although glycosuric polyuria is found associated with lesions of the nervous system and lesions of the pancreas in a noteworthy number of cases, there remains a decided majority in which no lesion is discoverable, and the affection must still be regarded as a symptomatic one.

The etiology is also uncertain. It is a disease of the rich rather than of the poor, and is more frequent in men than in women. It is especially frequent in the Hebrew race, and is unusual among negroes. More frequently than not no cause is discoverable. Physical and mental overwork are assigned as causes. Heredity is an acknowledged factor, or, at least, several members of a single family may be subjects. Unrestricted eating and drinking are probable factors, in view of the fact that it is found more among the rich than the poor, and among well-to-do Hebrews rather than among those in the humble walks of life.

Symptoms.—In addition to the polyuria and glycosuria already mentioned, thirst and dryness of the mouth, and, at times, also dryness of the skin, are characteristic. They vary in intensity with the severity of the disease. In some cases "gallons of water" are drunk—to use the expression of the patient—and as much may be passed, although more often smaller quantities are ingested too variable to permit of precise statement. The specific gravity of the urine varies from 1020 to 1040 or higher, and the percentage of sugar from 2 to 10 percent or more, although the latter percentage is not often reached.

An abnormally large appetite is likely to be present in the early stages, notwithstanding which the patient loses flesh, and in advanced stages emaciation is often extreme. With this is associated a corresponding weakness and debility. Boils and carbuncles are frequent and sometimes initial symptoms—the very first to attract attention. The urine should, therefore, be examined in all cases in which boils and carbuncles are present. The same is true of pruritus, and especially of pruritus vulvæ, though the same symptoms also occur on the genitals of men. Eczema in various situations on the body, and in varying degrees of severity, is also at times a symptom.

A like manifestation of nutritional disturbance is gangrene, which is sometimes the result of diabetes when least suspected. It is extremely difficult to heal, and is not infrequently a cause of death. Cataract is a rarer symptom, similarly caused. Cataract is of most significance when it occurs among the young, as the usual causes of cataract may operate in the aged diabetic. Neuritis often causes much suffering. In advanced stages the knee-jerks are often absent; not because of any demonstrable lesion in the spinal cord, but probably because of a toxic effect of the sugar-laden blood. Loss of sexual desire is a symptom often named.

Diabetic coma is a terminal symptom that is justly dreaded. The most characteristic symptom is deep inspiration. It is sometimes ushered in by cramp-like pains in the epigastrium; at others by drowsiness that gradually increases until the patient is profoundly comatose. The presence of acetone, and especially of diacetic acid, as shown by the ferric chlorid reaction, is often a forerunner of impending coma. Convulsions may supervene toward the end. The condition is probably the result of a self-infection due to the absorption of poisons in some way engendered in the body of the diabetic. The phenomena of diabetic coma are not confined to diabetes.

Complications.—There are few complications of diabetes. Pulmonary tuberculosis is perhaps the most frequent one, the diabetic state favoring its development. Some conditions mentioned under the symptomatology may be regarded as complications—viz., eczema, furuncle, and gangrene—but these are direct consequences rather than true complications. Albuminuria occurs in connection with a certain number of cases of diabetes, generally late in the disease, and is probably the result of slight degree of degeneration from excessive function. In a few instances it is the result of associated interstitial nephritis, which is probably a coincidence. In like manner visual symptoms, when present, are more often a result of a complicating interstitial nephritis than a result of the diabetic condition, excepting always cataract, which has been alluded to. See Acidosis.

In this connection some mention should be made of the relation of gout to diabetes mellitus. Undoubtedly, the milder forms of the disease have some relation to gout, being sometimes substituted for it; though more frequently, perhaps, gout is replaced by diabetes. Sometimes the two are interchangeable. There is no satisfactory explanation of the relation.

The diagnosis is usually easy. Polyuria and glycosuria are key-notes. Diabetes mellitus only exists when grape-sugar is permanently present in the urine. If polyuria is not actually present, the presence of any one of the foregoing symptoms should suggest an immediate examination of the urine for sugar. Tests for acetone and diacetic acid should also be frequently made, as their presence indicates the probable onset of diabetic coma. See Urine (Examination), Glycosuria.

The prognosis of diabetes varies with the severity of the case and the age of the patient. A well-developed case in a child under 12 years of age

probably never recovers, though amenable to treatment to a degree. Mild cases in persons over 50 are so far amenable to treatment that they may be regarded as curable—at least, as long as a suitable diet can be maintained.

Dietetic Treatment.—By far the most important treatment is dietetic, and a choice between medicines and diet promptly discards the former. The recognition that there is a lowered functional capacity not only for the assimilation of carbohydrates, but also for proteins and fats is the basis for whatever dietetic restrictions are instituted. The object of the treatment, therefore, should be the supplying of a diet below the assimilation limit, thereby resting what Allen emphasizes as the underlying cause, namely, a weakened pancreatic function. The diabetic who constantly indulges in dietetic excesses tends to progressively weaken pancreatic function and become progressively worse. A diabetic who is given a diet within the tolerance limit will gradually manifest an increase in the tolerance and an improvement in the condition. Allen, who has studied the question of the treatment of diabetes extensively, has formulated a plan of treatment which may be outlined as follows: (1) A preliminary fast until the urine is free from sugar. (2) Following the fast, carbohydrate food is gradually added, at first in the form of green vegetables. (3) Coincident with the addition of carbohydrate, or in place of it, if the carbohydrate tolerance is very low, protein is added to the diet in small but gradually increasing amounts until glycosuria occurs, or a sufficient amount of protein is taken to cover the basal requirement. (4) The addition of fats in small amounts during the time of addition of carbohydrates and protein. Subsequently, a sufficient amount of fat is added to make up the fuel requirements of the body, provided this amount can be tolerated without the appearance of glycosuria or acidosis. (5) Frequent urine examinations are made, either by the medical attendant or by the patient himself, and the appearance of glucose is taken as an indication for a fast of sufficient length to cause a cessation of the glycosuria. Feeding is subsequently begun with not more than one-half of the carbohydrate contained in the diet at the time of the appearance of glycosuria. Subsequent carbohydrate increase is made very gradually. (6) At intervals, the patient is fasted for a day or else takes a greatly restricted diet. (7) Body fat is reduced to a minimum and the adult diabetic is not allowed to gain weight; children may gain, but the gain must not be adipose tissue. (8) Active daily exercise carried to the point of healthy fatigue is advocated. The length of time of the preliminary fast is usually less than five days, although in exceptional instances it may be as long as eight or ten days. During this time water is allowed freely and tea or coffee (without sugar or cream) in moderate amounts. Alcohol, in the form of whiskey, from 1 to 2 ounces daily is given by some, but is not considered an essential in the treatment. Rest in bed may be necessary for weak patients, but the more vigorous ones may exercise with benefit, and in some instances it seems that the duration of the fast may be shortened thereby. If during the fast, symptoms referable to severe and progressive acidosis occur the fast must be temporarily terminated and the acidosis treated. The fast is terminated and feeding cautiously begun when the urine is sugar free for twenty-four hours. Two essentials for the preparation of the diet are a scale for the weighing of the food and a knowledge of the percentage values of the food principles in the different types of food. The latter has been tabulated in a practical form by Joslin and is reproduced herewith:

JOSLIN'S DIET TABLE.

Strict Diet—Meats, Fish, Broths, Gelatin, Eggs, Butter, Olive Oil, Coffee, Tea and Cracked Cocoa.

Foods Arranged Approximately According to Percentage of Carbohydrates.

Vegetables.

5 Percent.	10 Percent.	15 Percent.	20 Percent.
Lettuce Spinach Cauliflower Sauerkraut String beans Celery Asparagus Cucumbers Brussels sprouts Sorrel Endive Dandelions Swiss chard Sea kale Tomatoes Rhubarb Egg plant Leeks Beet greens Watercress Cabbage Radishes Pumpkin Kohlrabi Broccoli Vegetable marrow	Onions Mushrooms Squash Turnip Carrots Okra Beets	Green peas Artichokes Parsnips Canned lima beans	Potatoes Shell beans Baked beans Green corn Boiled rice Boiled macaroni

Fruits.

Ripe olives (20 percent fat) Grapefruit	Lemons Oranges Cranberries Strawberries Blackberries Gooseberries Peaches Pineapple Watermelon	Apples Pears Apricots Blueberries Cherries Currants Raspberries Huckleberries	Plums Bananas

Nuts.

Butternuts Pignolias	Brazil nuts Black walnuts Hickory Pecans Filberts	Almonds Walnuts (Eng.) Beechnuts Pistachios Pinenuts	Peanuts 40 Percent Chestnuts

5 Percent

Miscellaneous.—Unsweetened and unspiced pickles, clams, oysters, scallops, liver, fish roe

Reckon *actually available* carbohydrates in vegetables of 5 per cent group as 3 percent, of 10 percent group as 6 percent

DIABETES MELLITUS

Thirty grams or 1 ounce, of each of the following contain approximately:

	Protein, Gm.	Fat, Gm.	Carbohydrates, Gm.	Calories.
Oatmeal, dry weight	5	2	20	110
Meat (uncooked)	6	2	0	40
Meat (cooked)	8	3	0	60
Broth	0.7	0	0	3
Potato	1	0	6	30
Bacon (cooked)	5	15	0	155
Cream, 40 percent	1	12	1	120
Cream, 20 percent	1	6	1	60
Milk	1	1	2	20
Bread	3	0	18	90
Butter	0	25	0	240
Egg (one)	6	5	0	75
Brazil nuts	5	20	2	210
Orange (one)	0	0	10	40
Grapefruit (one)	0	0	10	40
Vegetables, 5 and 10 percent groups	0.5	0	1	6

1 gm. protein, 4 calories.
1 gm. fat, 9 calories.
6.25 gm. protein contain 1 gm. nitrogen.
30 grams (gm.) or cubic centimeters (c.c.), 1 ounce.
A patient "at rest" requires from 25 to 30 calories per kilogram body weight.
1 gm. carbohydrate, 4 calories.
1 gm. alcohol, 7 calories.
1 kilogram, 2.2 pounds.

The day **the feeding is started** the patient is given from 150 to 200 gm. of the vegetables of the 5 percent group. These so-called "green vegetables" contain a very small quantity of available carbohydrate (approximately 5 gm.) and only traces of protein and fat. Their bulk serves to fill the stomach and allay, to a certain extent, the hunger, and by their residue tends to prevent constipation. If no glycosuria occurs 5 gm. of carbohydrate are added every day until 20 gm. are given, then every other day until the patient is receiving as much as 3 gm. of carbohydrate per kilogram of body weight in 24 hours (Joslin). After the first day or two carbohydrates may be given in the form of vegetables of the 10 percent group, followed subsequently by those of the 15 and 20 percent groups. Fruits are then added and ultimately if glycosuria has not supervened, bread and oatmeal. Ordinary bread is but seldom included in the dietary of the diabetic. There are on the market a large number of brands of "gluten" and "diabetic" flour which contain relatively little carbohydrate and much protein. Bread made from such flour, provided the composition is accurately known, may be eaten. These special brands of flour, however, are expensive and many are fraudulent. The patient's longing for bread may, in a measure, be satisfied by bran biscuits. These contain no carbohydrate and serve as a convenient vehicle for the administration of butter or other fats. The bulky residue fills the stomach and relieves constipation. The appearance of glucose in the urine means that the patient's assimilative limits have been exceeded and a fast must be instituted until the glycosuria ceases. Following the fast, the carbohydrate ration should bd diminished by one-half and not increased beyone this amount for some days and then very cautiously. The amount should be kept well within the limit of tolerance previously determined for a considerable period of time. Subsequently, if there is reason to suppose the patient can assimilate more carbohydrate, the limit of tolerance may again be determined by gradual addition of carbohydrate, even to a point in excess of the former tolerance. **The addition of protein** to the diet may be made in most cases during the period when the carbohydrate tolerance is being tested. At first one egg, then two, three, four eggs, and lean meat until the patient receives about 1 gm. of protein per kilogram of body weight. Later this may be increased to 1 1/2 gm. and in children 2 gm. of protein per kilogram. In exceptionally severe cases of diabetes it may be necessary to test the protein tolerance by feeding exclusively protein foods until glycosuria appears; in the same way the carbohydrate tolerance is tested. **The fats are added** to the diet when the amount of protein fed has reached 1 gm. per kilogram body weight. These are added in increasing amounts (25 gm. a day) until the caloric requirement of from 25 to 40 calories per kilogram of body weight is covered by the total food intake. Patients who are exercising require a higher caloric intake than when resting, and growing children up to as much as 50 or 60 calories per kilogram, depending on the age. The caloric intake should eventually be such that a progressive loss of weight does not occur. On the other hand, the patient must not gain in weight, or, more correctly, he must not gain in adipose tissue, though muscular development is allowable. Fat, besides that obtained in the eggs and meat fed, may be supplied in the form of bacon, cream, olive oil or butter. If acidosis appears, it is advisable to substitute olive oil for butter and cream or to use washed butter. **Weekly Fast Days.**—For a long time it has been recognized that days of partial or complete fasting are of benefit to the diabetic. Joslin's rule is to fast all patients once a week whose tolerance for carbohydrates is less than 20 gm. When the tolerance is between 20 and 50 gm., 5 percent green vegetables and one-half the usual quantity of protein and fat are allowed on the fast days; when the tolerance is between 50 and 100 gm. of carbohydrates, the 10 and 15 percent vegetables are allowed as well. If the tolerance is more than 100 gm. of carbohydrate, the carbohydrate intake is halved on the weekly fast days. The treatment of **Acidosis** is seldom necessary with proper diet regulations, because under these conditions the development of acidosis of a serious grade is unusual. A few patients do develop a severe acidosis during the fasting period and the indications are to break the fast by allowing a diet strictly of green vegetables. In such cases subsequent fasting frequently causes acidosis to disappear. The dietetic treatment outlined above, however, usually prevents any tendency toward progressive acidosis. In order to check acidosis temporarily, especially if it threatens life, it may be necessary to administer alkalies. This is accomplished by giving **sodium bicarbonate** by mouth, intravenously or subcutaneously (rarely). A half to one

dram is given by mouth every 3 or 4 hours until the evidences of acidosis lessen (the estimation of the carbon dioxid tension of the alveolar air is extremely simple with the use of the Marriott apparatus and is recommended as the easiest and most reliable method of estimating the degree of acidosis and the influence of alkali therapy). If the patient is unable to retain the alkalies by mouth or has approaching coma, the intravenous injection is used. For this purpose a 4 percent solution of sodium bicarbonate may be used and as much as 500 mils at one time is injected slowly. The injection may be repeated as often as the symptoms would indicate or dependent upon the concentration of the carbon dioxid tension in the alveolar air.

Criteria of improvement are: Retention of body weight; obesity; the urine remaining without sugar; carbohydrate tolerance; and absence of fatigue, vomiting, restlessness, drowsiness, listlessness, nausea, vertigo, headache.

Medicinal Treatment.—Of medicines, only 2 have borne the trial of experience: viz., arsenic and opium. The former drug is efficient in mild cases. Fowler's solution, in 5-drop doses, is the most convenient and trustworthy preparation. It should be intermitted at times. Opium is a much more efficient drug, but it has its disadvantages, and should be used only when dietetic treatment and arsenic do not suffice. Any one of the preparations of opium are efficient, but codein is commonly preferred, because its use is attended with fewer of the inconveniences of the other preparations: it constipates less, nauseates less, produces less of the uncomfortable head symptoms so often caused by the use of opiates, and there is decidedly less danger of forming the opium habit. It may be used beginning with 1/4 of a grain 3 times a day, and increased 1/4 of a grain a day until the desired effect is obtained, or until 10 grains a day are given. It should then be as gradually reduced. Much larger quantities have been used. All other drugs are practically useless so far as specific effect on the diabetic process is concerned. Lactic acid, nitrate of uranium, benzosol, antipyrin, antifebrin, and jambul are equally useless. Tonics are required as in other diseases that tend to weaken and exhaust the patient. The continuous use of alkaline mineral waters is helpful. In lieu of such waters, solutions of alkalies—viz., citrate of potassium and sodium bicarbonate—may be given. Aperients are necessary when there is a tendency to constipation. Mercurial purges are especially useful, as engorgement of the liver tends to aggravate the disease, and mercurials relieve this. Salines may be used.

Hygiene is important. The patient should be kept in well-ventilated rooms, should spend as much time as possible out of doors, and should dress suitably in woolen underclothing; for the diabetic is very susceptible to cold, and lung complications often cause his death. Walking and cycling in the open air are especially wholesome if the patient is not too weak and exhausted.

The treatment of diabetic coma promises little, but the patient should immediately be put on milk and Vichy, and potassium citrate in 30-grain doses hourly, well diluted—the more water, the better. Hypodermoclysis with a 0.6 percent solution of sodium chlorid should be practised, and a pint should be introduced at one point and another pint at another. Or, in lieu of this, an alkaline injection, of the strength of 2 ounces of sodium bicarbonate to the pint, should be given by the rectum. The rectum should first be washed out, or, if time permit, an aperient should be given. The reviving effect of hypodermoclysis is magic, but, unfortunately, it is only temporary. This same treatment used in the prodromal stage is more efficient, and the further development of the condition has not infrequently been arrested.

DIABETIN.—Levulose. Fruit sugar. As it is more easily consumed in the system than the other sugars, it is used with advantage in diabetes. Dose, 1 to 2 ounces daily.

DIAPHORETICS.—Remedies that increase the action of the skin and promote the secretion of sweat. When they act energetically, so that the perspiration stands in beads upon the surface, they are known as *sudorifics.* They may be subdivided into the following groups—viz.:

1. **Simple diaphoretics,** which enter the circulation and are eliminated by the sudoriferous glands, which they stimulate to increased action.

2. **Nauseating diaphoretics,** which produce relaxation and the dilatation of the superficial capillaries.

3. **Refrigerant diaphoretics,** which reduce the circulation, at the same time acting directly on the sweat-centers in the spinal cord and medulla.

The principal diaphoretics are enumerated as follows, the figures referring to their respective supposed modes of action, as indicated above (Potter)—viz.:

Aconite.[3]	Camphor.[1]
Veratrum.[3]	Cocaine.[3]
Tobacco.[2,3]	Ammonium acetate.[1]
Lobelia.[2,3]	Ammonium citrate.[1]
Alcohol.[2,3]	Potassium salts.[3]
Ether.[2,3]	Mezereon.[1]
Nitrous ether.[2,3]	Sarsaparilla.[1]
Salicylates.[1]	Guaiacum.[1]
Pilocarpus.[1,3]	Serpentaria.[1]
Pilocarpine.[1,3]	Sassafras.[1]
Ipecacuanha.[2]	Senega.[1]
Opium[2,3](large doses).	Vapor bath.[2]
Dover's powder.[2]	Turkish bath.[2]
Tartar emetic.[2]	Wet pack.[2]
Sulphur.[1]	Warm drinks.[2]

DIAPHRAGM, AFFECTIONS.—These are due to physical interference with the diaphragm, to displacement, to functional disorders—either paralysis or spasm—and to organic lesions.

Displacement may be partial or complete. Pleuritic effusions, empyema, pneumothorax, emphysema of the lungs, abundant pericardial effusion, enlargement of the heart, and tumors are the chief thoracic causes. The abdominal causes of displacement of the diaphragm are distended stomach, tympanites, ascites, peritonitis, pregnancy, large fecal accumulations, and ovarian,

hepatic, splenic, or renal tumors. Tight lacing may embarrass and alter the position of the diaphragm.

Symptoms.—Instead of actual pain, there is a sense of constriction, tension, or tightness of the lower part of the chest. Respiration is more or less impeded, hurried, and oppressed and labored. Spasmodic cough may ensue. The exact position of the parts can be determined only by carefully noting the physical signs.

Paralysis.—When the spinal cord is destroyed at the origin of the phyrenic nerve, or if this nerve is cut, injured, or destroyed on one or both sides, or if severely compressed, either one lateral half or the entire diaphragm will be paralyzed. It may also be affected by diphtheritic paralysis, by lead-palsy, or in hysteria. Death speedily ensues from impediment to the respiration when the entire diaphragm is paralyzed. When one-half is paralyzed, coughing and sneezing cannot be performed, and sputa cannot be easily expelled, while defecation and vomiting are ineffectual or impossible. The lower parts of the lung are more or less collapsed and congested, and if bronchitis sets in, grave danger is at hand. A peculiar dysphonia, in which the voice loses power as the day advances, is developed.

Spasm, either tonic or clonic, may depend upon disorder of the nerve-center, or may be the result of irritation of the phrenic nerve, from direct or reflex excitation of the diaphragm. Tonic spasm is chiefly observed in tetanus, poisoning by strychnin, and in hydrophobia. A form of asthma has been attributed to spasm of the diaphragm; and spasm may result from immoderate laughter. Hiccup is probably due to clonic spasm of the diaphragm, and a spasmodic cough may be due to spasm of this muscle. See Hiccup.

Organic Lesions.—The diaphragm may be perforated, lacerated, or ruptured. Rupture may result from violent strain, as in persistent vomiting or during parturition, or from efforts to suppress cries of pain; or the perforation may be congenital. It may result from empyema, from pulmonary, hepatic, or other abscesses, from aneurysm, or from gastric ulcer. Portions of the thoracic or abdominal viscera may pass through and form a **diaphragmatic hernia.**—See Chest (Injuries). This form of rupture is of little practical interest, since the condition is seldom diagnosed, and, even when diagnosed, the hernia is not very amenable to treatment. The serous covering of the diaphragm is not infrequently involved in pleurisy or peritonitis, and lesions may be caused by extension from pericarditis. Direct injury may cause inflammation of the substance of the muscle. Ulceration and gangrene have been noticed, and chronic inflammation may occur. The symptoms are obscure and ill defined. Muscular rheumatism may affect the diaphragm, causing much pain in coughing and defecation and a sense of aching. Progressive muscular atrophy may involve the diaphragm as well as other muscles. Fatty and fibroid degeneration are the forms most encountered. Brawny induration has been noticed in scurvy. In progressive muscular atrophy the fatal termination may result from paralysis of this muscle. Malignant disease usually involves this structure from extension.

Treatment.—Little can be done in the way of direct treatment, even when a diagnosis is made. Indications are to get rid of any mechanic obstruction to respiration or to the action of the diaphragm. The disease causing functional disturbance is to be treated. Dry heat, fomentations, bandages and supports, and anodynes may relieve the painful affections, while an acute inflammation is to be treated on general principles. Paralysis may call for electric treatment through the phrenic nerve, although this is particularly dangerous from the proximity to the pneumogastric nerve. Hiccup may be relieved by various remedies.

DIARRHEA.*—An abnormal frequency of the evacuation of feces, thin in consistence, and connected with tenesmus.

Etiology.—It is due mainly to two morbid factors: (1) Increased amount of water in the feces, on account of the rapid passage through the jejunum and ileum not permitting of absorption, and on account of abundant secretion and transudation from the vessels and glands; (2) an increase in the rate of peristalsis in the small or large intestine. When bile pigment can be detected in the feces, it is suggestive of diarrhea originating in the small intestine. When the diarrhea is due exclusively to disturbances in the colon, bile pigment is, as a rule, absent from the evacuations.

Classification.—It has been suggested to drop entirely the clinical conception of diarrhea and to class all such symptoms with enteritis and other anatomic alterations of the intestines. This would be incorrect, for there are diarrheas that run their course without any anatomic lesions whatever. Increased peristalsis of the small intestine need not cause diarrhea if the large intestine is not involved; but increased peristalsis of the colon alone causes severe diarrhea when the small intestine is quiescent. If both small and large intestines are involved, the stools will contain more and more undigested food the further up the small intestine is involved. Etiologically, diarrheas may be considered under three headings, viz.: (1) those in which the irritations arise from the intestinal contents; (2) from the nervous system; and (3) from the blood.

Under the first group the following types may be conveniently considered: (*a*) dyspeptic, (*b*) cathartic, (*c*) stercoral, (*d*) entozoic diarrhea.

Dyspeptic Diarrhea.—Caused by certain articles of food—fruits, cucumbers, turnips, and sour milk. Sometimes the diarrhea depends upon the combination of certain foods; for instance, fruit and beer, or milk and cucumbers. Spoiled articles, such as cider and sour beer, and unripe fruit are more detrimental. In some persons milk causes diarrhea, and in others constipation. The gases formed in fermenting food—CO_2, H_2S, CH_4—increase peristalsis. Catarrhal changes of the intestines do not occur in the beginning, but may

*See also the remarks on diarrhea in the article on Constipation.

develop later on. The diarrhea in this case is a curative effort, and should not be checked by constipating medicines.

Cathartic Diarrhea.—This type is due to the ingestion of purgative medicines that act chiefly by increasing the peristalsis. Alkaline salts act by causing an endomosis from the blood-vessels into the intestine, and also by increase of peristalsis. The stools produced by purgatives differ from normal stools mainly in their greater percentage of water—the rapid peristalsis inhibiting absorption.

Stercoral Diarrhea.—This form exists when alternating diarrhea and constipation constitute the main symptoms; it may even exist when there is no history of constipation, but retention of fecal matter occurs that, by its irritating effects on the mucosa, brings about diarrhea. The gases CO_2, CH_4, H_2S, when produced during chronic habitual constipation, may bring on an exaggerated peristalsis. In the beginning stercoral diarrhea is not associated with enteritis, but supervenes when diarrhea is not treated properly or when errors of diet are continued.

Entozoic Diarrhea.—It is very probable that entozoa, certain worms, and infusoria may cause diarrhea, perhaps by mechanic irritation, or, more likely, through chemic toxins that they produce. The relation of certain amebas and cercomonas to DYSENTERY (*q. v.*) is considered under that head. It is not definitely known whether the unicellular protozoa cause diarrhea, but the thread-worm oxyuris and trichocephalus may occasion this symptom, though not invariably.

Nervous Diarrhea.—When the previously mentioned forms can be excluded, this type of diarrhea may be suspected, though it is occasionally difficult to distinguish from the stercoral type. Nervous diarrhea may be caused by (*a*) increased irritation of the nerves that excite peristalsis, (*b*) paralysis of the nerves that inhibit peristalsis, (*c*) increased serous transudation, and (*d*) excitation of the peripheral nervous apparatus contained in the walls of the intestine. Diarrheas that occur after intense fright, fear, or terror belong to this type. They are generally acute attacks, but nervous diarrhea may also constitute a chronic disease. It is usually accompanied by other nervous phenomena, such as giddiness, vertigo, cerebral oppression and congestions, a sensation of alternating heat and cold in various parts of the body, fear, feeling of oppression around the heart, rapid breathing, palpitation—all of which symptoms rapidly disappear after a diarrheic passage has occurred. The number of passages may vary from 2 to 20 in the day, consisting of liquid intestinal contents with very little mucus. The passages are often preceded by active peristaltic unrest and accompanied by tenesmus and borborygmus. Diarrhea occurs very frequently complicated with hysteria, neurasthenia, migraine, and diseases of the genitourinary apparatus. The diagnosis is based upon exclusion of other forms of diarrhea or diseases of the digestive tract, absence of abnormal constituents in the stool, and presence of nervous symptoms. It may, however, occur in individuals that show no signs of nervousness or neurasthenia.

Diarrhea after Taking Cold.—This form is probably brought about by reflex vascular hyperemia of the intestinal mucosa, accompanied by increased serous transudation and mucous secretion. This reflex is mediated through the cutaneous nerves.

Diarrhea Caused by Irritants Acting from the Blood.—Under this heading may be classed the diarrhea occurring in uremia, malaria, septicemia, croupous pneumonia, erysipelas, influenza, and cholera. It is supposed that the poison formed in these diseases is absorbed into the blood-vessels, and reaches the intestinal glands with the blood, causing an enormous increase of secretion. In this way diarrhea may occur in typhoid fever long before enteritis or intestinal ulcers have developed.

Treatment.—The treatment of diarrhea might be briefly summed up as follows: Rest, diet, external heat, castor oil, calomel, and opium. If the disease has not disappeared under the simultaneous use of these means, it is certain that it is not a simple diarrhea, but one of the forms of enteritis or colitis, the treatment of which is considered under its proper heading. The treatment of the dyspeptic diarrhea consists in excluding all food for 24 hours, and giving a saline purge, such as a tablespoonful of Epsom salts, 1/2 of an ounce of castor oil, or 1/10 of a grain of calomel every hour. External warm applications should be made to the abdomen, and the patient should keep very quiet. The cathartic diarrhea produced by the abuse of purgative medicines should not be treated at all, but permitted to recover spontaneously. The stercoral diarrhea should be treated like the dyspeptic form, with castor oil or calomel, though in this case an enema with 1 quart of water is especially beneficial. The entozoic diarrhea is best controlled by diet, rest, warmth, and colon enemas consisting of 5 to 10 grains of nitrate of silver to 1 quart of water; 1 to 2 drams of quinin to the quart of water is an effective injection in diarrhea due to amebæ. The treatment of nervous diarrhea must remove the cause of the fundamental neurasthenia. Hydropathic and electric management may be followed by improvement. Of medicines, the bromid of strontium in doses of 15 grains 4 times a day, and Fowler's solution of potassium arsenite, are occasionally of value. Fowler's solution should be given in doses of 2 drops 4 times a day, gradually increased to 12 drops.

In diarrhea caused by irritants acting from the blood, the underlying causative condition will require careful investigation, and the means of treatment are stated under the headings in which these causative conditions are considered.

The Diet.—The best diet in diarrhea is milk; if the patient is weak, milk and whisky. For chronic diarrhea the following bill of fare is recommended:

Morning:

8 ounces of chocolate boiled in milk.
1 soft egg.
1 piece of toast.

Forenoon, about 11 A. M.:

8 ounces of a decoction of whortleberry (2 1/2 ounces dried berries and 1 pint of water); or—

8 ounces of soup made of toasted flour and bouillon with 1 egg added.

150 grains of scraped lean meat.

2 ounces of well-boiled rice.

Afternoon, 3 P. M.:

8 ounces of whortleberry decoction.

Evening:

8 ounces of maltoleguminose soup with 1 egg.

5 ounces of finely minced breast-meat of boiled chicken.

During the entire day 2 1/2 ounces of toast and 8 ounces of Burgundy or whortleberry wine may be added.

It is useless to consider the endless number of drugs recommended for diarrhea, but discussion may be limited to the use of the cardinal remedy—opium. There is no remedy that checks peristalsis, inhibits excessive secretion, and reduces intestinal pain so well as opium. The denarcotized extract of opium, in doses of 1/2 of a grain combined with 5 grains of tannigen, 3 or 4 times daily, will rarely disappoint in severe cases if used in connection with diet and a preceding dose of castor oil. The discussion of the use of intestinal disinfectants and astringents will be found under other diseases affecting the intestines. See ENTERITIS, etc.

DIARRHEA, INFANTILE.—This is most frequent in children under 2 years of age, though, as is well known, it may occur at any age. It is most prevalent during the summer. The poorer classes in the larger cities are affected in the greatest numbers, although bad hygiene is not essential, as diarrheal affections are not uncommon among the well-to-do in the cities as well as in the country.

Children with lowered vitality from malnutrition or any wasting disease are most subject to attacks, but strong and healthy children are not exempt. In some cases teething seems to be the exciting cause, and in others exposure to damp or cold brings on the attack.

That the food plays an important part in the etiology is shown by the fact that severe cases are very rarely seen in nursing infants, but occur so frequently in those who are hand-fed, and in older children whose diet is not properly selected or regulated.

The milk fed to infants may be impure—spoiled from long standing or contaminated from contact with filthy cans or surroundings and from foul nursing bottles; or, if pure, it may not have been properly modified to meet the requirements of the child's age and powers of digestion. Again, the amount given may be too large or the intervals of feeding too short.

In infants, as well as in older children, overfeeding and food that is not digestible are common causes of diarrheal complaints. Infants are allowed to partake of table food when consideration of their age should eliminate from the diet-list all but properly modified milk; older children consume in large quantities indigestible food or fruit, and fruit that is unripe or partially decayed.

Pathology.—In simple diarrhea there are no anatomic lesions. It is produced by a hypersecretion of the gastric and intestinal glands, and by increased peristalsis, when caused by improper food; the latter being a conservative measure of nature. In the more severe forms (as acute gastrointestinal catarrh, enterocolitis, dysentery) there may be a catarrhal inflammation of the digestive tract, or there may be the various stages of congestion, inflammation, and ulceration, depending in degree upon the severity of the infection and upon the duration of the attack.

Symptoms.—The symptoms are principally an increase in the number of stools—which may reach as high as 20 or more in a day—and a change in their character, the color and consistency varying in different cases or in the same case at different times. In infants they are frequently green, resembling chopped spinach, or they may be very light and contain curds or fat from undigested milk. They usually become, later, very thin, acid, and irritating, excoriating the skin about the anus and buttocks. The odor may be sour or very foul and penetrating. In both infants and older children, when the diarrhea continues for any considerable time, the stools become mucous in character and streaked with blood.

In mild cases the onset may be gradual, with loss of appetite and fretfulness, and the symptoms throughout the attack may be very slight. In more severe cases, however, the onset is more likely to be sudden, with vomiting, high temperature, a hot, dry skin, great thirst, pain, and all the symptoms of a serious illness. The child may be dull, or, on the contrary, restless and excitable; and in infants convulsions are not unusual at any time during the attack.

The course varies greatly—one child recovering in a few days, rapidly regaining its accustomed health, while another will suffer for a period of a week or longer.

In severe cases emaciation is rapid, the face becomes drawn and pinched, the eyes are sunken in their sockets, the anterior fontanel is depressed, and the abdomen is retracted or ballooned up with gas, and is hot, while the rest of the body may be bathed in a cold perspiration. The temperature remains elevated—100° to 103° F., or higher. The tongue is coated, and stomatitis is often present. The urine is scanty and high-colored. Pain, especially before a bowel movement, is a prominent symptom, and is shown in an infant by an agonized expression of the face, by crying, and by twisting and writhing movements of the body, rigid flexion of the legs upon the abdomen, and spasmodic contraction of the extremities.

The prognosis in the simple, noninflammatory diarrheas is favorable, but recurrences are frequent, and there is always danger, unless the attack is cut short, that a more serious form will develop. When enterocolitis is present the prognosis is not so good, many cases terminating fatally. Complications that would influence the recovery of

the patient are convulsions, bronchitis (which is very common), bronchopneumonia, nephritis, and various skin eruptions, as urticaria and eczema.

As sequels there may, and frequently do, occur chronic intestinal catarrh and marasmus.

Prophylaxis consists of improved hygienic surroundings and care, the wearing of woolen clothing next to the skin for those who are susceptible to atmospheric changes, and in all cases a proper regulation of the diet. Since experiments have shown that the house-fly is a carrier of infection, the house, dishes, food, and infants should be screened from flies.

All soiled napkins and clothing of the patient should be disinfected by soaking in a carbolic acid solution 1:40, or some other antiseptic, and should be removed from the room. When the child is soiled from discharges, it should be carefully washed and dried. To prevent the skin about the anus from becoming excoriated, it should be anointed with such preparations as the ointment of zinc oxid or carbolized vaselin, which will act as a protective and be found more efficacious than the usual dusting-powders, which are sufficient when the bowel movements are normal and non-irritating.

Treatment.—For the attack the treatment should be, first, rest for the body by confinement to bed, and rest for the digestive organs by withholding all food for a period of from 12 to 36 hours, according to the indications, giving for this period water or ice to quench the thirst, and bland drinks, such as barley-water, albumin water, or toast-tea in small quantities, frequently repeated. To these may be added every 1 or 2 hours, when the child is weak, 10 or 15 drops of brandy.

Warm baths should be given 2 or 3 times a day, as they assist in the elimination of waste-products from the system, stimulate the cutaneous circulation, and thus have a tendency to lessen the local congestion of the digestive organs.

For the abdominal pain, which may be severe, turpentine stupes, a spice poultice, or a mustard plaster applied to the epigastrium will often give relief.

As stated, food should be withheld until there has been time to clear the alimentary tract of the irritating material that it contains and until the organs have regained to some extent their normal condition. When food is then given, it must at first be administered very weak and in small quantities. For a child under 2 years old a suitable formula to begin with would be 1 ounce consisting of equal parts of whey and water, 10 grains of sodium bicarbonate, and 30 grains of milk-sugar, fed from a bottle every hour; and if this is found to agree with the child, the strength of the mixture may be gradually increased by adding cream, also increasing the amount and the intervals of feeding. Older children may be cautiously fed on such light diet as milk, meat-juice, broths, soft-boiled eggs, and toast in very small quantities at first, not allowing coarse food, such as vegetables, fruit, etc., until the system has regained its normal tone.

Medicinal Treatment.—The first indication for medication is to aid nature in her efforts to clear the alimentary canal. If the stomach has not been emptied by vomiting, and there is reason for assuming that it contains undigested food, an emetic, as a teaspoonful of syrup of ipecacuanha, should be given. Following this, or at first in cases when an emetic is not necessary, some laxative should be given, one of the best being castor oil, or equal parts of castor oil and aromatic syrup of rhubarb, in teaspoonful doses every hour, until the bowels are freely acted upon. Calomel may be used instead of castor oil, and in many cases its action is most beneficial—1/2 of a grain, with 1 grain of bicarbonate of sodium, should be given every hour for 4 or 5 doses, or until its action is shown on the stools.

The colon should be irrigated once or twice a day as long as there is any irritating material left in the bowels.

When improvement is not marked and the diarrhea continues after the treatment outlined has been followed for from 24 to 36 hours, astringents or intestinal antiseptics, or a combination of the two, should be given. One of the following formulas will at this time be found useful for a child 1 to 2 years old, giving smaller doses for a younger child:

℞. Sodium bicarbonate, gr. xxx
Aromatic syrup of rhubarb, ʒ jss
Peppermint water, ʒ v.
One-half to 1 teaspoonful after each bowel movement.

℞. Aromatic sulphuric acid, gtt. xvj
Camphorated tincture of opium, ʒ j
Mucilage of acacia, ʒ iv
Brandy, q. s. ʒ j.
One-half of a teaspoonful after each bowel movement.

℞. Compound tincture of lavender, ʒ iv
Sugar, gr. xxx
Camphor water, ʒ ij.
One or 2 teaspoonfuls every 3 hours.

℞. Salicylate of bismuth, ʒ ij
Glycerin, ʒ ij
Listerine, ʒ iv
Chalk-mixture, q. s. ʒ iij.
One teaspoonful every 2 or 3 hours, as necessary.

℞. Subgallate of bismuth, ʒ ij
Chalk-mixture, ʒ iij.
One teaspoonful every 3 hours.

℞. Deodorized tincture of opium, gtt. xvj
Dilute nitric acid, ʒ j
Glycerin, ʒ iv
Chloroform water, q. s. ʒ ij.
One teaspoonful every 3 or 4 hours.

℞. Arsenite of copper, gr. 1/8
Camphor water, } each, ʒ j.
Cinnamon water, }

During convalescence the following pepsin mixture will be found a useful aid to digestion:

℞. Pepsin, ℥ j
Dilute hydrochloric acid, ℥ ij
Glycerin, ℥ iv
Water, q. s. ad ℥ iij.

One teaspoonful, well diluted with water, after meals.

Tonics, such as tincture of nux vomica, tincture of gentian, iron, etc., are frequently indicated following the attack, and great care should be exercised to keep the child in a healthy condition by proper food, bathing, outdoor exercise, change of air, etc., to guard against recurrences, which are so likely to occur.

DIASTASE.—A nitrogenous vegetable ferment that converts the starch of bread or other farinas into grape-sugar or glucose. It may be used to form a syrupy mixture with preparations of iron or cinchona. It is put in the form of a light yellow powder as a distinct product by manufactures, or contained in extracts of malt.

Taka-diastase is a brownish powder, almost tasteless; soluble in water and insoluble in alcohol. It is a powerful starch digestant, absolutely free from sugars, and is used in amylaceous dyspepsia in small doses—1 to 5 grains.

DIAZO-REACTION.—See Typhoid Fever.

DIETETICS.—Dietetics is the science of the systematic regulation of the diet for hygienic or therapeutic purposes.

Classification of Foods (Yeo).—

Organic — Nitrogenous:
1. Albuminates.—Nitrogenous substances having the same or nearly the same chemic composition as albumin. *Examples.*—Albumin, fibrin, syntonin, myosin, globulin, casein, from the *animal* kingdom; gluten and legumin, from the *vegetable* kingdom.

(*a*) *Subordinate* nitrogenous substances referred to this class, and known as—
Gelatigneous substances: Gelatin. Casein. Chondrin.

Organic — Nonnitrogenous:
2. Fats, or Hydrocarbons, containing carbon, hydrogen, and oxygen; the proportion of oxygen being insufficient to convert all the hydrogen into water. *Examples.*—Olein, stearin, margarin. (Butter is a familiar one.)

3. Carbohydrates, containing carbon, hydrogen, and oxygen; the two latter elements in the proportion to form water. *Examples.*—Starch, dextrin, cane-sugar, grape-sugar, lactose, or milk-sugar.

(*a*) The *vegetable acids*, oxalic, tartaric, citric, malic, acetic, and lactic, are by some authors referred to this class.

Inorganic:
4. Mineral.—Water. *Salts.*—Sodium and potassium chlorids, calcium and magnesium phosphates, iron, etc.

The special diet-lists for such conditions as constipation, diabetes, nephritis, etc., are considered under the special headings of the diseases to which they refer. See Typhoid Fever (Coleman-Shaffer diet).

Constituents of Foods.—The following table (by Atwater and Bryant) shows the composition of some of the more common articles of diet:

	Water Percent	Protein Percent	Fat Percent	Carbohydrate Percent	Ash Percent
Beef, round	73.6	22.6	2.8	.....	1.3
Pork, loin	52.0	16.6	30.1	.....	1.0
Salmon	63.6	17.8	17.8	.....	1.1
Eggs	73.7	13.4	10.5	.....	1.0
Milk	87.0	3.3	4.0	5.0	0.7
Cheese	31.6	28.8	35.9	0.3	3.4
Butter	11.0	1.0	85.0	.....	3.0
Bread (White)	33.2	10.9	1.3	53.6	1.0
Bread (Corn)	38.9	7.9	4.7	46.3	2.2
Rice	12.3	8.0	0.3	79.0	0.4
Oatmeal	7.3	16.1	7.2	67.5	1.9
Beans (Dry)	12.6	22.5	1.8	59.6	3.5
Potatoes (White)	78.3	2.2	0.1	18.4	1.0
Potatoes (Sweet)	69.0	1.8	0.7	27.4	1.2
Strawberries	90.4	1.0	0.6	7.4	0.6
Watermelon (Edible portion)	92.4	0.4	0.2	6.7	0.3

A liquid diet is indicated in many acute conditions, particularly in those of febrile character. The following is an appropriate list:

Soups.—Raw-meat juice, clam broth, chicken broth, vegetable broths, mutton broth, broth with egg, broth of gelatin, beef-tea, clear soups, fruit soup.

Eggs.—Beaten up with water or stimulants.

Foods.—Peptonized milk, malted milk, any of the prepared foods, liquid peptonoids, milk-toast, arrow-root, Indian-meal gruel, oatmeal gruel, ground rice, pounded raw meat, oysters; later, meat and calf's-foot jellies.

Beverages.—Skim-milk, 2 quarts daily; buttermilk, whey, koumiss, barley-water, rice-water, toast-water, jelly-water, gum-arabic water, lemonade, pure nonpurgative mineral waters, fruit-juices, egg lemonade, egg-nog, cocoa.

A Light Diet. Soups.—Any clear soup not highly seasoned.

Meats.—Scraped beef or mutton, pounded raw meat, sweetbread, beef-juice, liquid peptonoids.

Eggs.—Raw, lightly boiled, poached.

Farinaceous.—Crackers, toast, rice boiled with milk, arrowroot, tapioca, sago, well-boiled gruel; brandy or port wine may be added to the arrow-root or gruel.

Dessert.—Milk foods, milk and egg puddings if not sweetened.

Beverages.—Sterilized or pasteurized milk, skim-milk, milk with lime-water, peptonized milk, strong tea, lactic acid water, toast-water, rice-water, koumiss, egg lemonade, and nonpurgative mineral waters.

Articles Prohibited.—Vegetables, soups, new bread, brown and Graham bread, oatmeal, cooked or raw fruits, fried foods, fish, sweet foods, nuts, salt meats, veal, pork.

A sufficient though restricted diet, such as might be called for in convalescence or in persons with impaired assimilation, is as follows:

Soups.—Clear soups.

Fish.—Fresh fish, oysters, and little-neck clams; none of these may be fried.

Meats.—Meat-juice, roast or broiled beef, mutton, chicken, venison, tongue.

Eggs.—Raw, soft-boiled, poached on toast, omelet combined with chicken or oysters.

Farinaceous.—All kinds of bread at least 1 day old; Zwieback, crackers, cream crackers, cracked wheat, rice, sago, tapioca, macaroni, arrowroot, corn-meal, hominy, wheaten grits, Graham grits, vermicelli, rolled rye, rolled oats.

Vegetables (best made into purée by passing through a colander or mashing).—Greens—spinach, lettuce, water-cresses—French beans, sweet corn, green peas, asparagus, celery, artichokes, baked tomatoes, potatoes (sparingly).

Dessert.—Fruit, rice, tapioca, Indian, and farina puddings; custards, orange charlotte, gelatin creams, blanc-mange, baked and stewed apples and pears, grapes, and all ripe fruits except bananas and pineapples. No rich sauces may be used.

Beverages (drinks should be taken near the end of meals).—Hot water before meals, milk, lime-water, pure mineral waters, weak tea (1/2 of an ounce to the pint), koumiss, weak cocoa, peptonized cocoa and milk, butter-milk, acid wine (if acidity).

Articles Prohibited.—Rich soups and chowders, all fried foods, veal, pork, liver, kidney, hashes, stews, pickled and corned meats, preserved and potted meats, turkey, goose, duck, sausage, salt mackerel, bluefish, sturgeon, eels, shrimps, sardines, lobster, crabs, cabbage, cauliflower, cucumbers, string-beans, parsnips, egg-plant, turnips, carrots, squash, oyster-plant, sweet potatoes, beets, pastry, pies, made dishes, nuts, dates, jams, dried and candied fruits, candies, cheese, strong tea, ice water, malt liquors, sweet and effervescent wines, spirituous liquors.

The feeding of infants is considered under the headings of INFANT FEEDING and MILK (*q. v.*).

Recipes for the Sick-room Dietary (Thomas):

Toast-water.—Toast 3 slices of stale bread to dark brown, but do not burn; put into a pitcher; pour over them a quart of boiling water; cover closely and let stand on ice until cold; strain. Wine and sugar may be added.

Rice-water.—Pick over and wash 2 tablespoonfuls of rice; put into a granite saucepan with 1 quart of boiling water; simmer 2 hours, when the rice should be softened and partially dissolved; strain, add saltspoonful of salt; serve warm or cold. Sherry or port, 2 tablespoonfuls, may be added.

Gum-arabic Water.—Dissolve 1 ounce of gum-arabic in a pint of boiling water; add 2 tablespoonfuls of sugar, wineglassful of sherry, and juice of 1 large lemon; cool, add ice.

Barley-water.—Wash 2 ounces (wineglassful) of pearl barley with cold water; boil 5 minutes in fresh water; throw both waters away; pour on 2 quarts of boiling water; boil down to a quart; flavor with thinly cut lemon-rind; add sugar to taste; do not strain unless at the patient's request.

Egg-water.—Stir the whites of 2 eggs into 1/2 of a pint ice-water without beating; add enough salt or sugar to make palatable.

Flaxseed Tea.—Flaxseed, whole, 1 ounce; white sugar, 1 ounce (heaping tablespoonful); licorice root, 1/2 of an ounce (2 small sticks); lemon-juice, 4 tablespoonfuls. Pour on these materials 2 pints of boiling water; let stand in hot place 4 hours; strain off the liquor.

Sterilized Milk.—Put the required amount of milk in clean bottles (if for infants, each bottle holding enough for one feeding); plug mouths tightly with rubber stoppers; immerse to shoulders in kettle of cold water; boil 20 minutes; or, better, steam 30 minutes in an ordinary steamer; push stoppers in firmly; cool bottles rapidly, and keep in refrigerator; warm each bottle just before using.

Peptonized Milk. *Cold Process.*—In a clean quart bottle put 1 peptonizing powder (extract of pancreas, 5 grains; bicarbonate of sodium, 15 grains) or the contents of 1 peptonizing tube (Fairchild); add one teacupful of cold water, shake; add 1 pint of fresh cold milk, shake the mixture again; place on ice; use when required without subjecting to heat. *Warm Process.*—Mix peptonizing powder with water and milk, as previously described; place bottle in water so hot that the whole hand can be held in it for a minute without discomfort; keep the bottle there 10 minutes; then put on ice to check further digestion. Do not heat long enough to render milk bitter.

Milk and Egg.—Beat milk with salt to taste; beat white of egg until stiff; add egg to milk and stir.

Peptonized Milk-toast.—Over 2 slices of toast pour a gill of peptonized milk (cold process); let stand on the hob for 30 minutes. Serve warm, or strain and serve fluid portion alone. Plain light sponge cake may be similarly digested.

Baked Flour Porridge.—Take 1 pint of flour and pack tightly in small muslin bag; throw into boiling water and boil 5 or 6 hours; cut off the outer sodden portion, grate the hard core fine; blend thoroughly with a little milk and stir into boiling milk to the desired thickness.

Kumyss.—Take an ordinary beer-bottle with shifting cork; put in it 1 pint of milk, 1/6 of a cake of Fleischmann's yeast, or 1 tablespoonful of fresh lager-beer yeast (brewer's), and 1/2 of a tablespoonful of white sugar reduced to syrup; shake well and allow to stand in refrigerator 2 to 3 days, when it may be used. It will keep there indefinitely if laid on its side. Much waste can be saved by preparing the bottles with ordinary corks wired in position and drawing off the koumiss with a champagne tap.

Wine Whey.—Put 1 quart of new milk in a saucepan, and stir over clear fire until nearly boiling; then add a gill (2 wineglassfuls) of sherry, and simmer a quarter of an hour, skimming off curd as it rises. Add a tablespoonful more sherry, and skim again for a few minutes; strain through coarse muslin. Two tablespoonfuls of lemon-juice instead of wine may be used.

Junket.—Take 1/2 of a pint of fresh milk, heated luke-warm; add 1 teaspoonful of essence of pepsin, and stir just enough to mix; pour into custard cups, let stand until firmly curded; serve plain or with sugar and grated nutmeg. Sherry may be added.

Egg Lemonade.—Beat 1 egg with 1 tablespoonful of sugar until very light; stir in 3 tablespoonfuls of cold water and juice of a small lemon; fill glass with pounded ice and drink through straw.

Egg-nog.—Scald some new milk by putting it, contained in a jug, into a saucepan of boiling water; *but do not allow it to boil.* When cold, beat up fresh egg with a fork in a tumbler with some sugar; beat to a froth, add a dessertspoonful of brandy, and fill up the tumbler with scalded milk.

Nutritious Coffee.—Dissolve a little isinglass or gelatin (Knox) in water, put 1/2 of an ounce of freshly ground coffee into a saucepan with 1 pint of new milk, which should be nearly boiling before the coffee is added; boil together for 3 minutes; clear it by pouring some of it into a cup and dashing it back again; add the isinglass, and leave it to settle on the hob for a few minutes. Beat up an egg in a breakfast cup, and pour the coffee upon it; if preferred, drink without the egg.

Rum Punch.—White sugar, 2 teaspoonfuls; 1 egg, stirred and beaten up; warm milk, large wineglassful; Jamaica rum, 2 to 4 teaspoonfuls; nutmeg.

Champagne Whey.—Boil 1/2 of a pint of milk; strain through cheese-cloth; add a wineglassful of champagne.

Peptonized Oysters.—Mince 6 large or 12 small oysters; add to them, in their own liquor, 5 grains of the extract of pancreas with 15 grains of bicarbonate of sodium (or 1 Fairchild peptonizing tube). The mixture is then brought to blood-heat, and maintained, with occasional stirring, at that temperature 30 minutes, when 1 pint of milk is added and the temperature kept up 10 to 20 minutes. Finally the mass is brought to boiling-point, strained, and served. Gelatin may be added, and the mixture served cold as a jelly. Cooked tomato, onion, celery, or other flavoring suited to individual taste may be added at the beginning of the artificial digestion.

Beef-tea.—Free a pound of lean beef from fat, tendon, cartilage, bone, and vessels; chop up fine, put into a pint of cold water to digest 2 hours. Simmer on range or stove 3 hours, *but do not boil.* Make up for water lost by adding cold water, so that a pint of beef-tea represents 1 pound of beef. Press the beef carefully and strain.

Beef-juice.—Cut a thin, juicy steak into pieces 1 1/2 inches square; brown separately 1 1/2 minutes on each side before a hot fire; squeeze in a hot lemon-squeezer; flavor with salt and pepper. This may be added to milk or poured on toast.

Beef-tea with Acid.—One and a half pounds of beef (ground) cut in small pieces; same quantity of ice, broken small. Let stand in deep vessel 12 hours. Strain thoroughly and forcibly through coarse towel. Boil quickly 10 minutes in porcelain vessel. Let cool. Add 1/2 of a teaspoonful of acid (or acid phosphate) to the pint.

Mutton Broth.—Lean loin of mutton, 1 1/2 pounds, including bone; water, 3 pints. Boil gently until tender, throwing in a little salt and onion, according to taste. Pour out broth into basin; when cold, skim off fat. Warm up as wanted.

Chicken Broth.—Skin and chop up fine a small chicken or half a large fowl; boil it, bones and all, with a blade of mace, a sprig of parsley, 1 tablespoonful of rice, and a crust of bread, in a quart of water, for an hour, skimming it from time to time. Strain through a coarse colander.

Clam Broth.—Wash thoroughly 6 large clams in shell; put in a kettle with 1 cup of water; bring to a boil and keep there 1 minute; the shells open, the water takes up the proper quantity of juice, and the broth is ready to pour off and serve hot.

Cream Soup.—Take 1 quart of good stock (mutton or veal), cut 1 onion into quarters, slice 3 potatoes very thin, and put them into the stock with a small piece of mace; boil gently for an hour; then strain out the onion and mace; the potatoes should, by this time, have dissolved in the stock. Add 1 pint of milk, mixed with a very little corn-flour to make it about as thick as cream. A little butter improves it. This soup may be made with milk instead of stock, if a little cream is used.

Apple Soup.—Two cups of sliced apples; 2 cups of water; 2 teaspoonfuls of corn-starch; 1 1/2 tablespoonfuls of sugar; 1 saltspoonful of cinnamon and a pinch of salt. Stew the apples in the water until very soft, then mix together into a smooth paste the corn-starch, sugar, salt, and cinnamon, with a little cold water; pour this into the apples and boil for 5 minutes; strain it and keep hot until ready to serve. May be served with hot buttered sippets.

Raw-meat Diet.—Scrape pulp from a good steak, season to taste, spread on thin slices of bread; sear bread slightly and serve as sandwich.

Meat Cure.—Procure a slice of steak from top of round—fresh meat without fat; cut meat into strips, removing all fat, gristle, etc., with knife. Put meat through mincer at least twice. The pulp must then be well beaten up in a large saucepan with cold water or skimmed beef-tea to consistency of cream. The right proportion is 1 teaspoonful of liquid to 8 of pulp; add black pepper and salt to taste; stir mince briskly with wooden spoon the whole time it is cooking, over slow fire or on cool part of covered range until thoroughly hot and the red color disappears. This requires about 1/2 hour. When done, it should be a soft, smooth, still purée of the consistency of a thick paste. Serve hot. Add for first few meals the softly poached white of an egg.

DIGALEN.—Liquor Digitoxin Solubilis. A uniform solution of the active principle of digitalis containing no inert or antagonistic principles. Digalen is said to consist of 1 part of soluble digitoxin (Cloetta) in 1000 parts of glycerin, and 1600 parts of distilled water with 7.5 percent of alcohol. Owing to its far greater solubility this amorphous digitoxin is said to have the advantage over the crystalline form of prompt action, and of not producing irritation; and because of its more rapid diffusion and elimination it is said to have no cumulative effect. Dose, 16 minims.

DIGESTANTS.—A name sometimes given to the adjuvants to gastric digestion. The digestion ferments are pepsin, pancreatin, ingluvin, papain, and dilute hydrochloric acid. They are used to

supplement the action of deficient gastric juice, and are fully discussed under their separate headings.

DIGESTION, DISORDERS.—See Gastric Neuroses, Gastritis, Enteritis, etc.

DIGITALIS (Foxglove).—The dried leaves of *D. purpurea* of the second year's growth, growing wild in Europe and cultivated in America, often in private gardens for its beautiful spike of purple flowers. It is one of the most unreliable drugs in respect to its physiologic activity. The active principle is said to be digitalin, an amorphous product of complex composition that, however, does not represent the full properties of digitalis leaves. No alkaloid is contained in the drug. Four other glucosids are obtained from it—digitoxin, digitalein, digitonin, and digitin. The first two are active cardiac stimulants and are highly poisonous. The third is a direct depressant of the heart, antagonizing the stimulant action of the others.

Therapeutics.—The 3 important uses of digitalis are (1) to act as a powerful cardiac stimulant, (2) to slow the heart and regulate its rhythm, and (3) to act as a diuretic. As a cardiac stimulant it is indicated in weak heart, in syncope, collapse, and poisoning by cardiac depressants, especially aconite, and in dilatation of the heart. Dyspnea, dropsy, and feeble pulse are the indications for its use in valvular diseases of the heart. It is not so serviceable as strychnin in fatty degeneration. When the diuretic action of digitalis is desired, the infusion is the most suitable preparation in doses of 1/2 ounce, four times a day, to be reduced one-half when the desired effect is obtained or the pulse rate falls below 50 beats per minute. Nitroglycerin may advantageously be combined with digitalis when the peripheral resistance in the arterioles is very marked. In the second stage of pneumonia, in exhausting fevers, and in congestion of the lungs in typhoid fever, the drug is serviceable. When circulation is sluggish in congestion of the kidneys, digitalis acts as a diuretic. A cumulative action is said to occur in the course of administration when, in ascites or dropsy, paracentesis is performed. Signs of poisoning then ensue. To avoid this toxic action it is advised that the drug be withheld for 24 to 36 hours before paracentesis is performed.

The contraindications to the use of digitalis are marked atheroma of blood-vessels, aneurysm, apoplexy and other states of arterial excitement, arrhythmia when due to depressed conductivity, and gastric irritation. See also under Heart-disease.

In dropsy:

℞. Tincture of digitalis, ʒ j to ij
Tincture of squill, ʒ ij
Compound spirit of juniper, ʒ iv to vj
Acetate of potassium, ʒ iv
White wine, enough to make ʒ vj

A tablespoonful 3 or 4 times daily.

℞. Powdered digitalis, Powdered squill, each, ʒ ss
Potassium nitrate, ʒ j.

Make into a mass and divide into 30 pills. One pill thrice daily.

For cystitis:

℞. Tincture of digitalis, ♏ lxxx
Citrate of potassium ʒ ss
Spirit of chloroform, ʒ ijss
Infusion of buchu, ʒ viij.

Two tablespoonfuls 3 or 4 times daily.

In acute Bright's disease:

℞. Potassium acetate, ʒ ijss
Infusion of digitalis, Infusion of juniper, each, ʒ iij.

A tablespoonful every 2 to 4 hours as a diuretic.

In acute bronchitis when valvular lesions exist:

℞. Tincture of digitalis, ʒ ij
Aromatic spirit of ammonia, ʒ j
Spirit of ether, ʒ iv
Spirit of chloroform, ♏xl.

Give a teaspoonful in a small wineglassful of water every 3 hours.

Poisoning.—The slow, full pulse is followed by a shuttle-like, hobbling, dicrotic pulse, and the heart beats against the chest-wall in angry, tumultuous throbs. Vomiting occurs, with exopthalmos and a peculiar blue pearliness of the sclera. Consciousness is preserved until near death.

The treatment of this condition of poisoning includes the use of the stomach-pump, emetics when the heart is not much affected, the application of external heat, especially about the abdomen, the maintenance of the horizontal position, the administration of tannic acid as the chemic antidote, and of tincture of aconite as the physiologic antidote.

Incompatible with *Digitalis* are: Acids, alkalies, alkaloidal precipitants, cinchona infusion, ferrous sulphate, lead acetate, tannic acid, vegetable astringents, syrupy and aqueous solutions. Physiologically incompatible are: Aconite, chloral hydrate, cocain, glonoin, muscarin, saponin, scoparin, strychnin.

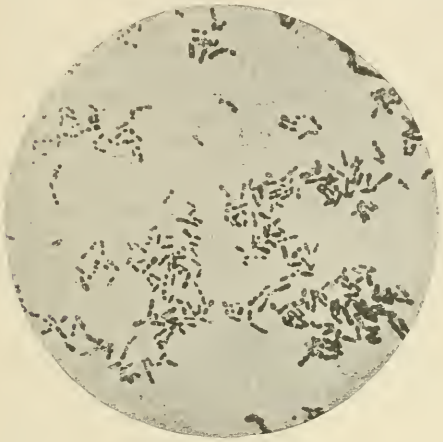
Preparations.—The dose of the leaves is 1/2 to 2 grains. **D., Ext.** Dose, 1/8 to 1/2 of a grain. **D., Flext.** Dose, 1/2 to 3 minims. **D., Infusum,** 1 1/2 percent in strength. Dose, 1 to 3 drams. **D., Tinct.,** 10 percent. Dose, 5 to 20 minims.

DIONIN.—Ethylmorphin hydrochlorid. A derivative of morphin, used as a substitute for other opium alkaloids and as an analgesic. Its indications and dosage are the same as those of Codein (*q. v.*).

DIPHTHERIA.—An acute infectious disease caused by the Klebs-Loeffler bacillus, and characterized primarily by local, and secondarily by constitutional, symptoms—the latter being due to the absorption of toxins produced by the growth of the bacillus upon the mucous membrane.

Diphtheria Bacillus.—This microorganism was first discovered by Klebs in 1883, and was isolated,

cultivated, and described by Loeffler in 1884. It is about the length of the tubercle bacillus and about twice as broad. It is frequently curved, and has rounded ends, one of which is sometimes swollen. It does not grow in chains, but is isolated. In the swab from the throat the streptococcus may slightly resemble this bacillus after being stained. This is due to the fact that the Klebs-Loeffler bacillus is very polymorphous. It is nonmotile and does not contain flagella or spores. It grows well upon artificial culture media, such as gelatin, agar-agar, potato, and milk.



Bacillus of Diphtheria.—(*After Fränkel and Pfeiffer.*)

It can be stained by the following solution:
Saturated alcoholic solution of methylene-blue, 30 parts,
Aqueous solution of caustic potash (1 : 10,000), 100 parts.

An aqueous solution of dahlia may also be used. If searched for in the tissues, Gram's method is preferable.

See Method of Staining, under Pathologic Technic.

The contagium is principally in the secretions of the nose and throat. Diphtheria is a toxinemia and the bacilli are not distributed in the blood or through the body, but are found at the site of, and in the parts adjacent to, the local disease. To the absorption of the toxic substance produced by the bacilli are due the general symptoms of the disease.

This toxalbumin injected into animals causes nephritis and albuminuria and paralysis.

Diphtheria is communicated by direct contact, as by kissing, or by the patient coughing or spitting in the face of another person; and indirectly by eating, utensils, toys, clothing, or anything that may have become infected by contact with the patient. The infection may be communicated during the incubation stage as well as during the attack, and for a considerable period following it—3 weeks at least—and as long as there are any of the bacilli present, and probably as long as there is any discharge from the throat, nose, ears, or other parts.

A lesion of the mucous membrane is necessary for the development of the disease, and any unhealthy condition of the nose or throat predisposes to the infection.

The incubation period is short—from 1 to 4 days; probably never longer than 7 days, although it is possible for the germs to remain in the mouth for an indefinite period, and finally, if the mucous membrane becomes weakened, produce the disease.

Pathology.—The formation of a pseudomembrane is the most constant lesion of diphtheria. This may occur upon any mucous surface, or may affect a freshly wounded surface of the skin, but is most commonly seen on the mucous membrane of the upper air-passages, as the tonsils, pharynx, soft palate, nose, or larynx. It is composed of fibrin, cells, granular matter, and bacteria. While it is usually of a mouse-gray color, it may vary from a white to yellow, green, or almost black color. A false membrane, similar in appearance, may be caused by other bacteria or by irritants. On the other hand, the Klebs-Loeffler bacillus may produce only a catarrhal inflammation, without the formation of the membrane.

There are present, due to the poison of diphtheria, degenerative changes in the cells of certain organs of the body—especially of the liver, nervous system, heart-muscle, spleen, and lymph-glands, and due to the invasion of the system by other organisms, as the streptococcus and pneumococcus—affections of the kidneys and lungs, or possibly a general septicemia.

Symptoms.—The symptoms, both local and constitutional, vary greatly in extent and severity. Locally, there may be only a catarrhal condition of the throat, with the bacilli present, but without the formation of a pseudomembrane; again, there may appear only a small patch upon the mucosa, or, on the other hand, the amount of pseudomembrane may be so great as to cover the tonsils, pharynx, soft palate, and uvula, and also extend to the nose, larynx, trachea, and bronchial tubes. Other mucous membranes, such as the vaginal and intestinal, and the conjunctival, are rarely attacked by diphtheria. Constitutional symptoms may be so slight as to pass almost unnoticed, or may reach the opposite extreme, the patient being prostrated, the fever high, the tongue parched, a fetid discharge from the nose, the throat and neck swollen and painful, food refused or taken with the greatest difficulty, and, when the larynx is involved, added to this picture of suffering is the noisy and difficult breathing of membranous croup.

Diphtheria, especially in young children, may begin abruptly, with chilliness, vomiting, or perhaps a convulsion. Usually, however, the onset is gradual, the child being indisposed, with perhaps a trifling sore throat for a day or two, and but a slightly increased temperature.

These symptoms increase steadily for 4 or 5 days, when the disease reaches its height. From the first the fauces and tonsils are a dull red color, the pseudomembrane appearing from the second to fourth day, usually first on the tonsils, and gradually or rapidly, according to the severity of the case, spreading to the fauces, back of pharynx, and uvula. This exudate is very adherent to the

parts, and when separated, leaves a bleeding surface.

The breath now becomes very offensive, swallowing is painful, the lymphatic glands at the angle of the jaw are swollen, and the pulse becomes rapid and weak, the appetite is lost, and the patient is greatly prostrated. Albumin, sometimes in great quantities, is usually present in the urine during the attack.

In uncomplicated cases the temperature is seldom high, ranging from 100° to 103° F. The symptoms mentioned continue until about the seventh or eighth day, when, if the course of the disease is favorable, there is noticed an improvement in the general condition, the membrane becomes loosened, and may be pulled away in large pieces. The swelling of the neck diminishes, fever declines, and by the end of a week the patient is convalescing, though still weak and usually very anemic. Convalescence is likely to be slow, and the heart's action remains feeble for weeks.

In unfavorable cases death most commonly occurs during the height of the local disease, the symptoms all growing more severe and death ensuing from asthenia, due to the poison of the disease. Another common case of death is heart failure, which comes on suddenly and may occur at any time during the course of the disease.

Death may also occur from extension of the disease to the larynx, or from complications, as bronchopneumonia, septicemia, or nephritis.

It is well to remember that an acute purulent rhinitis, unless caused by a foreign body in the nares (in which case it would be one-sided), is likely to be diphtheritic and therefore infectious. Since the introduction of diphtheria antitoxin the course of the disease, as well as the prognosis, has undergone a marked change; so that in average cases in which antitoxin has been given early, the exudate disappears in 24 to 48 hours after the injection, all alarming symptoms subside, and convalescence is established.

Complications and Sequels.—The most common complication is nephritis. Capillary bronchitis, bronchopneumonia, endocarditis and arthritis are met with. The most important sequel is paralysis. This involves most frequently the palate; next in frequency the muscles of deglutition, sometimes the eye muscles.

Diagnosis.—Diphtheria must be differentiated from other affections accompanied by an inflammation of, and perhaps an exudate on, the mucous membrane, especially from follicular tonsillitis.

In making this diagnosis the history of the case is important. Diphtheria is most common in children under ten years of age, and inquiry would elicit the fact of a probable exposure. The gradual onset and low temperature are characteristic of this disease, and enlargement of the cervical glands is usually present early.

Follicular tonsillitis often follows an overindulgence in rich food or pastry—the onset is sudden, temperature higher, the tonsils usually more acutely congested, and the exudate is *in* the follicles, while in diphtheria it is *on* the surface, is adherent, so that forcible removal is followed by bleeding, and the false membrane spreads to the adjacent structures in a typical manner. The gastric disturbances, coated tongue, and anorexia may be present in either affection.

In many doubtful cases a clinical diagnosis is impossible, and a culture showing the presence or absence of the diphtheria bacillus will alone remove the doubt. This bacteriologic test should be made in all cases in which there is any suspicion as to the origin of the disease, as only by this means is it possible to guard against infection from an apparently benign inflammation that in reality is diphtheritic, and that may, by infecting another, give rise to the most severe form of the disease.

Quite recently the **Schick reaction** has attracted some attention. Schick uses a toxin solution intradermically to determine the susceptibility of a patient to diphtheria; he injects 1 c.c. of toxin solution, and if the patient is *not* immune a reaction occurs somewhat similar to the von Pirquet reaction in tuberculosis. (And see DIPHTHERIA ANTITOXIN.)

Prognosis.—Practically, the prognosis of diphtheria is determined by the interval between the onset and the administration of antitoxin; provided a sufficient dose be injected. It is never safe to give too favorable an opinion as to the outcome of diphtheria, as the mildest cases may prove fatal, the physician often being disappointed in his expectations of an eventual happy issue, and complications causing a fatal result may arise at any time. The rapidity of the spread of the exudate and the degree of toxemia, as shown by the pulse and the nervous symptoms, are, as a rule, a reliable guide to the prognosis. The previous condition of the patient must also be considered, and the age is an important element, as the mortality rate in older children is low, and in adults diphtheria is rarely fatal.

In giving the prognosis it must be remembered that paralysis following diphtheria occurs in a large percentage of even very mild cases. It usually appears from 2 to 4 weeks after the attack, and is first noticed by the nasal tone of the voice, and from the fact that liquids, when swallowed, are regurgitated through the nose, as the palate is usually the first and often the only part affected. The extremities, pharynx, larynx, and muscles of the eye may also be involved. The course of diphtheritic palsy is nearly always to recovery, but it may continue for a period of several months.

Treatment. Prophylactic.—All cases of diphtheria should be isolated, and other members of the family kept from school or other places to which they may carry the infection. The danger is not that they will carry the disease on their clothing, but that they may have become infected, and have the germs of the disease in their mouths or throats. Quarantine, therefore, is necessary for 10 days or 2 weeks following the time when they may have been exposed.

It is important that a child's teeth, mouth, and nose should be kept in a healthy condition at all times, but this is especially true when there is danger of exposure to diphtheria. All the hangings, carpets, and unnecessary furniture should be removed from the sick-room which latter should

be large, well-ventilated, sunny, and kept scrupulously clean.

Any clothing or other articles that may have become infected should be soaked in a solution of carbolic acid (1 : 20) or bichlorid of mercury (1 : 1000), and afterward boiled, to sterilize them.

Other children in the family and the attendant nurse should be given an immunizing dose (1000 units) of antitoxin, and cultures should be taken on alternate days from the throats of all persons exposed to infection, until the patient is convalescent.

Curative.—As soon as the exudate is discovered, antitoxin treatment must be begun (as described in the following article), without waiting for bacteriologic confirmation of the clinical diagnosis.

The attendant or nurse should be careful to avoid infection, and the danger of this is slight if proper precautions are taken. She should take exercise daily in the open air, should gargle the throat frequently with an antiseptic solution, and should be careful that the secretions from the patient do not get into the eyes, nose, or mouth.

The room occupied by the patient including mattresses, pillows, etc., should be disinfected with formaldehyd or with sulphur. The convalescent patient should be isolated until thoroughly disinfected by a bichlorid, carbolic acid or alcohol bath for several successive days and by similar treatment of the hair.

A patient with diphtheria should be kept in bed, and not allowed to get up for any purpose, thus putting as little strain as possible on the heart. The food—preferably milk—should be given at regular intervals, and, if necessary, the patient, should be forced to take it. Water (to which has been added a tablespoonful to the quart of the following solution) should be kept boiling in the room.

℞. Oil of eucalyptus, Carbolic acid, each, ʒ j
Spirit of turpentine, ʒ vj.

Local treatment by sprays, etc., should not be forced upon an intractable child, as the excitement and exhaustion produced by resistance may be very harmful.

Syringing is an efficient method of cleansing the nose and throat. For injecting a liquid into the nose a small glass or rubber syringe with a soft-rubber tip should be used, and when this is done carefully from the beginning of the attack, the child will seldom rebel. Older children, or those more easily managed, should also gargle their throats and wash their mouths every 3 or 4 hours.

Nothing is better for irrigation or gargle than normal salt solution; next in efficiency is hydrogen dioxid diluted with an equal quantity of glycerin and twice the quantity of water. Strong alkaline and other antiseptic solutions are irritating and should not be used. It has been found by careful experiments that normal salt solution will cause disappearances of the bacilli from the throat more promptly than any other agent.

Recently pyocyanase, an enzyme obtained from a culture of the bacillus pyocyaneus, has been advocated as a local application by reason of its marked bacteriolytic properties.

Internally, at the beginning of an attack, give 1/6 of a grain of calomel every hour until the bowels are freely moved, and after that the following mixture:

℞. Mercuric chlorid, gr. j
Chlorate of potassium, ʒ j
Tincture of chlorid of iron, ʒ iij
Glycerin, ʒ jss
Water, q. s. ʒ vj.

To a child 4 or 5 years old a teaspoonful every 4 hours.

After 3 or 4 days it is well to omit the mercuric chlorid in the foregoing formula and add strychnin sulphate in the same quantity.

Alcohol should be given early and throughout the attack if the heart is at all weak. A teaspoonful of brandy or whisky, well diluted with water, may be given every 1 or 2 hours, when there are symptoms of heart failure, and every 3 or 4 hours at other times, to a child 4 or 5 years old.

During convalescence tonics and iron are indicated, which may be given in the following pill or capsule:

℞. Strychnin sulphate, Arsenic trioxid, each, gr. ss
Dried iron sulphate, Quinin sulphate, each, gr. xxiv
Extract of gentian, ʒ j.

Make into 24 pills, giving one 3 times a day.

The most efficient method of combating diphtheria is by treatment with **antitoxin**, though it should be remembered that when this remedy is used the local and general measures mentioned should be none the less vigorously pursued. To secure the best results from antitoxin it should be given early and in large doses, as stated in the following article, which see. Laryngeal obstruction demands special measures. See Intubation and Tracheotomy for the indications and technic of these operations.

DIPHTHERIA ANTITOXIN.—Diphtheria antitoxin is prepared by growing on a culture medium the bacilli of diphtheria, which are later destroyed by adding to the medium a weak antiseptic solution and subsequently removing by filtration the organisms that have thus been killed. The filtrate, which contains only the toxins secreted or generated by the bacilli, is then injected into a horse in very small quantities at first, repeating the injections at intervals, and increasing the dose gradually, until at the end of 2 or 3 months the serum of the horse, being tested, will show that antitoxin of proper strength has been formed.

The antitoxin unit is fixed by law and is under the control, in the United States, of the Hygienic Laboratory of the Public Health Service. The

immunity unit is the quantity of antitoxin which will neutralize 100 minimum lethal doses of toxin for a guinea-pig weighing 250 gms.

"A number of test doses of the toxin are prepared, each containing a hundred times the minimum fatal dose. To each test dose is added a measured quantity of the serum in question. To one dose is added 0.01 c.c. of the serum; to another, 0.05 c.c. of the serum; to another, 0.1 c.c. of the serum; to another, 0.5 c.c.; and to still another 1 c.c., and so on. The mixtures are now injected into guinea-pigs and the results observed. Animals not dying within four days were protected; local infiltration, wasting or death after the fourth day does not enter into the computation. The mixture containing the smallest amount of serum and yielding this result contains 1 immunity unit. If 0.05 c.c. of a serum neutralizes 100 times the minimum lethal dose, each cubic centimeter contains twenty immunity units. Antitoxin as placed upon the market, is labeled as containing a certain number of immunity units, and the measured quantity of serum necessarily varies, as the number of units obtained are rarely exactly the same in two animals" (Coplin).

The antitoxic serum now on the market varies in strength from 100 to 1000 units to the cubic centimeter, the dosage being regulated by the immunizing units represented, and not by the quantity of the serum. The horse is selected in the preparation of diphtheria antitoxin because it is naturally immune to diphtheria, is easily operated upon, and furnishes large quantities of serum.

The treatment does not affect the horses' health, nor are they at any time made to suffer pain, except that of the introduction of a large-sized hypodermic needle, which in them is very slight indeed.

The results of this remedy are shown a few hours after administration, by a decrease in both the local and constitutional symptoms. The swelling of the throat decreases, the membrane ceases to spread, the pulse and temperature are reduced, and, finally, the membrane disintegrates and disappears much sooner than in cases not treated with antitoxin.

Dosage.—Whenever diphtheria is suspected, antitoxin should be given at once. Antitoxin does no harm where the disease is not diphtheria, and delay in a true case may be fatal.

Very much larger doses of antitoxin are given now than formerly. Thus the beginning dose was 1000 *units* for ordinary pharyngeal diphtheria. Now 3000 units are a frequent initial dose, and even more is given in bad cases, 7000 to 10,000. In laryngeal diphtheria at least 5000 units should be given at the first dose. The "concentrated" form is preferred on account of its small bulk. The "standard" is cheaper and just as efficacious, but more painful because of its greater bulk.

If decided improvement is not noticed in 10 or 12 hours, the dose should be repeated, keeping in mind the fact that sufficient antitoxin must be used to neutralize the toxins of the disease, which can only be estimated in a general way by the severity of the local and general symptoms. Given in too small doses, the poison of the disease cannot be neutralized; and as no bad effects are produced by larger quantities, it is safer to give more than is required rather than less.

The *prophylactic dose* for children is 500 to 1000 units, and for adults 1000 to 2000 units. The immunity so conferred is only temporary, its duration depends on the quantity of antitoxin administered, and it gradually decreases as the antitoxin is eliminated.

The prophylactic administration of antitoxin to those who had been exposed to the infection has been universally recommended in spite of the fact that many persons are not susceptible at the time of exposure because of the presence of natural diphtheria antitoxins in the blood. Many persons, no doubt, have been given antitoxin as a prophylactic when nature has supplied sufficiently to protect the individual. The practical difficulty has been the separation of those in which natural antitoxin was present in sufficient amounts to protect the individual from those in which its absence or diminished quantity rendered infection probable. Recently a simple test known as the intracutaneous **reaction of Schick,** has been found of considerable value in estimating the presence of natural immunity. In the performance of the test a dilution of diphtheria toxin is made of such strength that 0.1 mil. contains one-fiftieth of the minimum lethal dose for the guinea-pig. This amount is injected intracutaneously and if a positive reaction results there appears from 24 to 48 hours a circumscribed area of redness and slight infiltration which remains for about a week and then fades, a brownish pigmentic area remaining for a considerable length of time. A positive reaction, according to Schick, indicates that the natural antitoxins are considerably reduced or absent, and such individuals are susceptible to diphtheria. So far this test has been corroborated by Park and other observers.

Method of Administration.—The more concentrated serums (250 to 1000 units to the cubic centimeter) are preferable, as by their use there are noticed none of the possible disagreeable effects caused by injecting a large quantity of fluid subcutaneously.

With a thoroughly sterilized hypodermic syringe, or a special antitoxin syringe, the serum is introduced into a part of the body where there is loose subcutaneous tissue, and where the spot will not be subjected to pressure from the patient's position in bed—the flank or the interscapular region being usually selected. With the concentrated serum small doses may be given with an ordinary hypodermic syringe, and a syringe holding 5 c.c. is large enough for any dose required. (See Serum Therapy and Vaccine Therapy.)

DIPLOPIA.—See Eye-muscles (Anomalies).

DIPSOMANIA.—The uncontrollable desire for spirituous liquors. This is generally regarded as a disease. See Alcoholism (Chronic).

DISARTICULATION.—See Amputation.

DISC, OPTIC.—See Optic Nerve Atrophy.

DISCISSION.—See Cataract.

DISCUTIENTS.—See Sorbefacients.

DISINFECTANTS.—See Antiseptics.

DISINFECTION.—Disinfection constitutes one of the most efficient means of controlling the spread of infectious diseases, and every practising physician should be familiar with its method of employment. The anxious mother in whose family a case of infectious disease, and possibly a death from the same, has occurred, often asks the question, How can I be assured that my other children and those of my neighbors can best be protected?

As infectious diseases differ essentially in their natural history and in the methods of their spread, so they also differ in the use of the disinfectants that are necessary for their prevention. The practical question, therefore, arises in each case of infectious disease, *What is the best disinfectant for use in this particular case, and how shall it be applied?*

If the air of a room is infected, the best method of disinfecting it is to open the windows, and a few moments' time will serve to replace it by fresh uninfected air. And in so doing there need be no fear of endangering the health of the neighborhood, except in the case of small-pox. Infected air is soon dissipated by the enormous dilution of the external atmosphere and by the action of the sunlight, the winds, and the rain, and thus rendered inert.

The actual solid substances that then remain in an infected room, after flushing out its atmospheric contents, are the wall, the ceiling and floor, the beds and bedding, furniture, carpets, clothing, etc.

The principal means of disinfection in use at the present time, and the methods of their use, are as follows:

1. **Actual Destruction by Fire.**—This is unquestionably the most thorough and certain method of destroying infected material, but is only applicable to organic substances, and to such as are worthless or cannot be disinfected by other methods. It may be applied to infected clothing, rags, and bits of infected cloth, such as are contaminated with the infected discharges from the mouth, nose, throat, and other parts of the body in cases of diphtheria, scarlet fever, typhoid fever, and phthisis. Mattresses saturated with infectious material, upholstery, and cheap furniture, which are not deemed worth disinfecting by other methods, may be treated in this manner. Infected school books and library books, especially when worn and of slight value, may be destroyed by fire, in preference to running the risk of using them without disinfection.

In the treatment of cases of small-pox in the milder season of the year, an efficient method would be the selection of an isolated location, remote from inhabited districts, and there treating the patient in a good wall tent that can be burned after the recovery or death of the patient, together with the bed, bedding, and furniture.

2. **The Application of Heat.**—**Dry Heat.**—Exposure of the infected material to a heat of from 150° to 250° F., according to the nature of the disease for which disinfection is required. This mode is not convenient for ordinary use, in consequence of the liability of overheating and of consequent injury of the fabrics or substances to be disinfected.

Moist Heat. *Steam.*—This is only applicable in cities, large towns, public institutions, and quarantine stations, where special apparatus can be provided. It is employed for the disinfection of clothing, bedding, mattresses, carpets, upholstery, metallic surgical instruments, and all other material that is not liable to injury by steam.

Boiling Water.—Boiling water may be employed for the disinfection of bed-linen, clothing, sputum cups, cuspidors and metallic surgical instruments, metal and crockery. These may be placed in a wash-boiler or other convenient receptacle partly filled with water, which may be brought to the boiling point, and boiling maintained for 15 minutes.

3. **Chemical disinfectants** having well-defined powers for the destruction of disease germs, as determined by experiment. Of these, the most efficient and useful in liquid form are solutions of carbolic acid, chlorid of lime, bichlorid of mercury, lime-water, and milk of lime. A good disinfectant for general use should be inexpensive, readily soluble in water, and capable of easy and rapid applications. As a general rule, disinfectants in the crude form and in bulk are both cheaper and more efficient than patented articles.

Crude carbolic acid or **phenol** is soluble in water in the ratio of about 1 part to 30 (about 4 ounces to the gallon). A solution of 1 part in 400 will destroy most bacilli, but not their spores. For disinfectant purposes it is decidedly inferior to the cresols.

Mercuric Chlorid (Corrosive Sublimate).—One part dissolved in 1000 parts of water will suffice to destroy disease germs of all sorts in less than 10 minutes, and ordinary bacilli* in less than 1 minute. The extremely poisonous character of this solution makes it necessary to take special precautions in its use. Its property of forming insoluble compounds with albumin also seriously interferes with its efficiency.

Chlorid of Lime.—This is one of the most efficient disinfectants, and may be used either in powder or in solution, in the latter case in the proportion of 2 parts of chlorid of lime to 100 of water.

Any one of the foregoing may be employed for application to walls, floors, or woodwork.

Milk of Lime (Common Whitewash).—This constitutes a very efficient disinfectant for use in the disinfection of the excreta of typhoid fever or cholera by mixing it thoroughly with the excreta in equal bulk. It may be prepared by sprinkling a quart of water gradually over a quart of quicklime, in broken pieces, in a wooden or metallic vessel. When the lime is reduced to powder, 3 quarts or more of water should be added, and the mixture allowed to stand. This is highly recommended by the German Government in its cholera circular of 1892. It may be used in liberal quantities for the flooding of areas and concrete floors.

Weaker disinfectants are the permanganate of potassium and the sulphates of iron, copper, and

* Ordinary bacilli—*i. e.*, most of the common forms of infectious disease. The spores of anthrax require longer time, but anthrax is a disease of rare occurrence in the United States, and when it does occur as a result of infection from the lower animals, it rarely spreads.

zinc, any one of which may be employed in a 5 percent solution.

The cresols—tricresol, creolin, lysol, etc.—are powerful disinfectants and are extensively used.

Gaseous Disinfectants.—The principal disinfectants in gaseous form are sulphurous acid, chlorin, and formaldehyd. None of these should be used during the occupancy of the room that is to be disinfected. Disinfectants of this character are employed for the disinfection of rooms that have been occupied by the sick. Chlorin gas is but little used, in consequence of its extremely irritating nature. Sulphur is also rapidly falling into disuse, because of its foul odor, the occasional injury caused by it, and the fact that it frequently fails to accomplish its end, as shown by experiment. When used, the sulphur should be broken up and burned in an iron vessel, in such a manner as not to endanger the safety of the woodwork, since fire is not an uncommon occurrence if it is carelessly used. At least 3 pounds should be used for each 1000 feet of air-space, and the disinfection will be much more thorough in the presence of moisture. The dry sulphur dioxid, in itself practically powerless against bacteria takes up the moisture and is converted into *sulphurous acid* which is the disinfecting agent, though the latter has the disadvantage when exposed to the air of taking up oxygen and changing into the destructive sulphuric acid.

Sulphur dioxid, however, is the most efficient *insecticide*. Dry or moist, it destroys vermin and insects, and therefore is invaluable in disinfection against yellow fever, malaria, plague, filariasis.

Formaldehyd is an important gaseous disinfectant for use in apartments after infectious diseases. Its ready application makes it quite desirable for this purpose, and the best authorities show that it can be depended upon for the disinfection of surfaces, but not when penetrating power is required. In this direction too much cannot be expected of any disinfectant. It is also difficult to disinfect the interior of a closed school book or library book, provided the leaves are not loosely opened out. This is mentioned as a practical matter, since books are often exposed to infection when used by sick children.

In the use of formaldehyd the room should be tightly closed, and all cracks, crevices, and openings sealed against the passage of air in or out. Every physician in practice in country districts where there are no efficient health authorities should provide himself at least one good formaldehyd generator, of a sufficient size to disinfect ordinary apartments containing from 1000 to 2500 cubic feet of air. Full directions usually accompany each apparatus. See FORMALIN.

DISLOCATIONS.—A dislocation is a displacement of the articular ends of two or more bones making up a joint, such displacements *persisting* after the displacing force has ceased to act. When the separation of the articular surfaces is *incomplete*, the condition is termed a *subluxation;* and when the separation occurs in the amphiarthroses, it is described as a *diastasis.*

A dislocation is necessarily accompanied by rupture of the joint capsule. Sometimes the bone-end escapes temporarily through the ruptured capsule, but returns spontaneously to its place when the displacing force ceases to act. Such an injury is described as a *distortion.*

Etiology.—As regards causation, dislocations are: (1) *Traumatic,* produced by actual violence; (2) *spontaneous, pathologic,* or *inflammatory,* occurring secondarily in the course of disease, chiefly tubercular disease; (3) *congenital,* due to faults of development or displacements occurring *in utero.* Traumatic dislocations are chiefly considered here.

Dislocations are *recent* or *old,* the term *old* designating the changes that have taken place hindering replacement, rather than the actual lapse of time. Like fractures, these injuries are *simple* when the injury remains subcutaneous, without serious injury to neighboring structures; *compound,* when open communication is established with the skin surface; *complicated,* when accompanied by fractures or by serious injury to adjacent structures, blood-vessels, and nerves. Complicated dislocations are, further, either *closed* or *open* (compound).

Traumatic dislocation is naturally more frequent in men than in women, as the former are more exposed to possibilities of violence, and is relatively rare in childhood and senility; fracture, rather than dislocation, occurring in such because of the fragility of the immature bones and epiphyses of the one, and the brittleness of the bones of the other. The upper extremity, being most exposed to violence, is the seat of the large majority of dislocations, being affected in 92.2 percent of cases, while the lower extremity furnishes 5 percent, and the trunk 2.8 percent (Kroenlein).

Direct violence rarely produces dislocation, and from its nature such dislocation is likely to be complicated by injury of the soft structures about the joint. *Indirect force,* imparted through the long bones, and acting by leverage, is the most common cause. *Muscular contraction,* especially at the shoulder-joint, may cause dislocation; this sometimes follows the general muscular contractions of epilepsy and eclampsia.

Voluntary dislocation of various joints, depending on the laxity of the joint capsule, can be produced by some athletes and by "snake men."

Habitual dislocation is one that, traumatic in its inception, tends constantly to recur, owing to imperfect repair and to permanent lengthening of the joint capsule and ligaments, or owing to the breaking down of the bony "checks."

In simple dislocations if early reduced, complete restitution is the rule. If reduction is not effected, a new joint (nearthrosis) is formed at the site of lodgment of the bone-head. In the case of ball-and-socket joints these nearthroses may become very movable and useful; but in the case of ginglymoid joints they permit little or no motion and use.

Repair after complicated and compound dislocation depends on the nature and course of the complication, function varying from almost com-

plete restoration to entire loss of motion and use. The worst cases may even demand amputation.

The symptoms of uncomplicated dislocation are usually prominent, making the diagnosis easy.

Objectively, they are a change in the contour of the joint; a change in the relative positions of the articular ends of the bones; the absence of the articular end in its normal position and its presence in an abnormal position; a change in the axis of the limb, resulting in most cases in the assumption of a characteristic attitude; an elastic fixation of the limb in its new position; it may be forcibly moved in various directions, but on being released, springs back to its first position—a symptom of great importance in differentiating between dislocation and fracture. In dislocation the limb is generally shortened, but it may be lengthened.

Subjectively, the patient experiences pain and inability to perform normal movements; while passive movements may be possible in some directions, they are impossible in others.

For differentiation between dislocation and fracture, see FRACTURE.

Coincident fracture, especially of the articular end of the bone, renders the diagnosis difficult.

Treatment is directed, first, to the reduction of the dislocation; and, secondly, to preventing its recurrence. While in former times forced reduction was often attempted by means of a powerful traction-apparatus (block and tackle), serious injury often resulted to blood-vessels and nerves, an entire limb even being torn away; nowadays reduction is effected almost entirely by manipulation, without much force, and generally under an anesthetic. In general terms, the displaced bone-end is made to return to its proper position reversely along the route it followed in escaping. Therefore, a proper conception of the anatomy of the dislocation is of supreme importance. After reduction a suitable dressing is applied to maintain reduction and to afford rest and protection during the period of repair. After a week or two careful massage and passive movements should be begun, and continued every day or two unless renewed pain and articular irritation become manifest. With the third week, ordinarily, more extensive movements, with active exercise, should be begun.

Impediments to reduction are, in *recent cases:* Contraction of the muscles surrounding the joint; the small size of the rent in the capsule; the hitching of points of bone on each other; and the interposition of soft parts. In *old cases:* Formation of adhesions; closure of the rent in the capsule; permanent shortening of ligaments and muscles; and alteration in shape of the articular surfaces.

Habitual dislocation calls for a more prolonged immobilization, thereby giving the capsule and ligaments opportunity to shrink and shorten. Irritating injections (tincture of iodin, white-oak bark, alcohol) have been employed for a similar purpose. Refractory cases may eventually demand arthrotomy and retrenchment by partial excision of the capsule.

Some simple and recent dislocations may be **irreducible** because of the small size of the slit in the capsule, but ordinarily because of intervening soft parts. In such cases reduction must be effected early by open incision and by division of such obstructing bands as may be necessary.

When dislocation is **complicated by fracture,** the fracture may first be fixed firmly by splints, and then efforts made to reduce the dislocation. If this fails, or if the fracture occurs close to the articulation, rendering fixation impossible, reduction is attempted by manipulation. This being impossible, control of the bone-end may sometimes be effected by screwing a gimlet or bone-hook into it. If all attempts at reduction fail absolutely, one of two things remains to be done: either the fracture must be set and its repair permitted before further effort is made to reduce the dislocation, or operative procedures must be at once undertaken. The circumstances of the individual case will determine the procedure.

The treatment of compound dislocations, whatever the complications, will be guided by general surgical principles, as in the case of compound fracture. Reduction and fixation, surgical cleanliness in manipulations and dressings, and drainage constitute the basis of the proper treatment. Formerly, such an injury of one of the larger joints was followed by so great a mortality that the condition was considered to demand primary amputation. This is now indicated only in extensive injury of the soft parts and of the blood-vessels.

In **old unreduced dislocations** in which the new joint permits fairly good motion, it is best not to attempt anything beyond improving the range of mobility; but when function is very imperfect, as is practically always the case in hinge-joints, efforts at reduction should first be made, and if unsuccessful, arthrectomy should be performed, with resection of the head of the bone if necessary. Such operations sometimes result in surprisingly good joints. At the hip, malposition can sometimes be corrected by subtrochanteric osteotomy.

For **special dislocations** see ANKLE, ELBOW, HIP-JOINT, JAW, SHOULDER, etc.

DISSEMINATED SCLEROSIS. Synonyms.—Cerebrospinal sclerosis; multiple sclerosis of the brain and cord; cerebral sclerosis; spinal sclerosis.

Definition.—A degenerative disease of the brain and spinal cord, characterized by pains in the back, disorders of sensation, loss of coordination, tremor on motion, scanning speech, and some mental impairment.

Pathology.—The disease consists of the development of patches of grayish, translucent, tough nodules. varying in size from a minute microscopic object up to the size of a walnut, varying in number, and widely distributed in the white matter of the hemispheres, ventricles, optic thalamus, corpus striatum, peduncles, pons, and cerebellum, while in the cord they are found in both the white and gray matter and in the columns. The deposits are also found in the nerve-roots and nerve-trunks. The nodules are composed of the neuroglia, much altered, and of a newly formed connective tissue. The result of the growth of the nodules is pressure upon the nerve structure, ending in its degeneration.

Symptoms.—Charcot divides disseminated sclerosis into 3 varieties, depending upon the chief site of the changes, whether in the brain, the cord, or a combination of the two. The last variety is the more common. Rarely, the malady is ushered in with apoplectiform symptoms, but generally the onset is insidious, with more or less severe pains in the limbs and back, which are attributed by the patient to rheumatism. There are also a fleeing of formication, itching, and burning in the limbs, loss of coordination of the hands in writing, or of the feet in walking, or a jerky coordination, followed after a time by paresis, more or less general, with contracture of the muscles. Voluntary movements of the paretic limbs develop a tremor, with shaking of the head. An early and frequent condition is nystagmus. The loss of coordination, with tremor and with contractures of the muscles of the legs, has given rise to the "waddle" or "hop" gait when walking. There are also present headache, vertigo, mental impairment, with an unnatural indifference to the symptoms and to the surroundings, a scanning or slurring speech, disorders of vision and hearing, sexual disturbances, vesical disorders, gastric and other crises, and often the development of bed-sores. The knee-jerk and muscular reflexes are exaggerated.

The disease is progressive, the symptoms developing as the various nerve-tracts are invaded. It ranges from 1 year to 20 years, an average being from 5 to 10 years.

Diagnosis.—Paralysis agitans may be mistaken for disseminated sclerosis. The chief points in the diagnosis are the continual presence in paralysis agitans of the fine tremor, without shaking of the head, with a peculiar flexion and rigidity of the hand, while in cerebrospinal sclerosis the tremor is produced only on movement of the muscle, and is associated with shaking of the head. Paralysis agitans is a disease of middle life; sclerosis occurs in patients under 40 years of age. Changes in the voice, speech, and vision are present in cerebrospinal sclerosis, but absent in paralysis agitans, Tumor of the pons or crus is accompanied by wild, jerky incoordination, closely resembling disseminated sclerosis, but tremor is also accompanied by headache, optic neuritis, local spasm, and local paralysis. General paralysis of the insane and disseminated sclerosis are frequently confounded, as are locomotor ataxia and primary lateral sclerosis.

Prognosis.—Unfavorable. The disease slowly but steadily progresses; chronic nephritis or tuberculosis frequently develops and causes death.

Treatment.—There is no drug that has the power to cure sclerosis. Syphilis has been the cause of the vast majority of cases, and potassium iodid, in large doses, or the biniodid of mercury is indicated.

DISTOMIASIS.—Infection with the different forms of distomata or fluke worms. Gives rise to symptoms varying according to the location of the worm. The liver fluke, lung fluke, intestinal fluke, and blood fluke (see SCHISTOSOMIASIS) are the chief varieties found in man. Treatment is symptomatic.

DIURETICS.—Agents which promote the secretion of urine, either by raising the local or general blood-pressure, and so increasing the renal circulation, by stimulating the secreting cells or nerves of the kidneys, or by flushing the kidneys with water. Diuretics may be classified according to their physiological action or according to the different purposes for which they are employed. *Refrigerant diuretics*, especially the salines, excite the renal epithelium, induce a hyperemic condition of the kidneys and increase the water of the urine. They possess a sedative action upon the heart and the general circulation, but used to excess they depress the heart and impoverish the blood. Potassium chlorate is a decided renal irritant, and should never be used as a diuretic. *Hydragogue diuretics* increase the water of the urine largely, and in general act by raising arterial pressure, either—(*a*) throughout the body, or (*b*) locally in the kidneys. This they accomplish in various ways, direct and indirect—increasing the action of the heart, contracting the efferent vessels or dilating the afferent vessels, so as to raise the blood-pressure in the glomeruli, etc. The action of the *stimulant diuretics* is directly upon the renal tissue, by which they are largely eliminated from the body. In small or moderate doses they dilate the renal arterioles, increase the renal blood-supply, and so induce diuresis, but in large doses they irritate the renal epithelium, contract the renal arterioles, diminish the renal blood-supply, excite renal inflammation, render the urine albuminous and bloody, and may even induce suppression of the urine. All the members of this division should be used with caution.

Diuretics act: (1) by increasing the action of the heart (alcohol, digitalis, etc.) or by contracting the intestinal and other vessels, thus raising the general blood-pressure; (2) by dilating the afferent renal vessels, thereby increasing the renal blood-supply, raising the pressure in the glomeruli; (3) by contracting the efferent vessels, raising the pressure in the glomeruli and lessening absorption in the tubules, or both; (4) by stimulating the secreting cells or nerves of the kidneys; (5) by flushing the kidneys, as by the ingestion of water in large quantity.

The following list contains the most important agents of this group, which are usually subdivided into the three classes indicated by the subtitles. The numbers refer to the probable modes of action of the drug in the above synopsis:

Refrigerant Diuretics.—Potassium acetate[4], potassium bitartrate[4], potassium citrate[4], potassium chlorate[4], potassium nitrate[4], sodium acetate[4], sodium chlorate[4], sodium chlorid[4], ammonium acetate[4], calcium chlorid[4], lithium carbonate[4], lithium citrate[4], magnesium citrate[4], magnesium sulphate[4], water[5], milk[5], carbonic acid, cold to surface[1]. *Hydragogue diuretics.*—Digitalis[1,2], strophanthus[2], convallaria[1], cimicifuga[1,3], adonis vernalis[1,2] erythrophlœum[1], squill[1,2], broom[3], spartein[3], calomel[4], caffein[1,4], theocin[4], theobromin[4], agurin[4], apocynum[1,2], nitrous ether[2], nitrites[2], strychnin[1], colchicum[4], tobacco[3], sugar of milk[1,4]. *Stimulant Diuretics.*—Alcohol[2], blatta orientalis[4], cantharides[4], turpentine[4], juniper[4], savin[4], copaiba[4], cubeb[4], cannabis[4], capsicum[4],

buchu[4], asparagus[4], guaiac[4], fennel[4], urea[4], uva ursi[4], zea[4].

Diuretics are employed in medicine for certain definite purposes, as follows: To remove fluid from the tissues and cavities of the body in cases of dropsy; to promote the elimination of waste-products and other poisons from the blood; to maintain the action of the kidneys; to dilute the urine, and to alter morbid conditions of that excretion.

In dropsies from cardiac disease, or other dropsies due to venous congestion, the most efficient diuretics are those which act on the general vascular system, as digitalis, strophanthus, squill, etc. Calomel is often very efficient in this form of dropsy, also theobromin sodio-salicylate (diuretin).

In dropsy from renal disease, diuretin, broom-tops, nitrous ether, oil of juniper, digitalis and squill are the most reliable diuretics, in the order named.

In ascites from hepatic cirrhosis, copaiba is the best diuretic when the kidneys are healthy. In this form and the previous ones a little pill of mercury given occasionally will often aid the diuretic action of the other agents.

To eliminate waste-products from the blood, potassium nitrate and bitartrate, turpentine, juniper, caffeine, and water in large quantity.

To dilute the urine, water is the best agent, its most efficient form being distilled water charged with carbonic acid gas.

As adjuvants to diuretics, when pressure on the uriniferous tubules or venous congestion prevents their action—paracentesis abdominis, purgation, cupping over the loins, and even venesection, are often necessary to start the diuretic action.

DIURETIN.—Theobromin sodio-salicylate should contain 46 percent of theobromin. It has been found useful as a diuretic in hepatic cirrhosis, in various diseases of the heart and kidneys accompanied by edema and in cardiac and renal dropsy. Dose, 15 grains every 3 hours.

DIVERTICULITIS.—The papers of Cahier, Brewer, Mayo and others have attracted attention to a condition named acquired diverticulitis. Acquired or false diverticula are simple herniæ of the mucous and submucous tunics through the circular muscular coat of the descending colon and sigmoid at points where the musculosa happens to be weak. Chronic leakage may take place through the diverticular walls and give rise to large inflammatory deposits. The result of the inflammation may be: (1) Abscess. This requires free drainage. (2) Acute local infection *plus* acute obstruction. This requires free drainage *plus* the establishment of an artificial anus. Subsequently, if necessary, the diseased segment of colon may be excised. (3) Chronic obstruction with inflammatory tumor but no abscess. This form is usually mistaken for malignant disease. The treatment is resection of the involved segment of gut.

DIZZINESS.—See VERTIGO.

DOSAGE.—**Conditions that modify** the action of medicines, and therefore affect their dosage, are age, body-weight, temperament and idiosyncrasy, drug habits, intervals between doses, time of administration, condition of the stomach, temperature of the body, cumulative drug action, mode and form of drug administration, disease, climate, race, etc.

The doses given in the following table are for adults; for children the following rule (Young's) will be found the most convenient: Add 12 to the age, and divide by the age, to get the denominator of the fraction, the numerator of which is 1. Thus, for a child 2 years old, $\frac{2+12}{2} = 7$, and the dose is one-seventh of that for an adult. Of powerful narcotics, scarcely more than one-half of this proportion should be used. Of mild cathartics, 2 or even 3 times the proportion may be employed.

In a general way, it may be said that, approximately, the dose for a child of 1 month is one-twentieth that of an adult; for one of 3 months, one-fifteenth; 6 months, one-tenth; 1 year, one-eighth; 2 years, one-sixth; 3 years, one-fifth; 5 years, three-tenths; 8 years, one-half; 10 years, three-fifths; 12 years, two-thirds; 15 years, four-fifths; 20 to 45 years, adult dosage; 50 years, five-sixths; 60 years, four-fifths; 80 years, two-thirds.

For **hypodermic injection** the dose should be one-half of that used by the mouth; by rectum, three-fourths of the same.

Average Adult Doses of Official Preparations (Potter)

Acids (dilute), 30 minims—except hydrochloric and nitro-hydrochloric, 15 minims; and hydrocyanic, 1 1/2 minims.

Alkalies.—Solution of potassium hydroxid (liquor potassæ), 15 minims. Carbonates, 15 grains, except that of magnesium, 45 grains; of lithium, 7 1/2 grains; of ammonium, 4 grains. Potassium bicarbonate, 30 grains; sodium bicarbonate, 15 grains. Sodium borate, 7 1/2 grains.

Alkaloids and their salts form several groups: (1) Aconitin, 1/400 of a grain; (2) those from plants of the *solanaceæ*, including atropin, hyoscin, etc.; also including colchicin, 1/128 of a grain; (3) strychnin and physostigmin, 1/65 of a grain; (4) those from *opium*, 1/4 of a grain, except codein, 1/2 of a grain; narcotin (unofficial), 3 grains; and apomorphin, as an expectorant, 1/30 of a grain, as an emetic, 1/10 of a grain; (5) those from *cinchona*, 4 grains; (6) pelletierin, 4 grains; piperin, 3 grains; caffein, 1 grain; cocain and hydrastinin, 1/2 of a grain; hydrastin, spartein and pilocarpin, 1/5 of a grain; veratrin, 1/30 of a grain, etc.

Extracts vary from 1/8 of a grain to 15 grains, as follows: Physostigma, 1/8 of a grain; belladonna, cannabis indica, digitalis, scopola, stramonium, 1/5 of a grain; nux vomica, 1/4 of a grain; colocynth, opium, 1/2 of a grain; colchicum, hyoscyamus, quassia, 1 grain; aloes, euonymus, 2 grains; cimicifuga, ergot, gentian, leptandra, rhamnus (cascara), rhubarb, sumbul, 4 grains; colocynth compound, krameria, 7 1/2 grains; glycyrrhiza, hematoxylon, taraxacum, 15 grains. Extract of malt, 4 drams.

Fluidextracts vary from 1 minim to 2 drams; 25 have an average dose of 15 minims, and 27 have 30 minims. Of the rest, those of aconite, belladonna root, cannabis indica, capsicum, digitalis, gelsemium, ipecac, nux vomica, scopola, staphisa-

gria, stramonium, have an average dose of 1 minim; phytolacca, sanguinaria, squill, veratrum, 1 1/2 minims; colchicum seed, conium, hyoscyamus, quillaja, 3 minims; convallaria, euonymus, lobelia, lupulin, podophyllum, quassia, 8 minims; matico, pareira, spigelia, 1 dram; taraxacum, triticum, 2 drams; that of mezereum is not given internally.

Glucosids.—Ammoniated glycyrrhizin, 4 grains; salicin, 15 grains; strophanthin, 1/200 of a grain.

Infusions.—Digitalis, 2 drams; wild cherry, 2 ounces; senna, the compound infusion, 4 ounces.

Mixtures.—Chalk, 4 drams; compound iron mixture, 2 drams; rhubarb and soda, 1 dram; compound glycyrrhiza, 2 drams.

Oils, Fixed.—Cotton seed oil, codliver oil, castor oil, 4 drams; expressed oil of almond, linseed oil, olive oil, 1 ounce. Lard oil and oil of theobroma are only used externally.

Oils, volatile, 3 minims—except that of mustard, 1/8 of a minim; bitter almond, 1/2 minim; cinnamon, savin, croton, 1 minim; cajuput, copaiba, cubeb, eucalyptus, 8 minims; betula, erigeron, gaultheria, turpentine, 15 minims. Ethereal oil is not used internally.

Oleoresins.—Ginger, pepper, 1/2 of a grain; lupulin, 3 grains; capsicum, 7 1/2 grains; aspidium, 30 grains.

Pills, 2—except those of opium, phosphorus, and the pills of podophyllum, belladonna and capsicum, 1 pill.

Powders form two classes: (1) Those given in *grains*, acetanilid compound, ipecac and opium, compound morphin, 7 1/2 grains; aromatic powder, 15 grains. (2) Those given in doses of *half a dram* or more, compound chalk, compound jalap, compound rhubarb, 1/2 dram; compound glycyrrhiza, 1 dram.

Resins.—Podophyllum, 1/4 of a grain as a purgative, 1/10 of a grain as a laxative. Jalap, 2 grains; scammony, 3 grains.

Spirits 1/2 dram—except that of nitroglycerin, 1 minim; bitter almond, 8 minims; ammonia, camphor, 15 minims; ether, anise, 1 dram; compound juniper, 2 drams. Spiritus frumenti (whisky) and spiritus vini Gallici (brandy), according to the amount of alcohol desired to be administered.

Syrups, 1 dram or more—except that of ferrous iodid, 15 minims; ipecac as an expectorant, 15 minims, as an emetic, 4 drams; squill and compound syrup of squill, 30 minims; lime, 30 minims.

Tinctures, 1 dram—except that of iodin, 1 1/2 minims; belladonna leaves, cantharides, 5 minims; capsicum, iron chlorid, gelsemium, ipecac and opium, opium, stramonium, strophanthus, 8 minims; aconite, cannabis indica, nux vomica, 10 minims; arnica, asafetida, benzoin, digitalis, hyoscyamus, lobelia (as an expectorant), myrrh, physostigma, sanguinaria, squill, veratrum, 15 minims; aloes, aloes and myrrh, benzoin (compound), cinchona (compound), cinnamon, colchicum seed, guaiac (ammoniated), lactucarium, lavender (compound), quassia, rhubarb (aromatic), tolu, valerian (ammoniated), ginger, 30 minims; camphorated tincture of opium (paregoric), 2 drams. The tinctures of calendula, lemon, pyrethrum, quillaja, and vanilla, are not assigned any dose.

Waters, 1/2 of an ounce—except ammonia, 15 minims; bitter almond, hydrogen dioxid, 1 dram; orange flower (stronger), camphor, creosote, hamamelis, rose (stronger), 2 drams.

Wines, 2 drams—except opium, 8 minims; antimony, ipecac, 15 minims; colchicum seed, 30 minims; coca, 4 drams. White wine and red wine are not assigned any dose, but are prescribed according to the amount of alcohol desired to be given.

Vinegars are only two—that of opium, 8 minims, and that of squill, 15 minims.

See PRESCRIPTION-WRITING.

DOUCHE.—A jet of water propelled against some part of the body or used to flush some body-cavity. The size of the jet, force of its impact, temperature, and composition can be regulated. A simple affusion differs from a douche in that the latter is more local, and is applied with greater force. The extremities and head bear douches better than the chest, the chest better than the abdomen, and the posterior aspect of the body better than the anterior. Warm douches are more easily borne and give less shock. Douches to the head have most general action, those to the spine coming next. Douches for the eye and ear are much used. The Scotch douche is one consisting of alternate cold and hot douches. Ascending douches are used for the rectum and vagina. The shower-bath is a multiplication of fine douches.

The average temperature of the cold douche is 50° F., and the duration is from 4 to 15 minutes.

As a rule, douches are most useful in chronic diseases. Constitutional diseases are best treated by cold douches, and local affections by warm douches, and by alternate hot and cold douches. Nervous diseases are benefited by alternate hot and cold douches. In chlorotic and hysteric conditions, in hysteric paralysis, in oversensibility of the skin with a tendency to catch cold, in special treatment of phthisis, in infantile convulsions, and in maniacal affections, the cold douche is very useful. In congestion of the liver and of the uterus cold douches are effective revulsives. In skin affections and chronic ulcers, in old sprains, in chronic rheumatism, in gouty thickenings of joints, in lumbago, in some paralyses of not too recent origin, douches are beneficial. In threatened tabes dorsalis the Scotch bath has proved more efficacious than any other remedy. See VAGINAL DOUCHE.

DRACONTIASIS.—See GUINEA-WORM DISEASE.

DRAINAGE.—The provision, by means of tubes or strands of fibers, of a channel of exit for the discharge from a wound or cavity.

An aseptic wound in which there is no cavity for blood to collect in requires no drainage. Most superficial wounds, also wounds of the abdominal wall, are completely sutured. An accidental wound, however well disinfected, also an operation wound, which when closed has a cavity in which blood may collect, is better drained for a few days, by inserting a strip of iodoform gauze or a rubber tube perforated by cutting a number of side holes, which can be dispensed with at the first dressing.

A cavity being filled with a long strip of gauze, a little may be withdrawn every day, during which the wall of the cavity is contracting, while discharges are taken up and prevented from being absorbed. The withdrawal of the gauze is facilitated and much pain avoided by soaking it before removal with peroxid of hydrogen; then, seizing the end with clamp forceps, twist up the strip while gently drawing on it. To further facilitate this a strip of gutta percha may be wrapped round the gauze, the "cigarette" drain. Even for draining suppurating wounds and cavities, draining-tubes and counter-openings are not now so much used. Generally, it is better to make a wide opening, and fill the whole with iodoform gauze, which is changed every day or two until the surfaces are lined by healthy granulations, when healing may be expedited by applying secondary sutures, so as to draw the granulating surfaces together. Some wounds are sutured as regards the deeper part, but the skin is partly left open, lest, as in the case of wounds of the bladder, esophagus or larynx, leakage may occur from within, and septic infection spread widely beneath the skin.

Before use, drainage-tubes are kept in carbolic-acid lotion (1 to 20). Lest a tube be lost in a cavity, *e. g.*, an empyema, it should be fixed to the dressings by a strand of silk or by a safety-pin, or have a flange. A counter opening occasionally improves drainage. It is made by pushing sinus forceps through the bottom of the cavity toward the skin avoiding important structures, cutting down upon the forceps, seizing with them the tube and drawing it into the cavity through the counter-opening. A drainage-tube should be removed as soon as possible to avoid the formation of a sinus. (Spencer and Gask.)

Position facilitates or opposes drainage, and gravitation should always be kept in mind in securing drainage (outward and downward). The opening for an abscess should be made in the most dependent position. Pressure, as well as position, may direct fluids outward, and prevent their permeation into the healthy tissues. Drainage-tubes, if necessary, should not be of such size as to act as foreign bodies, preventing contact of surfaces in which union is desired. To prevent a tube from slipping from the wound, its outer end should be of good length and secured by stitches or adhesive strips. It may be passed through a hole in the dressings or between the edges of two pads or folds, the bandage pressing over the tube so as not to close its lumen or shut its orifice. Catgut, horsehair, and iodoform gauze are used as minor drains, but absorbent dressings and gentle pressure may often be substituted.

DRESSINGS.—The two objects of dressings are: first, absorption of secretions; and, second, protection from the infection and injury and prevention of movement. The substances most commonly employed are cotton-wool, loosely woven cotton cloth, gauze, jute, sawdust, moss, etc. They should be in themselves not only aseptic, but also impregnated with antiseptic materials. Proper proportions of corrosive sublimate, the double cyanid of mercury and zinc, carbolic, boric or salicylic acids, or similar antiseptic agents are used for this purpose. Additional security, not only from infection, but also from mechanic violence and against movement, is given by the use of voluminous dressings.

Generally, dressings should be changed as rarely as possible, and to meet distinct indications, such as an elevated temperature, evidences of retention of secretions or of septic absorption, moistened external dressings, hemorrhage, suppuration, or sloughing.

Ordinary cheese-cloth after boiling with soft soap and soda, and being rinsed and dried, may be impregnated with mercuric chlorid, iodoform, or other antiseptic substance.

Dressings are often covered with rubber-dam, which is the thin, pure rubber tissue used by dentists. It should be washed with soap and water, rinsed and dipped in carbolic or bichlorid solution before using. Its purpose is to prevent soiling from secretions that have soaked through the dressings, and to check the access of bacteria to the wound through the dressings. Mackintosh has a cloth finish and is inferior for this purpose. Bandages of unbleached muslin or flannel are most used to hold dressings in place, to make pressure, and to check motion. Absorbent cotton or antiseptic wool is often placed over the dressings and beneath the bandage. For occlusive dressings, dry or moist, gutta-percha tissue is highly recommended.

Permanent Dressings.—The most reliable bandages for permanent dressings are the plaster-of-Paris, silicate of sodium or silicate of potassium, paraffin, and the starch bandage, which is now seldom used.

The plaster-of-Paris bandage is prepared by rubbing dry plaster of the finest quality, and freshly calcined, thoroughly into the meshes of a thick, coarse muslin or crinolin roller, which if not required for immediate use, is loosely rolled and kept in a dry place until it is needed, when it is soaked for a few minutes in cold water. The limb, first carefully enveloped in flannel, wadding, or old linen, is then surrounded by the bandage; 3 or 4 rollers generally answer the purpose. See PLASTER OF PARIS.

The silicate of sodium or of potassium in a saturated solution, applied with a stout brush, is the **"glass dressing"** of surgeons. When well rubbed into the meshes of a wet roller, a firm and immovable apparatus is formed, in no way inferior to the plaster-of-Paris. The glass dressing dries very rapidly, does not irritate the skin, and is easily procured. From 3 to 5 layers of bandage are necessary to insure the requisite amount of stiffness. Sometimes a binder's board will be required to impart sufficient support.

Paraffin is frequently used as a fracture dressing. After being thoroughly melted it is partly cooled to render it more viscid; it is then rubbed thoroughly into the meshes of the bandage with a coarse paint-brush, whereby a neat, light dressing is formed, impermeable to water, pus, and other fluids, and in every way adapted to the treatment of compound fractures.

The glue dressing is prepared by rubbing warm glue into the bandage. Before being used it must be diluted with one-fifth its bulk of alcohol or a small quantity of oxid of zinc, to promote desiccation. When applied in the usual manner, the mixture at once begins to harden, but it does not become thoroughly dry for several hours.

Wadding should be placed next to the skin, and then 2 or 3 layers of bandage must be applied. Should additional strength be needed, fresh strips of linen may be glued on without changing the original dressing.

The starch bandage is also used; it is moistened before application, and is applied, like the glue bandage, by rubbing starch into the interstices of ordinary rollers. Four, and sometimes five, thicknesses are required to insure sufficient support. It may be necessary to place on the sides of the limb strips of pasteboard that have been soaked in starch.

DRIPPING SHEET.—A means of reducing temperature in fever, entirely distinct from the wet pack. The patient is placed erect in a tub containing 12 inches of water at 100° F. A linen sheet (the coarser the better) is dipped in water at 70° F., and the temperature is reduced daily two degrees until 48° F. is reached. This sheet is thrown over the patient from behind, covering the head and body, so that it clings to the person. The attendant now makes rapid passes with both hands, beginning anteriorly and posteriorly, so as to produce friction and afflux of blood to the surface. Occasionally, cold water at from 40° to 70° F. is thrown on from a cup, and friction renewed. The procedure is also said to be useful in anemia.

DROPSY.—See Edema.

DROWNING.—Death due directly to drowning is caused by obstruction to respiration from submersion in a liquid, but death from shock, syncope, apoplexy, etc., may have occurred at the very instant of falling into the water. The evidence of death from drowning is cumulative. Externally, the skin is pale or slightly livid, and the body is bloated if it has been for some time in water. Froth at the mouth or nose, the presence of abrasions or excoriations of the skin, retraction of the penis, the tongue swollen and congested and closely applied to, or clenched between, the teeth, and the muscles of the hair-bulbs rigidly contracted, causing the "cutis anserina," or "goose-skin," are usual symptoms. Internally, the trachea, bronchi, and smaller air-tubes are congested and filled with a mucous froth, more or less tinged with blood. The lungs are edematous and pit on pressure, and pressure causes exudation of a sanguineous fluid. Sand, mud, or small weeds may be drawn deep into the air-passages. Water is often found in the pleural cavity and in the stomach. The right side of the heart gives the symptoms of asphyxia, and the brain is usually congested.

Complete submersion for 2 minutes is often sufficient to cause death.

The treatment of an apparently drowned person consists in removal from the water, freeing the mouth and nostrils from froth, water, and foreign bodies, loosening of clothing that binds the neck, chest, or waist, squeezing water out of the lungs and stomach with the body partly inverted, and clearing the base of the tongue from the larynx, either by pressing forward the angles of the jaw or by drawing the tongue forward out of the mouth. The body may then be laid out flat on the back, with a shawl, folded blanket, coat, or block of wood high under the shoulders so as to cause the front of the neck to be put on the stretch.

Artificial Respiration (*q. v.*) may now be tried, and warm blankets, hot bottles or bricks, and necessary medicines sent for in the meantime. The simplest way to perform artificial respiration is for the operator to place himself on his knees above the head, seize the arms near the elbows, and sweep them around horizontally away from the body and over the head until they meet above it, when a steady, strong pull may be made upon them—say, for 2 seconds. The arms may then be returned to their positions alongside the chest, and strong pressure now made against the lower ribs for several seconds. These movements should be made at a rate of about 16 times a minute, should be maintained for 1/2 to 3/4 hour, and abandoned only when the heart has ceased to beat. Deep pressure just below the end of the breast-bone may reveal pulsations in the aorta when they cannot be found elsewhere. As natural respiration begins, the artificial respiration should be timed to it. Ammonia or smelling salts may stimulate it or hot water may be dashed on the chest. Continued rubbing of the body and limbs toward the heart will aid the circulation and produce warmth. Hot bottles, plates, bricks, stones, or even boards will help to give warmth to the body. Twenty to 30 minims of ether may be given hypodermically. As soon as it can be swallowed, teaspoonful doses of brandy or whisky in a tablespoonful of hot water may be given every minute until danger is passed. Weak tea or coffee, or beef-tea, should be given after consciousness has returned. The reflex sobbing will little by little be replaced by the natural breathing, and must be watched for some time. Removal requires great care, the head being kept low and respiration constantly watched.

DRUG ADDICTION.—The public is gradually being aroused to the enormity of the demand for habit-forming drugs. Exposure has been made of the numerous popular drugged patent medicines —soothing-syrups, tonics, cough cures, so-called cures for drug habits, etc.—of the drug-doped soft drinks and of the illegal sale of these drugs frequently in disguised form. It is estimated that 2 percent of the American people are drug fiends. The use of these drugs undermines insidiously the constitution as well as the moral character of the victim, who is frequently a child, and converts him into a degenerate and often a criminal. See Lambert Treatment, Acetanilid Habit, Opium Habit, Cannabis Indica, Chloral Habit, Cocainism, Ether, Paraldehyd Habit.

DRUG ERUPTIONS.—This class includes eruptions due to the ingestion or absorption of certain medicaments. Drug eruptions are favored by (1) idiosyncrasy, (2) excessive cutaneous elimination,

(3) imperfect renal and intestinal elimination (often due to renal or cardiac disease), (4) large doses, (5) long-continued administration. Individual susceptibility is the most important factor. The eruption may be macular, papular, vesicular, urticarial, bullous, or hemorrhagic.

Aconite, vesicular exanthemata. *Antimony* (locally), papules, vesicles, pustules, similar to the eruption of small-pox. *Antipyrin*, erythema and urticaria, chiefly on thighs and abdomen, with much itching and dyspnea. *Antitoxin* (diphtheritic), erythema, with pain in the joints. *Arsenic*, erythema, eczema, papules, vesicles, pustules. *Atropin*, erythema, like the rash of scarlet fever. *Belladonna*, as atropin. *Borax*, papules, scarlatiniform. *Bromids*, acne, chiefly on the face and back; pustules, deep tubercles with ecchymoses, ulcers, pemphigus. *Castor oil*, urticaria. *Cinchona*, as quinin. *Phenol*, erythema. *Hydrated chloral*, erythema, on face and neck, itching, desquamation, eczema, petechiæ, purpura. *Codein*, as opium. *Copaiba*, also *cubeb*, urticaria, erythema, eczema, pemphigus; the Copaiba rash has a preference for the ankles and wrists. *Cod-liver oil*, acne. *Croton oil* (locally), papules, pustules. *Digitalis*, erythema, after long usage. *Enemata*, of the simplest form, as soap and water, may cause a bright scarlet rash and other symptoms of a mild septic toxemia. *Iodids*, acne, papules, vesicles, pustules, eczema, ecthyma, ecchymoses and purpura; the iodid rash prefers the face and back of neck and shoulders. *Mercury*, erythema, eczema. *Opium and morphin*, erythema, papular eruption with marked desquamation and itching. *Phosphorus*, purpura. *Quinin*, erythema, scarlatina, papular erythema, hemorrhagic purpura, pemphigus and prurigo; the prevailing type of the quinin eruption is erythema, or exceptionally eczema or purpura, and is essentially ephemeral; it is of a bright vivid hue, disappearing on pressure, and resembles the scarlatinal rash, first appearing on face and neck, and thence spreads over the body; in some instances it comes in distinct spots and resembles measles; in others it is an urticaria, with some edema, and distressing burning, tingling, and itching; five cases of purpura are authentically reported. *Rhus toxicodendron* (and other varieties of sumac), vesicles perhaps pustules, with redness, swelling and intolerable itching. *Salicylic acid*, urticaria, purpura, pemphigus, vesicular angina. *Santonin*, pemphigus, vesicles. *Stramonium*, as atropin. *Strychnin*, as quinin. *Sulphur* (locally), erythema, eczema. *Tar*, acne. *Tartar emetic* (locally), as antimony; in some cases of poisoning by tartar emetic a rash of the above description appeared all over the body. *Turpentine*, as copaiba.

DUODENUM, DISEASES.—See Enteritis, Stomach (Ulcer), etc.

DUOTAL.—See Guaiacol (Carbonate).

DUPUYTREN'S CONTRACTION.—See Hand.

DYING DECLARATIONS.—Statements of homicide made by the victim under the solemn belief of impending death. The effect of such belief is regarded as equivalent to the sanctity of an oath. Declarations so made are substitutes for sworn testimony, and they must be such narrative statements as a witness might give on the stand.

It is important for the physician in attendance upon a woman likely to die from the results of a criminal abortion to have clearly in mind his legal position and responsibilities. Dying declarations are accepted in law without being sworn to. It is naturally presumed that all statements made at so solemn a crisis must be sincere, believed to be true by the dying person, even if subsequently shown not to be so. The attending physician, under such circumstances, having expressed the opinion that the patient is dying and in sound mind, a magistrate should be summoned to take the statements that the dying person may wish to make. Should it not be possible to obtain the services of the magistrate, then the attending physician may take the dying declaration. The physician should, however, limit himself to writing down the exact words of the dying person, without offering any interpretation whatever. The statements should be read over to the dying person, and, if possible, the signature obtained.

The declarations must be made not simply *in articulo mortis*, but under the sense of impending death, without expectation or hope of recovery. Such statements are admissible even though others may not have thought the person would die. The declarations may be signs or other appropriate modes of communication. It is not necessary that the examination of the dying person should be made after the manner of interrogating a witness in the case, although any departure from that mode may affect the value and credibility of the declarations. It is no objection to their admissibility that they were made in answer to leading questions, or were obtained by pressing and urgent solicitation, but the declarations must be made under a sense of impending dissolution. It does not matter that death may have occurred a considerable time after such declarations were made.

Declarations of a deceased person are admissible only in reference to those subjects to which he would have been competent to testify if sworn in the case. He must, therefore, in general, speak of facts only and not of mere matters of opinion, and he must be confined to what is relevant to the issue. The circumstances under which the declarations were made are to be shown to the judge, it being his province, and not that of the jury, to determine whether they are admissible.

If the deposition of the deceased has been taken under any of the statutes on that subject, and is inadmissible as such from want of compliance with some of the legal formalities, it seems that it may still be treated as a dying declaration, if made *in extremis*.

DYSENTERY (Bloody Flux).—An acute or chronic inflammatory disease of the large bowel, often leading to ulceration, and characterized by the passage of mucous or bloody stools accompanied by tormina and tenesmus.

Varieties.—Since the discovery of the *bacillus dysenteriae* by Shiga dysentery is classified as: (1) Catarrhal; (2) amebic; (3) bacillary. The term "tropical" is sometimes used incorrectly as a syno-

nym for "amebic;" whereas the commonest form of the disease in the tropics is bacillary dysentery.

Catarrhal Dysentery.

Definition.—Inflammation of the intestine characterized by diarrhea, frequent blood-stained mucous stools, and desquamation of the epithelium lining the large, and to a less extent, the small intestine.

Etiology.—(1) Indigestible food, such as unripe fruits; (2) polluted drinking-water; (3) sudden changes in the weather; (4) secondary to typhoid fever, tuberculosis, the acute infectious exanthemata, diphtheria, etc.

Pathology.—The mucous membrane is congested and swollen, and covered with a thin layer of bloody mucus. The solitary glands are enlarged and may undergo ulceration.

Symptoms and Clinical Course.—The disease is usually ushered in by an attack of diarrhea, accompanied by slight fever, nausea, and vomiting. The pain in the abdominal region is often intense and there is a constant desire to go to stool. The dejections are composed for the most part of glairy mucus, but as the disease progresses, they may become tinged with blood. There may be as many as 20 stools a day, always accompanied by tenesmus, generally worse during afternoon hours or at night. At the onset the temperature may be normal, but as the disease advances it may be slightly elevated (100° F.). Rapid emaciation follows the onset of dysentery, and the strength is early exhausted, causing great debility, restlessness and general nervous disorders. The milder cases may terminate favorably during the course of a week; other cases become protracted if not properly treated, and pass into the chronic condition.

Diagnosis.—It may be distinguished from ordinary diarrhea by the fact that in diarrhea blood is absent from the stools, the course is not so prolonged, and it is not accompanied by the same degree of tenesmus.

Prognosis.—Generally favorable.

Treatment.—Rest in bed and a liquid diet are indicated. The bowels should be thoroughly cleansed by means of salines, such as Epsom salts (4 drams) or Rochelle salts (4 drams). Castor oil (1 ounce) containing laudanum (20 drops) is also highly recommended.

To relieve the pain, opium (1 grain) may be of great advantage. Bismuth subnitrate (10 grains) may be combined with the opium. Naphthalin (7 grains) with bismuth subnitrate (8 grains) is useful.

Suppositories may be beneficial:

℞. Cocain, gr. iij
Extract of belladonna, gr. jss
Extract of opium, gr. iij.
Cacao-butter, enough to make 6 suppositories.

One to be used every 3 or 4 hours.

Hope's camphor mixture, containing nitrous acid (1 dram), camphor mixture (8 ounces), and tincture of opium (40 drops), often acts well in cases disposed to be chronic. The dose is 2 ounces, taken every 3 hours.

Should the symptoms not abate, the colon should be thoroughly irrigated every 2 days by means of the rectal tube and fountain syringe. The fluid may be simply lukewarm water, or starch-water containing laudanum (1/2 of a dram).

Throughout the disease the diet must be bland, nonirritating but nourishing, and leaving little residue. The peptonized foods, beef-juice, beef-peptonoids, together with stimulants, furnish a suitable diet. Well-cooked barley and rice in broths may be added.

Amebic Dysentery (Amebic Enteritis).

Definition.—Ulcerative inflammation of the large intestine, due to *entamœba histolytical* and characterized by ulcers involving the mucous and submucous, rarely the muscular and peritoneal coats of the large intestine.

Etiology.—Its relation to so-called tropical dysentery was first clearly established by Kartulis in Egypt. Councilman and Lafleur in America, and Kruse and Pantini in Italy have also confirmed the etiologic significance of the entameba. The protozoon varies from 25 to 40 microns in diameter and is actively motile. In its resting stage it appears round or oblong, hyaline in color, containing one or more vacuoles, a nucleus, and granular particles. Its movements may be quite active, caused by the constant thrusting out and retraction of pseudopodia. Phagocytosis of the ameba, especially of red blood cells, has been described.

Amebic dysentery occurs sporadically in this country, especially in the Southern States, where it is relatively common. A number of cases are reported annually among soldiers and others returning from the Philippine Islands and other tropical regions.

Pathology.—The mucous membrane is highly congested, containing small spots of extravasated blood, the surface being covered with a whitish or bloody mucus. Ulcers of the large intestine involving the mucosa and submucous tissue form the characteristic lesion; rarely the muscular and peritoneal coats are included in the ulceration, but cellular infiltration occurs throughout the deeper layers. Atrophic cicatrices and a narrowing of the lumen of the bowel may occur.

Symptoms and Clinical Course.—These are the same as in catarrhal dysentery, but more protracted, the stools containing the *entamœba*. Distinct intermissions occur, in which the patient becomes better, but again relapses. The stools are watery and more copious although less frequent than in the catarrhal form. Abscess of the liver is a common complication.

The diagnosis rests upon the history, prolonged course, and the presence of the ameba in the stools.

To examine for the organisms, the stools should be passed into a clean and warm bed-pan; a small mucoid particle is selected, quickly placed upon a warm stage and immediately examined.

Prognosis is guardedly favorable.

Prophylaxis.—Since the mode of infection is the ingestion of water and food containing ameba, it is of signal importance that all possibly contaminated water or food be sterilized. Another

important consideration is a knowledge of the importance of the carrier problem, the stools of all persons preparing food in localities where amebic dysentery is prevalent should therefore be examined for the 4 nucleated cyst of the pathogenic ameba. It must be remembered that while emetin controls the dysenteric manifestations of amebiasis it does not seem to cause the disappearance of the parasite, so that patients who have amebic dysentery tend to become carriers (Stitt). The same precautions recommended for cholera are applicable here.

Treatment.—The patient must be put to bed and given a liquid diet, such as peptonized milk, beef-juice, barley-water, light animal broths.

The **emetin** treatment may now be considered as the specific one for amebic dysentery. In Brazilian ipecac about 72 percent of the total alkaloids is emetin, so that it is better than Carthagena ipecac which contains only about 40 percent of emetin. Emetin was recommended for dysentery as long ago as 1817, but owing to the impossibility of differentiating between bacillary and amebic dysentery, until recently, this method of treatment was little advocated. It is usual to give from 1/3 to 2/3 grain of emetin hydrochlorid, dissolved in sterile saline, by hypodermic injection into the subcutaneous tissues. Some now give as high as 1 grain daily for about 10 days, but Vedder prefers 1/3 grain repeated 3 times daily. In these doses there is practically no nausea (Stitt). The use of this drug has caused the rapid disappearance of the amebæ and of the intestinal symptoms; and so far it seems to be unattended by any bad after-effects.

For internal medication the use of laudanum (30 drops), followed by ipecac (30 grains) within half an hour, has been highly extolled by a few physicians, though decried by others. These remedies may be repeated 2 or 3 times during intervals of 24 hours. During the administration of the ipecac it is important that only milk be given; beef-tea, bread, etc., prevent the favorable action of the drug. On the second day the ipecac is given in reduced quantity supplemented by bismuth salicylate, quinin, naphthol and opium.

Warm injections of quinin (1 : 5000 to 1 : 1000) have been successfully used. The quinin solution has a destructive action on the protoplasm of the ameba.

If diarrhea is excessive, give:

℞.	Codein sulphate,	gr. iv
	Naphthalin,	gr. xl
	Bismuth subnitrate,	ʒ jss.

Divide into 6 powders; 1 powder every 3 hours.

Pain must be relieved by opium (preferably given by the rectum in suppository or small starch-water enemas) or hypodermic injections of morphin (1/6 of a grain) with atropin (1/125 of a grain). The blood should be carefully examined for the plasmodium malariæ, and, if it is found, quinin is indicated in appropriate doses.

For the treatment of hepatic abscess see LIVER (Abscess).

Bacillary Dysentery (Acute Specific Infectious Dysentery).

Definition.—Dysentery due to the *bacillus dysenteriæ*, the form occurring most frequently in temperate and tropical countries, may be (1) *pseudomembranous*, *croupous* or *diphtheritic*, (2) *ulcerative*, or (3) *chronic*. The chronic form may result from catarrhal or amebic dysentery, but in most cases is associated with Shiga's bacillus.

Etiology.—The causal microorganism, *bacillus dysenteriæ*, was discovered by Shiga in 1898, and its pathogenicity confirmed by other observers, prominent among whom are Flexner, Barker and Kruse. The organism belongs to the typhoid-colon group and resembles the typhoid bacillus both morphologically and in certain cultural peculiarities; it is slightly motile when freshly isolated, flagellate, and renders milk alkaline. The bacilli are found in large numbers in acute cases, and in general become more numerous as the attack subsides and the acute inflammatory changes in the bowel disappear. A characteristic agglutination reaction takes place between the bacilli and the blood of dysentery patients.

Pathology.—In cases running an acute and fatal course in from 48 to 72 hours the mucous membrane of the large, and part of the small intestine, is found greatly swollen, infiltrated with blood and serum, and of a pulpy consistency, but no false membrane is formed, death occurring early. The variety usually seen, however, is the *diphtheritic* or *pseudomembranous*, in which a variable portion of the large intestine, sometimes only the rectum and sigmoid, sometimes almost the entire bowel, is involved. The false membrane is grayish-white, granular, deeply injected and covered with blood-stained mucous. Microscopically it is composed of a fibrinous and cellular exudate which penetrates into the depths of the mucosa, invading and causing necrosis of the glands of Lieberkühn. Bacteria in large numbers are present, and the blood-vessels of the mucosa show thrombosis.

The *ulcerative* type is characterized by the formation of a clear line of demarcation between the living and the necrotic tissues. The ulcers may heal or the *chronic* form of dysentery may develop through extension of the ulcerative process into the deeper layers, with the formation of new tissue and thickening of the gut. Secondary infection with pyogenic organisms takes place, and the course of the disease is marked by frequent exacerbations. Polypoid growths and strictures are among the possible results.

Symptoms.—The symptoms are those of the simple catarrhal form greatly intensified. The fever is higher, the pain is greater, the tormina and tenesmus are more severe, the stools more bloody, and the adynamia more profound. Delirium is often present. The abdomen is tender and swollen, and typhoid fever may be simulated. The symptoms in the secondary form are less severe than in the primary.

Complications and Sequels.—The complications

in this form of dysentery are numerous. Fatal *hemorrhage* from the bowel and *perforation* are occasional occurrences. Perforation is followed by peritonitis, the local symptoms of which vary with the seat of the perforation, and which usually proves fatal. *Perityphlitis* and *proctitis* occur in this way. *Peritonitis* may also arise by extension of the inflammation from the mucous coat.

Hepatic or *hepatopulmonary* abscess is the most important complication of this, as well as of the amebic form of dysentery. It is ascribed to thrombotic extension from the seat of inflammation along the vessels of the portal system into the liver, or to emboli carried from the primary focus to the liver. See LIVER, Abscess.

Association with malaria has been observed, and a form of septic arthritis, which may also be of pyemic origin. Paralysis, pleurisy, pericarditis, endocarditis, and Bright's disease are among the sequelæ reported.

Diagnosis.—This is established by demonstrating the *bacillus dysenteriæ* or by the *agglutination test*. In acute cases the bacilli are abundant and can be recovered without much difficulty from the blood-stained mucus in the stools. Plate cultures upon agar-agar are made and incubated for 24 hours. The colonies which have developed at the end of this time are carefully marked with a blue pencil for further study, and the plates returned to the incubator for another 24 hours. The second crop of colonies usually contains a large proportion of Shiga bacilli, which grow more slowly than the colon bacillus in the mixtures of organisms. Transplantations from the second crop of colonies are made into glucose agar tubes, which are incubated for a day, and all gas forming colonies are excluded as being nondysenteric. The tubes which show no gas are then further examined, and among them the specific organisms will be found (Duval).

The *agglutination test* is easily obtained in positive cases in dilutions varying from 1 to 20 to 1 to 1000 in from one-half to one hour, and as early as the third or fourth day of illness. Twenty-four hour cultures on agar-agar are employed, from which suspensions are made in bouillon. The wet method, by which the blood is obtained in capillary tubes, is to be preferred. The test is applicable to the study of all cases of dysentery, as well as the enterocolitides of children.

Prognosis.—The prognosis of this form of dysentery is the most unfavorable of all the varieties. Most patients die, death being preceded by extreme adynamia and other symptoms of the typhoid state, including dry tongue, stupor, emaciation, and the cadaveric countenance. Consciousness is sometimes persistent to the end.

Prophylaxis.—Since the mode of dissemination of the bacillus of dysentery is similar to that obtaining in cholera and typhoid fever through the stools the same prophylaxis is applicable. Food should be screened from flies, stools should be disinfected, drinking water and food should be sterilized. Eating and drinking utensils should be cleaned with boiling water, dried with sterile towels, and handled with clean hands. The ease with which water closet seats may be contaminated should make us pay great attention to their disinfection during an outbreak of bacillary dysentery. The same applies to the bed clothes of such patients sent out for laundering. Great care should be given to the washing of one's hands prior to eating. The greatest care must be taken with rectal tubes when used for treatment. It is better to make an invariable rule to confine the use of a single tube to a single patient, as the rubber tubes are difficult to disinfect other than by boiling and such treatment, especially in the tropics, soon ruins the tube (Stitt).

Treatment.—The first consideration in the treatment of bacillary dysentery is a bland and nonirritating but nourishing diet; one that leaves as little residue as possible.

Opiates are needed to relieve the pain, and their hypodermic injection is sometimes especially useful for this purpose. When the necrotic membrane is removed, an extensive ulcerated surface remains to be healed, and this is favored by the restrained peristalsis that opium produces. The same purpose may be served by the use of ipecacuanha. On the other hand, it is doubtful whether soluble remedies intended for the direct healing of the ulcers ever reach these surfaces in an active state when administered by the mouth. Bismuth, being largely insoluble when administered in large doses, undoubtedly reaches the bowel, and may perhaps produce some healing effect. More promising is the use of iodoform, which may also be expected to reach the lower bowel in a similar manner, and which is not only more healing in its action but is also antiseptic. It may be given in a pill or capsule in doses of 1/2 to 3 grains. For colon irrigation astringent antiseptic solutions are used. After a cleansing enema of normal saline solution nitrate of silver (20 grains to the pint) may be given, followed by an enema of normal salt solution. Hydrogen dioxid solution is useful.

Serum Therapy.—While a very considerable reduction of the mortality of dysentery has appeared to result in Japan and Russia, from 32 to 12, 9 and even 4 percent, the results thus far obtained in this country have not been sufficient to justify any conclusions as to the efficiency of sera, although they show it to be harmless even in the case of little children.

Chronic Dysentery.

Any one of the forms of dysentery described may become chronic. All the lesions occurring in the other varieties of dysentery may be present. The most common is ulceration, varying in extent and exhibiting also efforts at healing.

Treatment.—The patient should be put to bed, and given a diet easy of assimilation and furnishing a minimum of waste. Its quantity should be just what is needed, and no more. Tyson has little confidence in methods of treatment the object of which is to get remedies to the diseased bowel by way of the mouth. Bismuth in large doses and iodoform may be tried for the purpose; 1/2 dram to 1 dram of bismuth should be given at a dose,

so that from 12 to 15 drams are given in the course of a day. Iodoform may be given as directed for diphtheritic dysentery.

The topical treatment of chronic dysentery by way of the rectum is that on which most reliance is placed at the present day. Its object is to get remedies to the diseased part. With this in view they are dissolved and their solutions are introduced into the lower bowel. Nitrate of silver is the favorite remedy, but alum, sulphate of zinc, sulphate of copper, and acetate of lead are also used in the same doses. From 20 to 30 grains are dissolved in 1 pint of water, and from 3 to 6 pints are introduced at one time through a long tube, gently forced well up into the bowel; but at the onset weaker solutions and smaller quantities are injected. The patient should be placed on his back, with the hips elevated by a pillow, so that there may be the cooperation of gravity. This treatment is sometimes painful. Very decided counterirritation to the abdomen by iodin, and even by blisters, is sometimes of decided benefit. Irrigation of the colon through an appendiceal fistula has been advised. (See Appendicostomy.)

DYSIDROSIS.—Excessive activity of the sweat-glands, in association with a retention of their secretion, probably due to some neurotic disorder. It is a rare disease of a vesicular and bullous character, limited to the hands and feet, and thought to be due to a depressed state of the nervous system. It is more common in women and in adult life, and is to be differentiated from eczema and pemphigus.

The treatment keeps in mind the general health, tonic remedies directed to the nervous system, and, locally, soothing and anodyne applications, such as lead-water and laudanum, boric acid lotion, oxid of zinc, boric acid, and diachylon ointment; or—

℞. Powdered salicylic acid, gr. x
Powdered boric acid, } each, ʒ ij
Powdered starch, }
Petrolatum, ʒ iv.

The external treatment is similar to that of acute eczema. See Sweat-glands.

DYSLALIA.—See Speech Defects.

DYSMENORRHEA.—Painful or difficult menstruation.

Etiology.—Dysmenorrhea sometimes occurs independently of any local lesion. These cases are neurotic in origin or they are the result of malnutrition and of bad hygienic surroundings. They are usually associated with scanty menstruation, and sometimes with long periods of amenorrhea.

The local causes of dysmenorrhea are important. They are imperfect development of the uterus and atresia of the cervix; displacements, particularly anteflexion; inflammation of the tubes, ovaries, pelvic connective tissue, and endometrium.

Symptoms.—The pain of dysmenorrhea varies in intensity, position, and character. In women with unstable nervous systems the pain is usually very severe. The situation of the pain depends very largely upon its cause. When the result of inflammation of the pelvic connective tissue, it is usually located in the back; if due to tubal and ovarian disease, in the ovarian region; if due to stenosis of the cervix or anteflexion, in the middle line of the abdomen just above the symphysis pubis. The pain may be most marked before the menstrual flow begins, as in those cases due to anteflexion and stenosis, or it may continue throughout the entire period.

The treatment of dysmenorrhea depends upon the cause. If constitutional in origin, change of surroundings, attention to the diet and general health, and the administration of nerve sedatives will prove of value. Hyoscin, chloral and the bromids, administered just before the menstrual periods, have been followed by good results.

Dysmenorrhea due to anteflexion and stenosis will require dilatation of the cervix. Intrauterine inflammation usually needs curettage; pelvic inflammation will require its appropriate treatment.

Membranous dysmenorrhea is a peculiar and rather rare variety of painful menstruation, attended by the expulsion of membrane from the uterus. The causes of this condition are not known. It occurs most frequently in virginal and unmarried women. It must not be confounded with an early abortion or discharge of deciduæ in an extrauterine pregnancy.

The treatment consists in thorough curettage that may have to be repeated several times before cure is obtained.

DYSPEPSIA.—See Gastric Neuroses, Gastritis, etc.

DYSPHAGIA.—Difficulty in swallowing or inability to swallow. It is a sign of spasm or paralysis or disease of the pharynx or esophagus or of neighboring structures. A foreign body may remain lodged in front of the epiglottis, in the pharynx, or in the loose tissue behind the pharynx, eluding observation, and cause dysphagia.

Spasmodic dysphagia, though usually of central origin, may be due to strychnin poisoning, tetanus, hydrophobia, or inflammation of the cervical cord, and may occur in epilepsy or early insanity. The ordinary spasmodic stricture, very rare among men, is not marked by much pain or craving for food, emaciation, or cough, exhibits no swelling, secondary growths, or hemorrhage, and it vanishes under anesthesia. The immediate violent return of a mouthful of food or milk is an important sign of spasmodic stricture. Electricity often cures, the frictional form being the best. The positive pole of a continuous current may be placed at the back of the neck, and the negative pole over the pharynx or inside the mouth, if it can be borne. Tonics and antispasmodics and an improved mental and moral tone are indicated. In grave cases the cure is tedious and the relapses common.

Dysphagia from disease is usually the result of chronic enlargement of the tonsils (especially in children), acute pharyngitis, pharyngeal erysipelas, retropharyngeal abscess and tumor, spinal disease, nasopharyngeal tumor, and ulceration back of the pharynx and hidden by the uvula. When the

disease is confined to the esophagus, it may be due to erysipelatous and membranous inflammations, pouches, diverticula, valvular obstruction, or benign tumors. Most commonly, however, simple and syphilitic ulceration and malignant disease are responsible. Simple ulceration often follows the swallowing of boiling water, soap-lees, or strong acids. There are no tumors or diseased glands in simple fibrous stricture of the esophagus. The passing of bougies to dilate the stricture is never free from the danger of perforation. A black, olivary catheter is useful, and may pass best after the patient has taken a mouthful of water, or wine, with the head thrown back a little. Malignant disease causing stricture is usually of epithelial type, and is most common in men. The dysphagia is usually gradual. Food may be given through a rubber catheter, or a fine tube may be worked down over a long piece of catgut and tied in.

Disease of the thyroid gland or hyoid bone, mediastinal tumors, advanced spinal curvature, paralysis of the internal or external laryngeal muscles, inflammation of the trachea, acute or chronic edema of the glottis, and ulceration of the esophagus are causes of dysphagia. Dysphagia in combination with cough or dyspnea indicates that the larynx must be examined. Dysphagia may be caused by an aneurysm of the carotid or innominate artery or of the aortic arch. No instrument should be passed down the esophagus in such cases. See Esophagus.

DYSPHASIA.—Imperfect or disconnected speech arising from loss of or faulty arrangement of words, and dependent upon a central lesion. See Aphasia.

DYSPHONIA.—A condition of defective voice; hoarseness. Dysphonia implies imperfect and irregular approximation of the vocal cords in the production of voice, and anything that produces this imperfect approximation may cause it. General or local chronic swelling of the mucous membrane of the larynx, interfering with the closure of the rima; simple, syphilitic, tubercular, and diphtheritic ulceration or exudation; neoplasms, old cicatricial contractions, paralysis of one adductor, or ankylosis of the cricoarytenoid joint, and the general exhaustion seen in phthisis and chorea are among the causes.

The treatment requires removal of the cause as the first object. As simple overstraining is most common, rest should be enjoined. When the voice must be used, the following gargle may tide over an emergency:

℞	Tannic acid,	ʒ j
	Boroglycerin,	ʒ ij
	Tincture of capsicum,	ʒ ss
	Acid infusion of rose, enough to make,	ʒ x.

Use frequently as a gargle.

Local laryngeal disorders interfering with the closure of the rima glottidis may be dealt with surgically. Diphtheria demands serious and prompt treatment adapted to the disease. Hoarseness from central lesions needs for its relief treatment directed to the primary lesion. Remedies suitable for Laryngitis (*q. v.*) are often serviceable.

DYSPNEA.—Difficult or labored breathing. It is due to various causes. It may be either *inspiratory* or *expiratory*, according as it is mainly dependent upon the muscles of inspiration or expiration; or it may be *general*—that is, both inspiratory and expiratory. It may be the result of heart-disease, nephritis, or anemia, or it may occur from conditions preventing or impeding access of air to the air-passages (1) in the nose and nasopharynx; (2) in the pharynx; (3) in the larynx; (4) in the trachea; (5) in the bronchi; (6) in the lungs. In the first instance acute catarrhal or inflammatory tumefaction of the mucous membranes, neoplasms (polypi, adenoids, malignant growths), and deviations of the nasal septum are causative. In the second instance acute tonsillitis, hypertrophy of the tonsils, benign and malignant new formations, foreign bodies, traumatic and edematous pharyngitis, retropharyngeal abscess, and syphilitic contractions may be passed in review. Of conditions in the larynx causing dyspnea, acute laryngitis in infants, edema of the larynx, abscess, erysipelas, diphtheria, large benign growths, syphilis, tuberculosis, perichondritis, ankylosis of cricoarytenoid articulation, lupus, lepra, fractures and dislocations, wounds, foreign bodies, various paralyses, spasm of the glottis, perverse vocal cord action, and compression of the larynx are provocative. In the trachea various stenoses, syphilis, benign and malignant tumors, and compression from goiter, aneurysm, enlarged glands, emphysema, disease of the vertebral column or of the bones of the thorax may be considered.

Capillary bronchitis, diphtheritic deposits, syphilitic cicatrices, foreign bodies, and intrabronchial tumors may cause dyspnea from affections of the bronchi. In the lungs pneumonia and other inflammatory processes, collapse, and atelectasis of the lungs, edema, phthisis, and gangrene, and compression of the lung from tumors or pleuritic effusions, hydrothorax and pneumothorax, may cause dyspnea.

When due to affections of the pharynx or of the trachea, the respiratory movements are prolonged, and there are inspiratory depression of the epigastrium and a tendency to edema of the lung. The degree of dyspnea depends upon the degree of stenosis and upon the quickness of its development. See Asphyxia, Artificial Respiration.

DYSTOCIA.—Difficult labor. It may be *fetal* or *maternal* in origin.

Fetal dystocia may be caused by prolapse of the cord, overgrowth of the fetus, malformations and diseases of the fetus, malpresentations and malpositions, and plural births.

Maternal dystocia may be caused by anomalies in expulsive or resistant power, hemorrhage, or disease. See Fetus, Labor, Pelvis, etc.

DYSURIA.—Difficult or painful urination. It may be due to calculi, cystitis, spasm, or urethral stricture, and is considered under these special headings.

E

EAR, DISEASES.

Diseases of the External Ear,

Anomalous formations of the auricle are sometimes found; they are generally associated with defects in the meatus or the deeper parts of the ear.

Impacted cerumen is due either to increased activity of the glands or to obstacles interfering with the escape of their secretion. The former condition is often associated with disorders of the external and middle ear; the latter may be produced by exostoses or foreign bodies, or by the cerumen being pushed into the meatus during attempts to cleanse the ear.

The symptoms vary according to the size and position of the plug. They are, generally, deafness, often coming on or increasing suddenly, tinnitus, giddiness, and cough; usually there is no pain. The glistening surface of the wax has been mistaken for the membrana tympani.

Treatment.—Syringing with warm water is generally sufficient to clear the meatus if the stream is directed against its floor, but should the plug be hard and near the orifice, it may be gently moved with a spud. If the syringing causes pain, the wax may be softened with the following drops:

℞.	Sodium bicarbonate,	gr. xxx
	Glycerin,	ʒ j
	Water,	ʒ j.

If the ear is tender, a few drops of laudanum may be added. After the wax has been removed, the meatus should be dried with absorbent cotton-wool and a piece kept in the meatus for some hours.

Othematoma, or blood-tumor of the auricle (*hematoma auris*), may occur spontaneously or be due to injury; the former is much more commonly found among insane patients, and more often in men than in women. It appears as a swelling on the outer surface of the auricle, produced by the effusion of blood beneath the perichondrium. The size, outline, and tenseness of the tumor depend upon the amount; its color, on the depth. If the tumor is small and not very tense, it may be left to subside, or the fluid may be evacuated and pressure applied. Traumatic cases are sometimes attended by great disfigurement.

Fungi in the external auditory meatus are usually found when there has previously been disease of the parts, producing an accumulation of epidermic scales. There are usually tinnitus, pain, and impairment of hearing. On examining the meatus the fungus is seen on the walls of the canal, and often also on the tympanic membrane. The ear should be syringed several times a day with a warm solution of perchlorid of mercury (1:1000) or hyposulphite of sodium (5 grains to 1 ounce), and then a few drops of warm alcohol should be put into the ear. This should be continued for several days.

Circumscribed or furuncular inflammation of the external meatus is usually found in the cartilaginous portion and is often associated with deranged health; it may be due, however, to local irritation. If the deeper part is affected, fever, and even delirium, may occur, especially in children. The pain often radiates over the side of the head, and is increased by movement of the jaw and by making pressure over the tragus; it generally increases toward night, and continues, with but slight diminution, until the abscess bursts or is opened. Deafness, when present, is mainly due to the obstruction. Tinnitus may be present. There is often no congestion of the meatus, but one or more extremely tender swellings inside. Recurrence is quite common, especially in debilitated subjects.

Treatment.—Leeches may be applied to the tragus, plugs of gelatin containing 1/6 grain of extract of opium inserted into the meatus, and an incision made into the swollen tissue. Applications of ichthyol and menthol, and dry heat, *i. e.*, hot water bag or hot salt bag, are also advised. After the incision the parts should be painted with carbolized glycerin, solution of boric acid or ointment of yellow oxid of mercury. Hot compresses should not be applied to the auricle. Opium should be given internally to relieve the pain, and much attention should be paid to the general health.

Exostoses are generally multiple and sessile, and they vary in size from slight elevations to large rounded projections. They are often associated with chronic catarrh of the middle ear, and are also said to be caused by gout, syphilis, and sea-bathing. They grow slowly, and should not be interfered with unless they close the meatus. They can be removed with a dental drill. Pedunculated growths are sometimes found in cases of chronic suppuration; they grow quickly, and are, as a rule, easily removed with forceps.

Foreign Bodies in the External Auditory Meatus.—The first and important injunction is to be sure that there is a foreign body in the ear before endeavors are made to extract it. Much damage has been done by groping after a foreign substance said to be in the ear that was not there, and never had been there. In no case should any one not specially trained use any form of surgical instrument to extract a foreign body from the ear. If a living insect has entered the ear, a few drops of sweet oil will smother it, and it may then be syringed out with warm water. If an inanimate substance has been placed in the ear, as is often done in play by children, syringing with warm

water will generally remove it if the ear has not been previously scratched by probes or forceps. If the latter has been done, the child should be etherized, and the foreign body removed by an expert. There is no haste demanded in these cases. The foreign substance had better be left in the ear indefinitely than to apply rough measures for its removal. What a child can slip into the ear in play can be easily removed if the physician first called knows how to do it. Death has resulted from unskilful endeavors to remove a foreign body from the ear of a child. Not the foreign bodies in the ear, but the improper treatment is the cause of death in such cases. The instillation of oil into the ear for the removal of foreign matter from it is futile. If, as sometimes happens in tropical countries, the larvæ of flies are present in the ear, a drop or two of chloroform or ether should be put into it.

Diseases of the Middle Ear.

Otitis media (inflammation of the middle ear, tympanum, or drum-cavity) is divided into 4 clinical forms: viz., acute catarrhal, chronic catarrhal, acute purulent, and chronic purulent otitis media.

Acute catarrhal otitis media is the original form of all the other phases of otitis media. It is caused most frequently by acute coryza, or cold in the head, though it is often caused by the exanthems, typhoid fever, and influenza, the infection entering through the tube, through the meatus, or through the blood. Other factors in its etiology may be traumatism and reflex irritation such as dentition. Its earliest symptoms are a painless, obstructed sensation in one or both ears, with slight hissing or pulsating tinnitus, but without pain, and altered hearing. Sometimes the hearing may be hyperesthetic. Most persons experience this simple stage of catarrhal otitis media with a cold in the head. As a simple coryza passes off all ear symptoms go with it if the local treatment of the nares and nasopharynx has been mild or gentle and purely negative. If we will note conditions in our own nasopharynx and middle ear when we have a cold in our head or an acute nasal catarrh, we shall observe that as secretion increases in the nasopharynx, the Eustachian tube ceases to open at each act of swallowing as it does in a normal state. The ear may feel more or less stuffed, and now and then there may be a dart of slight pain from the posterior nares into the ear. If we are patient, and do not treat locally the nasopharynx, nares, or Eustachian tube in any way, or only with a bland, oleaginous spray at such a time, we shall note that as secretion in the nares and nasopharynx diminishes, in the course of from 3 to 6 days, the Eustachian tube will open spontaneously, and the ear will feel natural once more. This occlusion of the Eustachian tube in the early secretory stages of an acute coryza is beneficent, since it is nature's seal set against the entrance of pathogenic germs from the nasopharynx into the normally aseptic middle ear. If this seal is broken, either by forcible blowing of the nose or by the inflation bag of the surgeon, it is done at the peril of the patient, as pathogenic germs are very likely to be forced by such manipulations from the nasopharynx into the middle ear, and an acute purulent otitis media thus developed. This latter condition constitutes the so-called "earache" of children. Acute catarrhal otitis is almost as common as acute coryza, and as simple, if properly managed; but the transition to acute purulent otitis —a serious malady—will be rapid if the local treatment of acute catarrhal otitis is injudicious.

If the membrana tympani is examined in the early stages of a simple acute catarrhal otitis media, it will be seen to have undergone very slight, if any, change. It may be slightly pink, or even red, along the malleus and periphery. But its general surface undergoes no change in appearance or position in these early stages of acute catarrhal otitis media.

The acute catarrhal otitis media of the exanthems, of typhoid fever, or of influenza, originates also by infection from the nasopharynx but, owing to the more weakened condition of the patient in these maladies than in simple coryza, tends to a more virulent course from the onset. Nevertheless, the simpler the local treatment of the nasopharynx and ear in such cases, the less likelihood there will be of secondary infection, and the more favorable will be the course of the aural disease in the end.

Treatment.—Any infection or irritation in the nasopharynx should receive proper local treatment; in order to get free drainage through the tube 1 to 8000 adrenalin chlorid solution in 4 per-cent cocain solution applied to the mouth of the tube through the nose and mild Politzerization should be employed. If there is a pain in the ear, it can best be allayed with *dry* heat, by means of the hot-water bag, hot-salt bag, or hot stone wrapped in flannel. The application of dry heat about the ear may be combined, in those instances demanding it, with an antifebrile treatment of the general system. Calomel should be given at the outset. Any systemic disease which might act as a predisposing cause should be carefully treated. There will be no harm in instilling into the ear, if it aches, 10 drops, *warmed*, of a solution of carbolic acid (1:40) or one of formalin (1:2000), if these can be borne. But the membrana tympani, when in the slightest degree inflamed, cannot endure the pressure of a column of fluid in the canal. When it can, however, and these drops give relief, it is, in the opinion of many, the heat, and not the drug, that allays the pain, and therefore, hot water may be tried first.

The advantage of instilling an antiseptic into the inflamed ear in the early stages, before the perforation of the drum membrane occurs, is that the auditory canal is thus rendered more or less aseptic—*i. e.*, free from staphylococci—and hence a safer place into which the membrana may rupture or be ruptured, since when the membrana ruptures and pours out the germs causing the acute inflammation into the outer ear freed from staphylococci, there is less danger of the entrance of the last-named germs, the promoters of chronic purulency,

into the drum-cavity, and secondary infection is less likely to occur.

Acute Purulent Otitis Media.—Acute catarrhal otitis media, instead of undergoing resolution, may pass into acute purulent otitis media (especially in exanthems) from the passage of pathogenic germs from the nasopharynx into the middle ear. (And see COLON BACILLUS INFECTION.) The pain will now become more intense, the hearing dull, tinnitus will become louder and distressing, and fever usually sets in, if it is not already present. The membrana tympani will be found injected, and its features lost in the general swelling of its surface as the inflammation within the drum-cavity advances. The patient should be put in bed and kept on restricted diet, his bowels kept open with calomel and salts. Dry heat about the ear will be of benefit in allaying the pain, and sometimes in causing resolution. The ear should be douched every hour or at least 3 times a day, according to the case, with warm carbolic acid solution in water (1 : 40) or saturated boric solution at 99 to 105° F., from a fountain syringe. Judicious local treatment should be given to the nasopharynx in order to obtain tubal drainage. If the pain ceases in a few hours under the foregoing conservative treatment, well and good. If pain continues over 6 hours in a child, or over 12 hours in an adult, without spontaneous rupture of the membrana tympani, paracentesis of the membrana must be performed, because hearing and life are at stake in many cases if the drum-membrane is not opened. As the inflammation advances the membrana tympani will be seen to bulge, especially at its posterior half. Sometimes the most prominent portion, however, is in the membrana flaccida. As the inflammatoin in the drum-cavity increases, of course the pain becomes most intense, children being thrown into convulsions in some instances. After secretion forms in the drum-cavity and the membrana bulges, no relief can be obtained until an escape is offered to the pus by either a spontaneous or an artificial opening in the drum-membrane. In time a spontaneous opening will usually occur, but as the tendency is for secretion inside the drum-cavity to inspissate, the longer perforation is deferred the less likely it is to occur spontaneously, and the retained secretions will burrow toward the meninges, sinuses, and brain-cavity, especially in children. Hence the vital indication is paracentesis in a case of acute otitis media with the membrana still imperforate after a few hours of great pain followed by bulging of any part of the membrane. When the discharge becomes scanty the douching may be stopped and after dry cleansing, boric acid powder may be insufflated. When the active symptoms have subsided mild daily Politzerization should be performed.

In a case of earache with congested and bulging membrane the surgeon must be careful to differentiate between swelling of the outer surface of the membrana and bulging of this structure from its outward pressure by secretions on its inner surface, as it occurs in so-called myringodermatitis. In the latter the prominence is generally more punctate and sharply defined; often being, in fact, a yellowish, brownish, or livid blister. In otitis media the protrusion from retained secretions comprehends more of the surface of the membrana, especially in its lower and posterior portions. In both forms of acute otitis media the condition of the membrana tympani must be watched carefully and constantly throughout the progress of the disease, for only by an intelligent observation of its varying conditions can treatment be properly conducted. In acute otitis media, furthermore, great aid in diagnosis and treatment is derived from observation of the state of the walls of the auditory canal—whether or not they participate in the congestion or inflammation of the drum-cavity. If they do share in this inflammation, the case is always complicated thereby.

Chronic Purulent Otitis Media.—Chronic purulent otitis media is due to the permanent lodgment of staphylococci in the acutely inflamed middle ear by reason of imperfect drainage.

The symptoms of chronic suppuration of the ear are, objectively, a more or less copious and offensive discharge from the ear, with a perforated membrana tympani. The perforation may vary from the size of a pin's head to that of the entire membrana. The membrana loses its luster first, and, sooner or later, becomes thick and red, and, finally, denuded of epithelium, raw and secreting. When the perforation is large, all the ossicles may be visible; or the malleus—the manubrium being partly destroyed by caries—may be the only one visible. The incus is generally the first to go, in part or entirely, as its nutrition is scanty. The stapes is the most resistant of all, especially in its foot-plate, as it is nourished by the vascularity of the inner wall of the tympanic cavity, of which it is practically a part. The head and crura of the stapes may be destroyed by necrosis in some virulent cases. But, as a rule, it persists the longest of the three bonelets, though it may remain invisible through the perforated membrana, because buried in the swollen mucous membrane of the drum-cavity. As this swelling goes down under treatment and the discharge ceases, the stapes comes into view, if still intact.

The subjective symptoms of chronic purulent otitis media are hardness of hearing or deafness, tinnitus of more or less intensity, either constant or interrupted, ear-vertigo at times, in adults, and in children attacks of so-called "gatherings in the ear," and earache, with, of course, impaired hearing, and sometimes tinnitus. Adults, too, will have attacks of earache if they allow cold water or cold air to enter the diseased ear, or if they neglect a cold in the head.

Treatment.—The first endeavor should be to render the external auditory canal and middle ear aseptic. The general health should be attended to and the nasopharynx should receive local treatment in order to get free drainage through the tube. Of course, cotton must never be worn in the chronically running ear. If the discharge is too thick and too copious to mop out, it may be syringed out of the ear by means of warm water, previously boiled. To this may be added a little salt (5 grains to 1

fluidounce) or carbolic acid (1:40). Once or twice in 24 hours is often enough in the worst cases. If the discharge is not copious, it may be removed with an absorbent cotton mop, previously singed, and then 10 drops of an antiseptic solution may be put into the ear, or boric acid powder may be insufflated. A solution of formalin (1:1000, 1:2000) or a solution of carbolic acid (1:40) may be dropped in and allowed to lie there a few minutes, and then turned out into a towel. When there is a tendency to granulations, absolute alcohol may be used instead of the foregoing. This treatment may be repeated once or twice a day in the worst cases, then once a day, and, finally, every second or third day as the discharge lessens. Polypi and cholesteatomata should be removed; tiny cotton pledgets should be passed through the perforation or if necessary an intratympanic syringe with a strong bicarbonate of sodium solution in normal salt solution should be used to remove granulomata and inspissated material. If still some accumulation remains dry suction cups may be valuable.

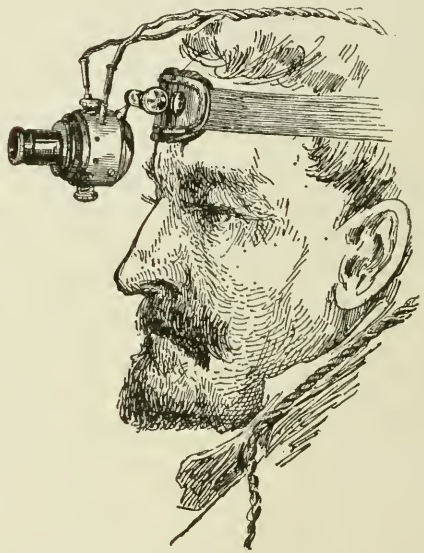
This, or a similar antiseptic treatment, persevered in for many months, will usually lessen the discharge, and in many cases check it, especially if the perforation of the membrana is below the folds and the disease largely or entirely in the lower part of the drum-cavity, or atrium. If the sole perforation is in the membrana flaccida, and the purulency chiefly or entirely in the attic, or recessus epitympanicus, it cannot be cured, as a rule, by local antiseptics. The disease being limited to the atrium and the perforation being generous, local antiseptics will often effect a cure. The surgeon must persevere for months, or even years, if he observes that the tendency of the purulency is to lessen and the condition of the diseased mucous membrane of the drum space improves.

Vaccine therapy has been tried in intractable cases with good results according to recent report and the outlook seems encouraging.

If the purulency ceases under local antiseptics, the hearing may be found to be more impaired after the discharge ceases than while it prevailed. This is due to the fact that in the healing process the partly destroyed ossicles and membrana tympani have been bound together against the promontory and oval window by synechiæ, and sound conduction thus impeded. When the largest ossicles are destroyed by necrosis or removed by the surgeon, healing of the chronic purulency of the drum-cavity ensues, without synechial interference to the oval window, and the hearing is better in such cases than when healing occurs with the ossicles in position. After six months, or sooner, if the tendency of the chronic purulency of the middle ear is not toward improvement under the foregoing local antisepsis, it is because drainage is defective, antisepsis cannot reach the intrenched staphylococci, and caries and necrosis of the ossicles, and sometimes of the neighboring tympanic walls, are advancing. This is especially true in chronic purulency of the attic. Such a patient is threatened now with deeper and most serious lesions in the antrum and mastoid cavities, involving the petrous bone on its inner surfaces, in the middle and posterior cranial fossæ.

Chronic purulent otitis media is in most instances amenable to the antiseptic treatment; but having defied local antiseptic treatment for months, and the ossicles or the petrous bone in their vicinity being carious, ossiculectomy and curettage are indicated. Thus drainage is favored. Some advise immediate resort to a mastoid operation. This is unjustifiable simply for the cure of chronic purulency, because, in the absence of urgent mastoid and cranial symptoms, ossiculectomy and removal of the remnants of the membrana and of polypi, followed by the application of antiseptics, will effect a cure.

Ossiculectomy.—In performing ossiculectomy in chronic purulent otitis media the patient should be etherized, in order to prevent his suffering and to keep him perfectly quiet. Movement of the head defeats the operation. Ossiculectomy is performed under local anesthesia by means of cocain. But anesthesia in the drum-cavity by means of cocain is not total, and the patient flinches

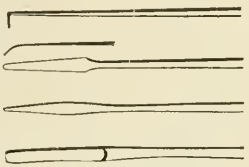


Electric Forehead Lamp.—(*Burnett.*)

and moves more or less; and as a good deal of cocain solution is required, there is some risk of toxic effects. The patient being under ether, the ear must be illuminated by an electric lamp held on the surgeon's head, like a forehead mirror on a band. Then the remnants of the membrana over the region of the incus-stapes joint should be cut away, if not already eroded by disease, and the malleus, in part or in whole, and the incus should be looked for. Sometimes the entire incus will be found in position, with its long process in connection with the stapes head and its body still in articulation with the head of the malleus. But this is the exception in chronic purulent otitis media. Most frequently the incus is entirely destroyed by necrosis. Sometimes the body of the incus, minus its long limb, is found fused with the malleus head,

and is removed with the latter when the malleus is seized with forceps and removed from the drum-cavity after severance of its suspensory ligaments, synechiæ, etc. In other instances the body of the incus is partly destroyed by necrosis, its posterior part being intact and the long limb still attached to the stapes. If the incus is present with the malleus, the former should be removed before the malleus is disturbed. If the malleus is removed first, the incus, unless adherent to it, may fall into the lower, posterior part of the drum-cavity and be lost, or recovered only after considerable, and possibly irritating, grappling. The incus being found and removed, the malleus may then be excised. In no case of chronic purulent otitis should the stapes be removed, or even mobilized, for fear of opening the oval window and inviting the entrance of pus into the internal ear, and thence into the cranial cavity.

Instruments.—The initial incisions in the membrana may be made with a sharp-pointed knife, but further cutting should be made with a blunt-pointed one. The incus is best detached from the stapes by means of the incus hook-knife, and if adherent to the attic, should be turned forward into the front and lower part of the drum-cavity by means of an incus hook-knife larger and blunter than that for detachment of the incus from the stapes. When the incus is entirely freed from its attachments, either normal or pathologic, it may be pulled from the drum-cavity by the blunt incus hook-knife or by means of the foreign-body forceps of Sexton's pattern.



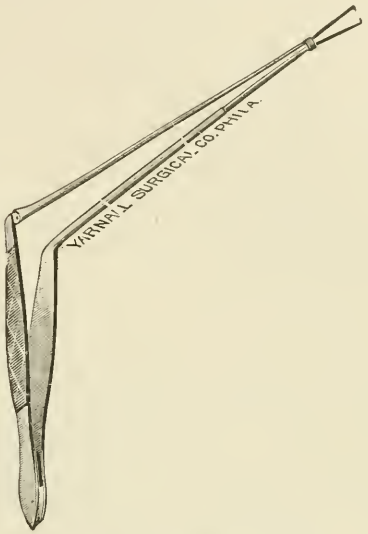
Instruments Used in Ossiculectomy.

After-treatment.—In no case should the drum-cavity be curetted, as such a procedure is very likely to wound the facial canal, irritate the facial nerve, and induce facial palsy. It is, furthermore, unnecessary, as granulations will disappear and denuded bone surfaces heal under proper antisepsis.

After the removal of the diseased remnants of the membrana and ossicles, the ear should be mopped with an antiseptic, like alcohol, or solutions of bichlorid (1 : 1000), or formalin (1 : 1000), and the meatus occluded with a light tampon of sterilized iodoform (5 percent) or carbolated (5 percent) gauze, and the ear let alone for 24 hours. If the gauze in the ear becomes moist with blood or bloody serum, it should be removed and dry dressing placed in the meatus, not far in the canal. In all cases the discharge diminishes at once, and ceases entirely, in the majority of cases, within a period varying from a month to 18 months. The after-treatment should consist in mopping the discharge from the ear and the instillation of a formalin solution (1 : 1000) from once a day to once a week, according to the quantity and frequency of the discharge.

The hearing improves to varying extents, the general health of the patient is rendered better, especially when there have been septicemic symptoms due to the aural purulency, and the patient is freed, by ossiculectomy, from the danger of extension of the suppuration to the mastoid and cranial cavities.

Chronic Catarrhal Otitis Media.—Acute catarrhal otitis media, instead of undergoing resolution or resulting in acute suppuration, may pass into a chronic hypertrophic catarrhal otitis media. In most cases it will be found that the nasopharynx has become the seat of chronic hypertrophic catarrh. The onset of chronic catarrhal otitis media is gradual; hence it has been called chronic progressive hardness of hearing. After an attack



Sexton's Foreign-body Forceps.

of acute catarrhal congestion of the middle ear tending to chronic catarrhal otitis, the ear does not return to its normal state, but remains the seat of more or less tinnitus and of an obstructed feeling. The hearing at first is but little impaired, which leads the patient to disregard his ear-disease, thinking it will pass off, especially if the impediment is confined to one ear. However, with every cold in the head the ear quickly feels worse, and after each cold the noises in the ear and the hardness of hearing increase, and are noticed more and more by the patient and his friends.

As the symptoms of tinnitus and deafness increase, there may be added attacks of ear-vertigo and vomiting, from invasion of the labyrinth, forming a symptom complex, consisting of cochlear and vestibular symptoms, known as Menière's Disease (*q. v.*). These attacks come on suddenly, occurring once or twice a year at first, and are usually not referred to the ear as a cause either by the patient or his physician. In fact, they are commonly considered and treated as attacks of stomachic vertigo. In some instances the attacks of ear-vertigo are preceded by an increase in the tinnitus aurium, and this may arouse in the patient a suspicion that the ear-disease is the cause of his vertigo. If in the later stage of chronic catarrhal deafness chronic ear-vertigo

sets in, the deafness may be profound in one or both ears, if both ears are affected. In every case of chronic catarrhal otitis media there is, very early in the process, contraction of the tensor tympani, retraction of the chain of auditory ossicles, and consequent impaction of the stapes in the oval window. It is this last event that causes compression of the intralabyrinth fluid, irritation of the motor filaments of the auditory nerve and cerebellar peduncles, with reflex phenomena of vertigo.

Treatment.—Since chronic catarrhal otitis media is caused by chronic hypertrophic nasopharyngeal catarrh, and not by throat-disease, the nasopharynx must receive the first attention, and the general health improved, if impaired, as it generally is. In order to improve the circulation and drain the middle ear, forcible Politzerization should be performed, and in the event of no result, catheterization, the frequency depending on the relief obtained without irritation. Gentle pneumomassage of the membrana tympani and of the ossicles will be beneficial. This is best accomplished by the Siegle pneumatic speculum, applied under direct inspection of the membrana by the surgeon. Hot air inflations have proved to be of value.

If, in spite of rational, conservative treatment the ear symptoms grow worse, occasional resort may be had to removal of the incus. The resultant overcoming of the retraction of the chain of ossicles, and consequent liberation of the stapes, will be followed by diminution and final cessation of the tinnitus and vertigo, and in some cases by improved hearing. The instruments and methods of procedure employed in intratympanic ossiculectomy have already been presented. In performing removal of only the incus, an incision must be made in the upper posterior quadrant of the membrana, and the incus-stapes joint exposed. The incus must then be detached from the stapes by means of traction outward and downward with the incus hook-knife. The descending ramus of the incus must then be seized with forceps and gently pulled downward and outward through the perforation in the membrana into the auditory canal, and removed from the ear. The meatus should then be occluded with a loose tampon of sterilized gauze and let alone for 24 hours. Healing by first intention usually occurs, if the ear is protected with dry sterilized gauze and let alone. Removal of the incus is never followed by inflammatory reaction if the foregoing conservative treatment is carried out. If anything is applied to the wound in the drum or to the middle ear, inflammatory reaction will surely occur.

Complications of middle-ear disease are infectious otitis interna, or panotitis (infection of the middle and inner ears), mastoiditis, osteomyelitis, caries and necrosis, phlebitis, meningitis, and brain abscess.

Mastoiditis.—Inflammation of the mastoid cells may be produced by the extension of the disease from the tympanum. Rarely it is due to extension of external inflammation. The symptoms are deep-seated pain (increasing on deep pressure), swelling and tenderness over the mastoid process, accompanied by more or less fever and rapid pulse, coated tongue, anorexia, and malaise. When the periosteum is affected, the tissues behind the ear are swollen and the auricle stands out from the head, the canal is smaller and the posterior superior, inner bony wall of the canal droops. If pus has formed, fluctuation may be detected.

Diagnosis.—In angioneurotic edema the swelling and edema are transient and not stationary. In otitis externa the auditory canal in addition to the extraperiosteal tissue is tender and swollen. In mastoid adenitis there is not often the history of middle-ear disease.

Treatment.—In the early stages rest in bed, paracentesis to secure drainage, saline laxatives, leeching over the mastoid process, douches every hour of saturated boric solution (100° to 110° F.), heat over the mastoid, normal saline solutions by rectum or mouth are indicated. If these measures fail to give relief, operation is necessary.

The Mastoid Operation. Indications.—The **simple mastoid** operation is indicated whenever an acute purulent otitis media involves the mastoid antrum and cells, characterized by the following symptoms:

1. Deep-seated, persistent pain over the mastoid.
2. Swelling (subperiosteal) over the mastoid.
3. Tenderness, probably, over the mastoid.
4. Persistent discharge after paracentesis and 6 weeks of thorough cleansing treatment.
5. Bulging of drum membrane and dropping of the posterior-superior wall, even after paracentesis.
6. Fever, especially in children.
7. Marked leukocytosis and polynucleosis.
8. Symptoms of intracranial involvement or facial paralysis.

A free paracentesis during the first few days of the attack, however, will often obviate the necessity of an operation.

The **modified radical operation** is indicated in a chronic suppurative otitis media unamenable to thorough cleansing treatment, when necrosis is limited to the mastoid antrum and cells (*i. e.*, when the tympanic cavity is not involved in the necrotic process).

The **radical mastoid operation** is indicated:

1. In the presence of cholesteatoma.
2. When there are symptoms of labryinthine involvement—nystagmus, vertigo, loss of bone conduction and caloric reflex, nausea, vomiting.
3. When an acute mastoiditis occurs in the course of a chronic purulent otitis media.
4. When facial paralysis or intracranial complications supervene.
5. When the discharge is intractable in spite of thorough cleansing treatment for at least 6 months, including use of the probe, curet, forceps, and intratympanic syringe and removal of the necrosed ossicles.

The kind of operation—simple, modified radical, or radical—preferable in the given case is best determined in the course of the operation as the exact extent of the diseased area becomes manifest upon thorough exploration.

The Mastoid Operation. Technic.—Rigid aseptic technic is of the greatest importance. The

patient should be prepared as for any other major operation. Preliminary to the operation, paracentesis is performed. The object is to explore the affected region, remove all diseased tissue and open up all the air cells to prevent recurrence and provide permanent drainage. A curved incision is made through the tissues behind the attachment of the pinna. The periosteum is cut and lifted and separated from the exposed mastoid process. The tip of the mastoid process is then removed by a large rongeur. If the disease has extended posteriorly, a posterior cut is made, the periosteum lifted and the diseased tissue removed by large or small rongeur. The bone surfaces should be levelled and smoothed with a Richard's curette. The bony trabeculæ and two-thirds of the posterior meatal wall should be removed. From the inner end of the osseous canal a slit should be made through the posterior wall of the membranous canal to the external meatus.

If the extension of disease calls for a "modified radical operation," the outer wall of the epitympanum may have to be removed down to the ossicles and the posterior wall of the bony canal down to the drum membrane and almost to the facial nerve. The ossicles, however, are undisturbed, therefore hearing is preserved.

If a "radical operation" is demanded because of extensive involvement and necrosis, it is necessary to remove the upper external and posterior meatal wall of the tympanum, avoiding the facial nerve, as well as part of the upper anterior wall. Tympanic structures should be preserved as much as possible in order to obtain better postoperative hearing. Labyrinthine involvement calls for further exposure. Unless the cochlea is diseased it should be left intact for the sake of postoperative hearing. The external wound should be closed at the earliest possible moment. In some cases this can be done at once; in others a very small drain must be inserted. This drainage should be kept up until the tympanum is entirely healed. For further drainage and to prevent adhesions Politzerization should be practised daily, beginning 3 or 4 days after the operation.

The Complete Mastoid Operation through the Diagastric Route.—Wm. S. Byrant's technic is as follows:

An incision is made "close to the posterior fold of the auricle beginning at a point on a level with the upper wall of the meatus. The incision is then carried in a curved line downward and forward to a point level with the tip of the process. The periosteum is next incised at the bottom of the wound on a line corresponding to the skin incision. Then the periosteum is lifted carefully, beginning at the tip of the process nd working upward, extreme caution being taken that the periosteum be removed in even sheets. After the anterior and posterior periosteal flaps have been loosened, the periosteum is lifted from the mastoid process entirely, the operator working around under the tip and up to the bottom of the digastric fossa. Then with a medium sized rongeur the tip is quickly removed, followed by removal of the outer table of the cellular area. The possibility of opening the sinus is thus rendered quite remote even when situated much further forward than is normally the case. If the knee of the sinus encroaches upon the posterior wall of the meatus too closely to allow easy entrance to the antrum by the usual route, the latter can be readily approached from below. The cells in the base of the process are now broken down with the rongeur and cleaned up with the curette, thus fully exposing the antrum."

Bryant considers the advantages of this method to be the following:

1. Elimination of sinus involvement and secondary operation.
2. Less time required.
3. Stylomastoid foramen readily found.
4. Convalescence is sooner and more rapid.

Caries and necrosis may attack the meatus, mastoid process, and tympanum. When this occurs, the granulations constantly return, even after persistent attempts have been made to destroy them, and the discharge frequently remains offensive. Facial paralysis may be present. In children an anesthetic should be administered, and if any caries is found, the diseased surface should be scraped and any sequestra that are present removed.

Phlebitis, when it occurs, generally affects the lateral sinus and the jugular vein, and may produce pyemia.

Meningitis and cerebral abscess may occur during acute or chronic suppurative inflammation of the middle ear, but are more often found in the course of the latter.

Localized meningitis complicating acute otitis media generally demands a simple mastoid operation with removal of every particle of necrotic bone, but complicating chronic purulent otorrhea it calls for a radical operation. The radical operation is indicated, too, in all cases of diffuse otitic meningitis.

EAR, EXAMINATION. Practical Tests for Hearing.—Unfortunately, the watch is commonly regarded as the most simple and ready test, and the voice, with all its varied possibilities, is supposed to be unscientific and haphazard. As a fact, watches vary more than voices. One can claim or imagine, with very little control upon his accuracy, that the known rhythm of the watch-tick is heard, when really inaudible; and its high-pitched, impure tone has very limited value as a test. Each watch must be tried with many normal ears to ascertain how far it should be audible: must be brought up *unseen* from a distance until heard, not withdrawn until it is hardly audible; and should be held half-covered in the hand, so that a turn of the wrist will interpose the hand and largely cut off the sound. In the individual, gain or loss may be thus determined if all conditions are strictly equalized; but imperfect hearing of the watch-tick is common in cases that hear all other sounds perfectly, and is often of no significance, while it may be audible to some who have no hearing. Much the same must be said of the Politzer "acoumeter," which has failed of the universality hoped for it.

The human voice, especially in whisper, is able to test the hearing through many octaves, and

forms the readiest, and often the best, test at our command. Loud, medium, and low voice, stage-whisper and low whisper, are fairly definite terms; while test-words, like the cardinal numbers up to 100, give ample variations and combinations of pitch. The few questions of the primary history taking, asked in a just audible tone, give the careful examiner a fair gage of the patient's defect; and having him repeat the test-words gives good control of the acuity of the hearing. As a standard, it may be stated that a stage-whisper spoken with the "reserve air" after an ordinary tidal expiration should be heard some 5 meters in a fairly quiet place—the high, sibilant sounds of *s* and *x* being generally most audible; while faint, clear whispers should be heard at 1 meter.

More valuable than any such quantitative tests are the qualitative showings of the **tuning-fork.** Various pitches must be used in any attempt at completeness; but much may be accomplished with one or two. Most authorities place first the "tenor C" fork of some 520 vibrations a second, although the "middle C," or the A-fork, of 213 vibrations a second is most sold. A lower fork is useful in revealing the beginning defects of catarrhal deafness, and the high-pitched forks best disclose nerve-lesions. A "continuous tone-series" is needed only by the specialist. With any fork the hearing distance for its tone (which can often be made pure by clamps or short sections of rubber tubing upon the tines, and varied by shifting their position) can be tested as with any other sound; but it is more precise to determine the length of time it can be heard after a certain blow. This is readily attained by letting the fork fall its own height upon a firm but not too hard surface, such as the muscle cushion above the knee or a rubber block upon the table. The A-fork, as generally made, should sound about 100 seconds, and should at first be audible at least 10 inches away in the clinic room—further in a quiet place. This is a test of **air-conduction.**

When the handle of the sounding-fork is rested (the pressure should about equal its weight) upon some part of the head, the vibrations are transmitted through the cranial bones to the auditory apparatus. High-pitched forks should have long handles, or the air-conduction, especially from the mastoid, may confuse this **bone-conduction,** which is normally about half as loud and long as the air-conduction; so the A-fork should be heard some 45 seconds by bone. This constitutes Rinne's or Schwabach's test, and is best indicated by the mathematic proportion, A.c. = 100 : B.c. = 45. Roosa and Emerson have shown the value of simply noting which is *louder* by sounding the fork close before the ear and quickly changing it to rest upon the mastoid. Many patients are confused by tests taking time or demanding precise answers, while any one should be able to correctly report whether it is heard "louder front or back—back or front," suiting the action to the word. This preponderance is best recorded A. c. > B. c., air-conduction is greater than bone-conduction; or A. c. < B. c., when air-conduction is less.

Gardiner Brown has shown that the vibrations should be palpable to the fingers holding the handle just as long as they are normally audible through the bone-conduction of the patient. This gives us a control-test, disproportion of which is a ready indication of abnormality, the patient hearing too short a time if the perceptive apparatus is in any wise impaired. A still older test is Weber's, as to whether the fork vibrating on the vertex is heard louder in one ear than the other. Simple and important as it is, this had better follow the Rinne test or the patient may report falsely, not believing his own ears when the worst ear hears under these conditions better than, and even to the apparent exclusion of, the better ear.

In practice, then, normal ears should hear the A-fork at least 10 inches (25 cm.) away, or for a period of 90 to 100 seconds; should hear it louder by air than by bone, the latter perception being lost in 40 to 45 seconds, just as the examiner ceases to feel it with his fingers; should hear it in front of the ear long after it has become inaudible through the mastoid, but should have increased bone-conduction, equal on the two sides, by stopping the ears tightly with the fingers.

A patient with **affection of the percipient apparatus,** in the labyrinth or beyond, would show reduction, great or small, of the air-conduction with greater or total loss of the bone-conduction—*e. g.*, A. c. 50 : B. c. 10—especially for low tones; the fork vibrating on the vertex or other point in the middle line of the head should be louder in the *better* ear, and probably increased by stopping the canal.

In the more common **affections of the conducting apparatus** (external and middle ear) it should be found that while air-conduction is lessened, perhaps greatly, bone-conduction may be actually, as well as relatively, *increased*—*e. g.*, A. c. 25 : B. c. 50; the fork is heard through the bone after it has become inaudible in front of the ear and is unfelt by the examiner's fingers; stopping the ears may not at all affect the sound, and from the middle line it is louder in the *worst* ear. Low tones are generally heard relatively better than high by bone; but the reverse holds for the air-conduction, and low tones may be inaudible when the shrill sounds are rather unduly distinct.

Another useful test has been devised by Politzer, in which the A-fork is sounded before the nostrils and the patient is told to swallow—it should be heard louder at the moment when the tubes open in deglutition. If either tube fails to open normally, there is less or no increase in the sound on that side; so it forms an index of the physiologic action of the eustachian tubes more instructive than testing their permeability under inflation.

Another serviceable apparatus is the **Galton whistle,** which furnishes very high-pitched sounds, a scale on the outside marking the variable length of the tube employed to form the note. Its piercing sound should be easily heard, while it can readily be concealed in the hand in examining children supposed to be deaf; so if they fail to turn toward the sound, varied through the upper octaves, which are commonly the last to be lost, it may be the sole means of deciding that no hearing remains.

It can take the place, for most purposes, of Koenig's rods or a series of tuning-forks many times as costly and less convenient.

In testing the bone-conduction there is a senile decrease to be taken into account when elderly persons are examined; and one may find that very low tones, if any, are heard through the bone. Coincident thickening of the drumhead and stiffening of the ossicular chain may markedly reduce the upper limits of air-conduction, so some have regarded this **presbycusis** as a nerve impairment or a failure of the hypothetic **aural accommodation.** It is probably to be ascribed to structural changes such as make the bones more brittle in age; but it should be borne in mind as wholly vitiating at times the conclusions that seemed deducible from the tuning-fork tests previously described. In some cases, again, care must be taken to avoid confusion of palpable with audible vibrations. Deaf-mutes will claim to hear a tuning-fork, generally by bone-conduction, when it is certain that it is merely felt. Applied to the knee, they will generally indicate the same perception of it as when it rests upon the head, showing that they have no conception of what hearing is.

Sometimes it is possible to locate lesions of the sound-conducting apparatus at the articulation of the stapes with the oval window, by reason of failure of the consensual action of the stapedius muscles of the two sides. If air-pressure or suction is exercised by the finger-tip or other means upon one drumhead and chain of ossicles, there will be, if the stapes is normally free, impairment of hearing for the tuning-fork or other sound in front of the opposite ear. Unfortunately, only a few patients can give definite and trustworthy answers to this test, called by Gellé, who devised it, "pressions centripetales."

In aural practice defect of hearing is present in 75 percent or more of the cases, in hardly one-tenth of which is the percipient apparatus at fault, and then rarely alone or primarily. Complicated cases or inaccurate responses may confuse or invalidate the tests; but usually those given will serve to locate the seat of the lesion and indicate the lines of treatment to be pursued.

The auscultation tube is a piece of rubber tubing about 30 inches long, having at each end a hollow piece of ivory or vulcanite to fit the meatus. To distinguish the end used for patients, one ear-piece may be made of ivory, the other of vulcanite. By placing one end in the patient's ear and the other in the examiner's, the condition of the eustachian tube can be ascertained while the tympanum is being inflated, by Valsalva's or Politzer's method, or by means of a eustachian catheter. Thus, if there is moist mucus in the tube or tympanum, a bubbling sound is heard, or whistling if the caliber of the tube is narrowed. In cases in which the membrana tympani is perforated the injected air can be felt by the surgeon striking against his own membrane.

Valsalva's method of inflating the tympanum consists in expiring forcibly through the nose while the mouth is closed and the nostrils are compressed by a finger and thumb. In a healthy ear the entrance of air is accompanied by a feeling of fulness and a slight cracking sound.

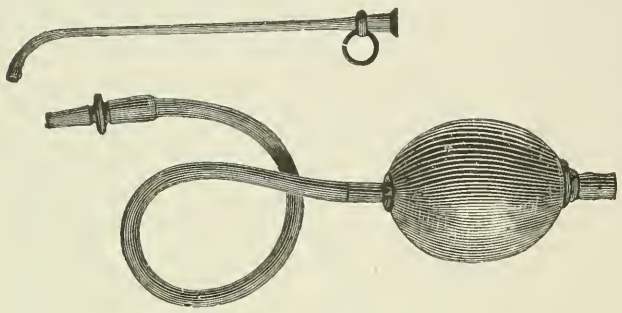
Politzer's method consists in holding a small quantity of water in the mouth, and then, while it is being swallowed, forcing air from an india-rubber bag through one nostril while the other is compressed with a finger or thumb to prevent the air escaping. The sensation produced in the ear is similar to that caused by Valsalva's inflation, but more marked. Instead of swallowing water, the nasopharynx may be shut off by the patient whistling or uttering a guttural sound, such as "huck." In children it is unnecessary, as the eustachian tube is more patent. A similar method is sometimes used: the patient is told to puff out the cheeks with air and when they are sufficiently distended, the bag is compressed.

A eustachian catheter should not be more than 4 1/2 inches long, and it is most convenient to use one with a diameter of small size. While introducing it the surgeon should stand at the patient's right side with the catheter held lightly between the thumb and index-finger of his right hand, the beak or curved end pointing downward, and allow it to slip through the nostril until it touches the posterior wall of the nasopharynx. It should then be withdrawn 1/2 of an inch, and the beak turned outward and sometimes slightly upward, when it will be found to be in the orifice of the eustachian tube.

As the dimensions of the nostrils vary considerably, owing to deviations of the septum, cartilaginous and bony spurs, and other abnormal conditions there is no fixed rule for the position of the catheter during its passage. It often passes best if the beak is directed horizontally outward beneath the inferior turbinated bone as soon as it is well within the nostril, turning it down again a little as it goes through the choana. A catheter should always be passed with the greatest gentleness, and in many instances it is best to allow it to find its own way. Should it be impossible to reach the tube through one nostril, the curve of the instrument must be increased, and an attempt made to do so through the other. If the catheter is drawn backward by muscular contraction when the beak is turned outward in the nasopharynx, it is an indication that it is behind the posterior lip of the eustachian orifice. A special catheter with a distinguishing mark should be kept for syphilitic cases. If a nostril is extremely sensitive, it may be sponged with a 4 percent solution of cocain. As soon as the catheter is in position, the little and the ring-finger of the left hand should be placed one on each side of the patient's nose, the palm of the hand being downward and forward, and the outer end of the instrument grasped between the thumb and index-finger. By this means the catheter is held firmly, and the hand at the same time well supported against the patient's face. The nozzle of the air-bag should now be introduced, and the thumb and index-finger of the left hand slipped forward to hold it in place. Air is then forced into the tympanum by compressing the air-bag. Many aurists prefer a modification of Politzer's bag, having a piece of tubing between the air reservoir

and the nozzle, which prevents the movement of the bag being communicated to the catheter.

For **examining the membrana tympani** many kinds of speculums are used, the simplest consisting of a funnel of metal or vulcanite; another (Brunton's), of a metal funnel with a lens at the opposite end and an aperture at the side for the admission of light. For using the former, daylight may suffice; but for the latter, artificial illumination is necessary. The focus for a Brunton's speculum should be 3/4 of an inch from the end when the center of the cap containing the lens is level with the larger extremity of the speculum. Siegle's



Air-bag with Nozzle to Fit a Catheter.
Suitable also for Politzer's inflation, with a teat slipped into it.

speculum allows the operator to see the movement of the drum under pneumatic pressure.

Before the speculum is introduced, any abnormal condition of the outer part of the ear should be noted, and the auricle raised upward and backward in order to straighten the canal. A healthy membrane is of a bluish-gray color, and is placed obliquely across the canal, its upper and posterior parts being more external than the lower and anterior. Passing downward and backward and a little inward, nearer the anterior than the posterior edge of the membrane, is a whitish ridge—the handle of the malleus; and passing forward and downward from its lower extremity, which is slightly enlarged, and situated just below the center of the membrane, is a triangular glistening surface called the *cone of light*, having its base toward the periphery. At the upper part of the handle of the malleus is a white projection—the short process of the malleus; and stretching backward and forward from the short process to the edge of the membrane are two slight ridges, the anterior and the posterior folds, the latter being the more clearly defined. Above these folds the membrana propria is absent, the part being called Shrapnell's membrane. Not infrequently a whitish line, showing the position of the long process of the incus, is seen behind, internal and parallel to the upper part of the handle of the malleus. Occasionally, the outer part of the stapes can be distinguished. After the position, color, degree of transparency, and any abnormal condition of the membrane that may exist have been carefully noted, the nares, pharynx and nasopharynx should be examined.

ECBOLICS.—See Emmenagogs; Oxytocics.

ECCHYMOSIS.—See Bruise.

ECLAMPSIA, NATURE AND CAUSATION.—At the present day eclampsia may be considered as merely an important detail of the general toxemia of pregnancy, which is expressed by a great variety of symptoms, including convulsive seizures. There is no room here for the discussion of the general autotoxic state upon which eclampsia develops. Moreover the mere subject of gestational convulsions as a general proposition is far from coinciding with that of puerperal eclampsia in the restricted sense.

Literally speaking, puerperal eclampsia should denote convulsive seizures which develop suddenly during the puerperium. As a matter of fact, however, only a minority of cases develop after delivery and these are of a milder type. Delivery, in fact, instead of precipitating convulsions is often the best guarantee of their prevention or mitigation. The great majority of cases develop after labor has begun, while a small percentage appear in advance of labor. When they occur well in advance of labor and cause death of the fetus they are decidedly atypical. Hence for the term puerperal, as used to designate eclampsia, we should substitute some other term, such as parturient or tocogenic.

The toxemia of pregnancy may develop at any period of gestation, and seems much more likely to develop in the earlier or later months than midway between the two. Whether expressed clinically by incoercible vomiting or acute yellow atrophy of the liver or other severe malady, terminal convulsions may appear. These while due to an autotoxic state allied to or identical with that producing tocogenic eclampsia, show wide clinical departures from the latter condition. Epileptic women have seizures during pregnancy, while the latter condition is quite likely to aggravate hysteria, and sometimes major hysterical convulsions are set up. If a woman develops simple acute nephritis in pregnancy, true uremic convulsions may develop, with an inevitably fatal outcome; and it is manifestly impracticable if not impossible to separate such cases from convulsions due to the autotoxic state of pregnancy. Cases of this sort develop with equal readiness at any time during pregnancy. Women already victims of chronic nephritis when they become pregnant seem almost immune from uremic seizures during pregnancy and the puerperium, but often become distinctly worse after the puerperium is past. If we restrict our conception of eclampsia to purely tocogenic cases, it is very evident that those forms of convulsive seizures just alluded to may be left out of consideration almost entirely. Neither true uremia, epilepsy, major hysterical crisis, acute yellow atrophy, incoercible vomiting is likely to develop or become critical during the short interval consumed by labor and the week or so preceding and following it. By thus narrowing our conception we can deal

with a distinct clinical entity having a definite incidence, symptoms, prognosis and indications for treatment and prophylaxis. **Tocogenic eclampsia** may be defined as a series of epileptiform convulsive seizures developing during or near (before or after) labor, often without prodromes, with a tendency to improve after emptying the uterus. In practically all cases oliguria coexists, often complete anuria; and in the great majority of cases there are albuminuria and formed elements from the kidneys. As recovery occurs these urinary abnormalities are rapidly corrected. In fatal cases the great majority show structural changes, but these are neither of a single type nor are they definitely related to the severity of the clinical phenomena. In the few cases subjected to surgical intervention on the kidneys, the latter have been found either pale and anemic or distended and gorged with blood. In the latter type, despite the severity of the symptoms and extreme oliguria, recovery is still possible.

The above brief outline shows us to what extent this clinical type of disease is dependent on the act of labor itself, and shows us why (with full subscription to the belief in a general autotoxic state as the predisposing cause of eclampsia) we should never lose sight of the fact that labor is the great exciting cause. Since we do not yet know just what brings on labor itself we cannot explain why eclampsia may sometimes develop ahead of labor.

In regard to the exact relationship between the autotoxic state of pregnancy and eclamptic seizures, we can only discuss in this connection the so-called preeclamptic state which is often very markedly in evidence for a considerable period before the convulsions develop or in other words before term. Since this condition in rare instances may exist without convulsions, and since the latter frequently develop without evidence of the preeclamptic state, we are unable to state whether the latter is a direct cause or only an accompaniment of the eclampsia. No doubt both are late manifestations of the toxemia of pregnancy, called forth by approaching or actual delivery. In regard to the nature of the toxic substances involved, the latter are evidently manifold in character and may differ notably from those active in early gestation. We naturally accuse either the fetus itself or the decidual structures which have now attained the acme of their development and have become entirely foreign to the maternal organism. But aside from this biologic cause, a more tangible element is present in mere mechanical hindrance to the natural disinteresting action of the intestine and great intestinal glands. From a third point of view we must consider the steady increase of nervous instability under the influence of gestation. If space served, abundant evidence could be cited to show that any one of these three predisposing factors may play a prominent part in eclampsia. That the poison of pregnancy has a neurotoxic action which renders a patient convulsible, well appears from the analogy of uremia, in which convulsions are preceded by marked nervous irritability. Individual cases of eclampsia seem determined by excessive distention of the uterus by pressure upon the ureters with urostasis, by stercoremia from obstipation, etc. The prompt relief which follows emptying of the uterus even in the absence of overdistention and pressure symptoms indicates the possibility of an intrauterine source of the poisoning. In the present state of our knowledge we are forced to conclude that a number of factors are cooperative in determining eclampsia, and that these may differ somewhat in individual cases. In fact, no one can at present disprove the claim that certain fatal cases are examples of pure uremia, however much we may disbelieve such a view. Beginners in medicine and those whose practice has comprised uremic and not eclampsia cases are hard to convince that the latter is not uremia secondary to acute nephritis or an acute exacerbation of chronic nephritis, especially in cases which with inevitably fatal ending present lesions of old or recent nephritis. The most valid answer to this objection is that while nephritis terminating in uremia is essentially a fatal malady, not necessarily during the attack, but within a short interval, eclampsia terminates much oftener in recovery than death, the patient usually making a permanent recovery. When eclampsia ends fatally, it ends thus during the paroxysm. In a uremic crisis the case may for the time being yield to treatment, but another crises should soon develop. In a state of nephritis it is a matter of record that labor does not precipitate a paroxysm of uremic convulsions. Nevertheless with all these reservations there is doubtless a certain number of cases of so-called clinical puerperal eclampsia which are really uremic. It is a problem not as yet much investigated as to whether a hysterical or psychogenic element can be involved in certain cases of eclampsia. Tocogenic eclampsia is a rare affection and analysis of large material shows that about one case occurs in five hundred or less. Nevertheless it occurs at times in groups, and a village physician who has practised for years without having seen a single case may be called on to treat several in close succession. In some localities it seems common enough to be dreaded by pregnant women. The same bunching of cases is sometimes seen in maternity hospitals. Primiparæ are slightly more disposed to it than multiparæ, elderly than young primiparæ, women with narrow pelves than other women, etc. One attack does not predispose to another in the next pregnancy, although attacks are in rare instances thus repeated. It is hardly correct to state unconditionally that eclampsia is peculiar to the calendar end of gestation, but when it occurs ahead of this period it almost always produces or is followed by premature labor, and it is impossible to prove that the labor is solely determined by the eclampsia.

Symptomatology.—In a small proportion of cases the paroxysm occurs without prodromes; without a preeclamptic state. The fact that a patient nearly at term should present edema of the limbs and a trace of albuminuria cannot be brought into any relationship with a prodromal stage, as it is of very common occurrence. Most attacks come on without warning, usually after labor has

begun. The oliguria, often so valuable an aid to warding off an attack, may not be in evidence until the convulsions have appeared. This fact furnishes one of the best proofs that most cases cannot be dependent on a gradual or sudden suppression of urine.

When as usually happens there is a preeclamptic stage, regarded at the present day as a phase of the autotoxemia of pregnancy, the symptoms are as follows: oliguria develops, and this lessening of the twenty-four amount of urine is a far more trustworthy symptom than any mere quantitative alteration in the urea eliminated. If the amount of water excreted is within normal limits, research of the amount of urea may be neglected. Conversely, if with scanty urine there is a fair elimination of urea, too much reliance should not be placed on the latter finding. Oliguria for a single day need not possess great significance, but persistent scantiness of urine is a symptom to be feared. The presence of a slight amount of albumin in the urine is not absolutely a warning of trouble, for this might be accounted for exceptionally by mere passive congestion of the kidneys, pyelitis, cystitis, etc. But the presence of casts naturally possesses much significance. A few words should be devoted to "pregnancy-kidney" so-called, a local condition due to the general toxemia of pregnancy which usually coexists with or precedes eclampsia. The latter may occur at term without pregnancy-kidney, while this lesion is not necessarily followed by eclampsia. But whenever a patient presents oliguria, with a considerable amount of albumin in the urine and formed elements from the kidney we may feel certain that a pregnancy-kidney is present. In the large percentage of eclampsia cases which recover, we may be sure that a pregnancy-kidney has been present, which has undergone rapid resolution. The pathologic condition in pregnancy-kidney has generally been regarded as essentially an acute fatty infiltration or perhaps degeneration of the renal parenchyma. But these findings appear to shade gradually into actual nephritis. Intense congestion is sometimes coexistent, so that the kidneys instead of being pale and flabby are greatly distended (so-called glaucoma of the kidney). Evidences of recent and old nephritis are sometimes found at autopsy, and it is these cases which furnish a presumption that the toxic state is sometimes simple uremia. In the great majority of cases of eclampsia, however, the toxic state of pregnancy precedes the renal lesion, but the latter sets up a vicious circle. The more the parenchyma of the kidney is involved the more likely are we to see marked oliguria with compensatory anasarca. The retinitis which develops at times does not belong to the ordinary syndrome of the toxemia of pregnancy and is very likely due to retention of urinary excreta. But unlike the retinitis of uremia it is not an irrecoverable affection, but usually disappears after delivery. It is usually an indication for quickly terminating pregnancy, for in some cases it may end in total blindness. Detachment of the retina may also occur. When the preeclamptic stage is well marked we see a syndrome not unlike that of uremia. This is present in perhaps a fourth of all cases. Among the leading symptoms are headache, high blood pressure, nausea and vomiting and cortical disturbances, the latter including at times restlessness, vertigo, insomnia, stupor, etc. Epigastric pain is sometimes complained of. Ocular disturbances, such as amblyopia, do not invariably imply acutal retinitis. Generally speaking a condition of restlessness and motor and mental excitation leads naturally up to a convulsive paroxysm. In rare instances there may be either a primary stuporous stage, or one secondary to a stage of cortical irritation, without any convulsive paroxysm. This is the so-called "eclampsia without eclampsia," which also occurs in uremia. In such cases coma is an equivalent of eclampsia and demands precisely the same radical treatment in order to save life. The eclampsia paroxysm usually occurs after labor has begun. It appears that labor itself is often necessary for its genesis, and we know that the most perilous periods for the gravida are the first or second month and at or near term.

The convulsive paroxysm is epileptic in character. Exceptionally an aura may be present. The gravida assumes a staring look and the pupil dilates. A stage of tonic contraction is by no means commonly present. When it does occur it is noted in isolated muscles only, as those of the neck or calves, which may be thrown in a tetanoid spastic state. As a rule, paroxysms begin with clonic twitchings of the face muscles, passing rapidly to the upper extremity, trunk and lower extremity in this order. The contractions of the respiratory muscles arrest respiration and cyanosis develops. The face becomes purple and foam appears at the lips, which is mixed with blood if the tongue is bitten. With the onset of convulsions consciousness is lost. The condition of cyanosis is probably responsible for the cessation of the attack which, however, abates gradually, the convulsions becoming progressively weaker after the acme is reached and as respiration is resumed. The patient passes into a comatose state and the entire musculature relaxes. Consciousness is soon regained and muscular soreness is complained of. In rare cases eclampsia is restricted to a single paroxysm. The duration of the initial attack is seldom long—from a few seconds to a minute.

In the vast majority of cases eclampsia consists of serial attacks, the intermissions varying considerably in length with the case. There is a general tendency for succeeding attacks to become progressively worse, with a shortening of the interval. Serious results due to the repeated convulsions soon become apparent. The patient is no longer able to regain consciousness and lies in a state of protracted coma. The temperature mounts steadily until it reaches 104° F. and upward. Attacks may be repeated until 10 to 20 or more have occurred, but in very many cases, fatal and otherwise, the number is by no means large. Individual attacks are determined in some cases by outside

influences. A labor pain, as might be expected, often provokes an attack; but the latter may be determined even by a digital examination or passage of a catheter, or any experience which acts upon one of the special senses or general sensibility.

The tension of the pulse during serial attacks of eclampsia is a notable phenomenon. During the paroxysms the pulse may be almost imperceptible. Much has been written with a view of proving that high tension is the principal manifestation of the diseased state and that it is an essential prodrome of the condition and the leading indication for prophylaxis and treatment. Like nearly all generalizations set up for this affection, it will not hold water. During the preeclamptic condition, however, the pulse is notably hard and tense.

To come now to the urine: Despite all that has been written of the pregnancy-kidney as a forerunner of eclampsia, along with evidences of metabolic irregularities, it is none the less true that in very many cases the urinary syndrome may be seen only too plainly as a result of the serial attacks of convulsions. With the progress of the convulsions the urine is often seen to be rapidly reduced in quantity, until at times complete anuria results. At the outset the urine may contain a little albumin or perhaps none at all. But as the convulsions increase the quantity of albumin actually increases, at least relative to the bulk of the urine. This seems to denote clearly that a vicious circle is usually present. With the advance of oliguria and albuminuria the formed elements of the urine increase. They comprise hyaline and epithelial casts, renal epithelia in fatty degeneration, and red and white blood-corpuscles. See Phenolsulphonephthalein Test.

It is a noted peculiarity of eclampsia that it has no tendency whatever to arrest labor. In fact, the pains often seem to be increased in frequency and vigor, as if nature were seeking to empty the uterus as rapidly as possible.

If the patient recovers, the convulsions become less frequent and severe, the comatose state clears up, and the amount of urine is increased, perhaps suddenly. Death may occur in several ways. In the majority of cases, the patient being in deep coma, death would be attributed to that cause; but in most of these cases acute pulmonary edema seems to lead to arrest of respiration. Less frequently death occurs during a convulsion from spasmodic arrest of respiration. In a few cases death comes about from central hemorrhage or other accidental cause.

Diagnosis.—If we restrict the notion of eclampsia to tocogenic convulsions only, any question of differential diagnosis can hardly arise. There is no other kind of epileptiform convulsion which is precipitated by labor. An epileptic woman would scarcely have a paroxysm under such circumstances, although it is conceivable, especially in an illegitimate pregnancy that hysterical convulsions could occur at that time. They should be rapidly excluded by the retention of consciousness during the attack and the demonstration of the sensory stigmata of hysteria.

To attempt to exclude uremia, or some form of pregnancy toxemia in which the kidneys function normally, is hardly practicable. A patient with chronic nephritis will almost never develop uremia just as delivery begins; while acute nephritis in pregnancy with suppression of urine and convulsions cannot possibly be differentiated clinically from ordinary eclampsia when seen for the first time. We can only differentiate by following up the case after delivery. An accidental nephritis is not benefited by delivery, but becomes worse. This is also the case with convulsions due to hepatitis and acute yellow atrophy of the liver. In the great majority of cases these patients die long before term. When we see tocogenic convulsions with normal urine we may assume that severe lesions of the liver are present. The entire subject of atypical eclampsia, due to accidentally acquired nephritis, or to destructive lesions of the liver, needs to be studied anew on a clinical and pathologic basis. This is also true of "eclampsia without convulsions."

Prognosis.—It is estimated that 20 percent of mothers who develop eclampsia die during the attack. In individual statistics the mortality may be much higher. It is conceivable that there may be a clinical type with natural tendency to recovery and others with the reverse, but at present we cannot separate the two. While most women make a clean recovery, others are left badly off, hemiplegic, blind or insane as a result of intracranial mischief due directly to the convulsions. In others, organic disease of the kidneys and liver persists and the patients inevitably perish. In cases which do not develop until after delivery the prognosis is much more favorable, but fatal results may ensue. In rare cases which develop well in advance of term, and which technically do not come under tocogenic eclampsia, the immature or premature fetus usually dies *in utero;* and whether or not miscarriage or premature delivery is set up, mere death of the fetus is often conservative for the mother, the convulsions ceasing and albuminuria clearing up. Cases have occurred in which normal expulsion of a dead fetus occurred at term. But these atypical cases need further study. An important point in prognosis is this: If a woman develop convulsions with the onset of a labor of average or prolonged duration, the prognosis is worse than when convulsions appear toward the close of labor; and this is eminently true for the child.

Nearly 50 percent of children die during eclampsia, although under intelligent and active treatment this number may be almost cut in two. Death of the child is due in part to asphyxia from the state of the maternal blood, and may result during the first or any subsequent convulsion. The belief is growing to-day, however, that the infant undergoes the same specific poisoning as the mother. Fetal rigor mortis and convulsions of the newly-born children occur frequently enough to give color to this view. Those who attach the greatest importance to the tension of the blood, and perhaps all clinicians irrespective of theory, regard the pulse as possessing great prognostic value. As long as this continues slow and full

between convulsions there is hope for the patient; if quick and feeble the outlook is bad.

Prophylaxis of eclampsia consists in the recognition and management of the pregnancy-kidney when that condition exists. In the large proportion of cases in which no pregnancy-kidney develops we can proceed as if it were present, although we cannot feel certain that we have headed off eclampsia in a given case. If a high tension pulse is present irrespective of urinary symptoms we can proceed against this condition. But if there are any symptoms pointing to toxemia of pregnancy, as headache, nausea, anorexia, epigastric tenderness, etc., with evidences of intracranial disorder, especially if this syndrome is associated with pregnancy-kidney or urinary anomalies of any sort and high tension pulse, rapid emptying of the uterus is imperative.

Whenever there is constant lessening of the twenty-four hour amount of urine coupled with anasarca and urinary evidences of a renal lesion, and antiuremic regimen should at once be instituted; the quantity of nitrogenous food ingested being reduced to a minimum, and a general depurative treatment being instituted by the use of purgative, diuretics and diaphoretics. The diet should be mild, combining diuresis with the necessary restriction in nitrogen. Some drastic purgative should be given daily at bedtime with a mild saline in the morning. As the bowels are prone to obstipation near term there is a considerable tolerance for purgatives, the patient being able to take one or two compound cathartic pills at night. Another method consists in giving a mixture of calomel, squills and digitalis for its combined diuretic and purgative effect. For the high tension pulse nitroglycerin may be given *pro re nata;* it behaves also as a diuretic. For a more sustained action on the pulse, some of the nitrites may be used. For diaphoresis the warm bath or pack is useful with the emergency use of a hot air cabinet bath. In connection with purgatives high colonic irrigation is often indicated, especially if the urine contains any of the products of intestinal putrefaction as shown by increased amount of indican.

By persisting in this regimen we can at least offset the effects of pregnancy-kidney and intestinal autointoxication. Whether we really prevent eclampsia in a given case cannot be told but doubtless eclampsia very seldom develops when this regimen is employed.

If the woman seems perfectly well as term approaches, to what extent ought we to give her the benefit of an antieclamptic regimen? We doubtless owe it to her to regulate her diet by giving it a low nitrogen value, but not all toxic substances which form in pregnancy are nitrogenous. Some are probably of carbohydrate origin, such as are believed to cause diabetic coma. Such a non-nitrogenous diet might give a false idea of safety and perhaps be overdone. While induction of labor and prompt emptying of the uterus is to a certain extent a prophylactic measure, it is best considered under the head of treatment. In cases in which labor is induced in advance of convulsions, we are not dealing with tocogenic convulsions, but with those forms of the toxemia of pregnancy which develop during gestation, as acute yellow atrophy and incoercible vomiting of pregnancy. It must be admitted that despite its theoretical value this resource is seldom successful unless practised at the earliest possible moment.

Treatment.—A woman in labor having suddenly been seized with convulsions, it is commonly assumed that labor must first be terminated to fulfil the main causal indication of getting rid at once of the source of the poison and the leading peripheral irritation which provokes the convulsions. When the convulsions are sufficiently frequent and violent it will be necessary to suppress them at any price in order to prevent their disastrous secondary effects. To institute a disintoxicating or eliminative treatment is also eminently logical, but there are differences of opinion as to the extent and order of procedure. The older procedure was to leave labor largely to nature, at most hastening the second and third stages by forceps and manual extraction of placenta, while a vigorous antitoxic and anticonvulsive program was being carried out. A more modern view is to empty the uterus by doing away with the delay of the first stage, and to apply other measures subsequently. But since even with the most rapid delivery followed by vigorous eliminative treatment, women succumb from the intoxication who might have been saved by more prompt disintoxication, the most rational course appears to be to institute both measures at the outset. In regard to control of convulsions the question also arises "May these also be prevented?" That is, after the first convulsion can the woman be placed in a state in which these will be reduced in number and frequency without prejudice to other indications? Chloroform given in connection with operative emptying of the uterus also antagonizes the convulsions. If, however, the case is not severe enough for such emergency measures, as when convulsions do not develop until after the first stage, or during the puerperium, veratrum viride may be sufficient to control them. This is especially true of cases with rapid high tension pulse, because veratrum appears to act by reducing the pulse rate. A patient with a pulse of 60 ° seldom has a convulsion. If veratrum fails or if the pulse does not furnish an indication for giving it, then chloral is probably the best antispasmodic and may be given either by the mouth or rectum. Morphin is not looked upon with favor, and in fact with all narcotics, hypnotics and most motor depressants we have to bear in mind that in theory at least they seem to favor the development of the dreaded comatose state, which while apparently due largely to the frequency and violence of the convulsions may sometimes develop after few and mild convulsions, or even after no convulsive stage. We should therefore abandon all idea of stupefying a patient in advance to head off convulsions, and give just enough drugs to diminish their number and severity. Whenever they can be controlled indirectly, therefore, this is a de-

cided advantage. Veratrum does this to a certain extent through correcting the circulation. An ice-bag to the nape of the neck is often useful. Also, whenever this is possible, the patient should be left in a state of passivity, noises and other happenings which affect all the peripheral sensory nerve organs being excluded. These measures are of course indicated when the uterus is empty.

To go back to disintoxicating measures, in a severe case beginning at once after labor, shall we proceed to empty the uterus or shall we first practise rapid eliminative procedures, or may the two be conjoined? Much depends on the surroundings and the experience of the obstetrician. In an institution a woman may be given a hot air bath, hypodermoclysis, and enteroclysis; while an oxygen tank is always at hand. In this way all the emunctories will be started up promptly and at once and the disintoxicating action of the oxygen will be available. In private practice slower and milder measures must be substituted, such as hot packs, hot drinks, etc., with a drop or two of croton oil or a large dose of saline, and dry cupping over the kidneys—all of which measures will of course be useful as adjuncts in institutional cases. The high rectal irrigation may also be used. In private practice nitroglycerin hypodermically is a valuable resource. Pilocarpin, however, is of very questionable value, and is believed to favor pulmonary edema, which is the actual cause of so many deaths. If the pulse, as sometimes happens in the gravest cases, is poor between convulsions, the indications demand in addition to oxygen, hypodermoclysis and nitroglycerin—the use of alcoholics, and even strychnin is not contraindicated if the uterus is empty.

In a certain number of cases the chief indication seems to lie in the state of the kidneys. This results from the operation of the "vicious circle," in which with extensive primary involvement of the organ the latter is entirely unable to exert its function. In these cases the kidneys are gorged with blood, and the complete retention of urotoxic substances greatly aggravates the number and severity of the convulsions. Hence in very recent years a rational procedure has been applied directly to the kidney, either as a substitute for rapid delivery or as a sequence to delivery. This is decapsulation of the organ which relieves the intense engorgement and is followed as a rule by free secretion of urine and diminution of the convulsions with ultimate recovery. Numerous successful cases are upon record. The chief criticism of this operation is that it is impossible to decide in advance whether the kidney is in this engorged state. Upon cutting down it will be found half the time that the organ is pale and flabby, and in these cases the operation has not only failed to save life, but has displaced other possible life-saving measures. Cases of so-called "glaucoma of the kidney" in which the operation succeeds, recover under other measures and even spontaneously, and decapsulation has therefore no sound theoretical foundation. This is the view of Edgar.

There now remains for consideration the method of emptying the uterus. Any consideration which involves saving the child when the mother is attacked early in labor is of minor importance if not altogether negligible as such. But whatever tends to save the mother's life will invariably favor that of the child. After the os is dilated it is a simple matter to extract with forceps. If the os is undilated, we have the alternative of cesarean section in some form and overcoming the resistance of the cervix. The former, once thought to be contraindicated, is now coming more into use especially as vaginal cesarean section. On the other hand, in overcoming the resistance of the cervix, slow forms of mechanical dilatation have given way to rapid manual and instrumental procedures and to deep incisions. The two methods therefore converge, and incisions combined with rapid digital dilatation fill the indication as promptly and with less risk than does typical vaginal cesarean section, and form a method much better adapted to routine use in the hands of the general practitioner. If as often happens convulsions develop before labor sets in, labor pains almost immediately ensue. Should this occur while the fetus is prematurely developed, and the uterus not ready for expulsion the outlook is especially unfavorable. The fetus is more likely to succumb quickly and its death has often a salutary influence on the mother. So far as we know, however, no one would feel justified in destroying the fetus. It is here if at all that an abdominal or vaginal cesarean section would seem indicated on account of the unpreparedness of the uterus for expulsion.

ECSTASY.—By this term is meant a peculiar state of the mind in which a delusion so governs the mental functions that the whole nervous system is held in a condition of subjection or insensibility.

ECTHYMA.—The term ecthyma is applied to an eruption characterized by discrete, flat, deep-seated pustules with broad inflammatory bases. Many dermatologists no longer regard ecthyma as a distinct disease, but rather as a form of dermic pus-infection.

Symptoms.—The lesions, which are usually situated upon the legs, begin as small, pea-sized pustules that rapidly increase until the size of a dime is attained. They are discrete, flat, and surrounded by a markedly reddened and often infiltrated zone. When ruptures take place, an irregular yellowish or brownish crust is formed, beneath which suppuration goes on. Pigmentation or superficial scarring may persist after the disappearance of the lesions.

Etiology and Pathology.—Debility, bad food, and improper hygiene are said to play an important predisposing rôle. The eruption attacks adults rather than children. The exciting cause is, in all probability, the introduction of a micro-organism into the cutaneous follicular openings. It is evident that scratching would greatly facilitate such an inoculation.

Diagnosis.—Ecthyma is to be differentiated from contagious impetigo, pustular eczema, and the large, flat, pustular syphiloderm.

Ecthyma.	Impetigo Contagiosa.
1. Seat of predilection, the legs.	1. Face and hands.
2. Primarily pustular.	2. Primarily vesicular.
3. Pustules deep.	3. Pustules superficial.
4. Marked inflammatory areola.	4. No inflammatory areola.
5. More common in adults.	5. More common in children.
6. Noncontagious.	6. Contagious.

Ecthyma.	Pustular Eczema.
1. Seat of predilection, the legs.	1. Indefinite localization.
2. Pustules discrete.	2. Grouped, often coalescing.
3. Pustules large and flat.	3. Small and rounded or acuminate.
4. Red and infiltrated areola.	4. No inflammatory areola.
5. More common in adults.	5. More common in children.

Ecthyma may be distinguished from the pustular syphiloderm by the more inflammatory character of the lesions, the absence of true ulceration, the distribution of the lesions, and the absence of other signs of syphilis.

Prognosis.—The affection responds promptly to treatment.

Treatment.—Tonics, good food, and improved hygiene are to be advised. The local treatment consists in the removal of the crusts and the application of an ointment such as the following:

℞. Ammoniated mercury,	gr. xxx
Zinc oxid ointment,	℥ j.

ECTOPIC GESTATION.—See Extrauterine Pregnancy.

ECTOPIC KIDNEY.—See Kidney, Movable.

ECTROPION.—See Eyelids.

ECZEMA (Tetter; Salt Rheum). Definition.—Eczema is an acute, subacute, or chronic, noncontagious, inflammatory disease of the skin, characterized primarily by erythema, vesicles, papules, or pustules, and, secondarily, by scales and crusts, and accompanied by itching and burning. The various forms of eczema constitute about 30 percent of all skin-diseases.

Symptoms.—There are 4 elementary types of eczema. *Eczema erythematosum, eczema papulosum, eczema vesiculosum,* and *eczema pustulosum.* These may remain as such throughout their entire course, or may merely represent stages in the development of an *eczema rubrum* or *eczema squamosum.*

Eczema Erythematosum.—This variety of eczema is encountered most frequently upon the face and the genitalia, but may occur upon any portion of the cutaneous surface. It begins as vaguely defined bright or dull red spots, which soon coalesce and form diffuse areas. The skin is roughened and slightly infiltrated. When the region about the eyes is involved, there is marked edema that results in an entire closing of the lids. The eruption is accompanied by considerable heat and itching. Convalescence is indicated by a fading of the color, by a branny desquamation, and by the occurrence of islets of sound skin. This form of eczema usually runs a chronic course. It may remain erythematous or develop into a squamous eczema or into eczema rubrum.

Eczema Papulosum.—Papular eczema involves, with predilection, the arms and legs. It is characterized by pinhead-sized, round or acuminate, reddish elevations, either discrete or closely aggregated. They are often surmounted by minute vesicles. The papules are intensely itchy—a fact which is evidenced by their abraded summits and by the scratch-marks. The eruption tends to relapse, and is often obstinately refractory to treatment.

Eczema Vesiculosum.—The onset of a vesicular eczema is heralded by tingling and a feeling of heat. Soon there develop, upon an erythematous and swollen base, numerous pinhead-sized vesicles, which rapidly become confluent and rupture, permitting the escape of a viscid and sticky serum. The drying of this exudation produces yellow, gummy crusts. The rupture of the vesicles is followed by an abatement of the subjective phenomena. Beneath the crusts the serous exudation continues. The body-linen is stained and stiffened by this constant oozing or weeping.

The course is chronic, with tendency to recurrence. Convalescence begins with a cessation of the serous discharge.

The eruption is common upon the faces of infants, in which locality it has been designated *milk-crust* by the older writers.

Vesicular eczema is very likely to terminate in an eczema rubrum.

Eczema Pustulosum (*Eczema Impetiginosum*).—Pustular eczema may begin as such or may develop from the vesicular variety. It occurs most commonly upon the face and scalp of strumous and poorly nourished children. Rupture of the pustules is followed by the formation of profuse yellowish, brownish, or greenish crusts. The itching is less than in the other forms of eczema.

Eczema Rubrum.—Eczema rubrum represents a later stage of one of the elementary varieties of eczema. It is characterized by redness, swelling, infiltration, and moisture, and is usually attended by much burning. The epithelial covering of the cuticle is lost. Profuse crusting results from the drying of the exudation. When it presents a raw, weeping surface, it is designated *eczema madidans.* It is most frequently situated upon the legs of adults and the faces of infants.

Eczema Squamosum.—This is the terminal stage of the foregoing types of eczema. In it a regeneration of the corneous layer of the epidermis takes place. It is characterized by redness, infiltration, and desquamation. It is often associated with the erythematous variety. In the neighborhood of joints the thickened skin is likely to become fissured. Some writers include under the name of squamous eczema the horny, hard, and infiltrated variety.

Eczema Fissum is characterized by the occurrence of fissures or cracks. Chapping is a mild example of this form.

Eczema Sclerosum is characterized by a leathery infiltration of the skin.

In **Eczema Verrucosum** the papillæ become hypertrophied, giving rise to a warty surface. When the papillary hypertrophy is still greater, a papillomatous condition results—**Eczema Papillomatosum.**

Eczema is also designated as *acute* and *chronic.* These terms refer not only to duration, but also to the intensity of the inflammatory process. An eczema may last a long time and yet be acute in character. Infiltration is the chief characteristic of a chronic eczema.

Etiology.—The causes of eczema are both *internal* and *external. Internal* causes include in their category: Disorders of the alimentary canal (dyspepsia, constipation, intestinal autointoxication, etc.), functional and organic nerve affections, general debility, rheumatism, uric acid diathesis, Bright's disease, diabetes, affections of the uterus and appendages, dentition, and scrofula. These may at times act as predisposing causes, at other times as exciting causes.

The number of *external* causes is legion. They may be classified as follows:

1. Chemic irritants—acids, strong soaps (containing excess of alkali), dye-stuffs, etc.
2. Thermal irritants—solar or artificial heat, cold (particularly when associated with wet), etc.
3. Mechanic irritants—friction of skin surfaces or of clothes, pressure, animal parasites, scratching, etc.

In a predisposed individual the application of any irritant may be sufficient to call forth an eczema.

Diagnosis.—The diagnosis of eczema is, as a rule, easy. The most distinctive features are:

1. Serous exudation.
2. The gradual merging of the patches into the surrounding healthy skin.
3. Polymorphism of the lesions.
4. The symmetry of the eruption.
5. The marked itching and burning.

Vesicular eczema may be confounded with *scabies* and *herpes zoster.*

Scabies.	Vesiculopustular Eczema.
1. Characteristic distribution: webs of fingers, flexor surface of arms, axillary folds, nipples, umbilicus, penis, buttocks, and inside of thighs and legs.	1. No characteristic distribution.
2. Presence of burrows.	2. Absence of burrows.
3. Presence of itch-mite.	3. Absence of itch-mite.
4. Itching much worse at night.	4. Itching variable.
5. Communicable.	5. Not communicable.
6. Except in children, face is exempt.	6. Face frequently involved.
7. Treatment rapidly effective.	7. More refractory to treatment.
8. Other members of family often affected.	8. Not the case.

Herpes Zoster.	Vesicular Eczema.
1. Special distribution—follows lines of nerves.	1. No special distribution.
2. Eruption often preceded by intense neuralgic pain.	2. Itching and burning attend outbreak of eruption.
3. Vesicles arranged in separate groups.	3. No definite arrangement.
4. Vesicles discrete and distinct.	4. Generally confluent.
5. Vesicles large and tense.	5. Vesicles small and flaccid.
6. Vesicles do not rupture spontaneously.	6. Vesicles tend to rupture.
7. Eruption unilateral.	7. Usually symmetrical.
8. Severe shooting pains during course of affection.	8. Variable amount of itching and burning.
9. Tends toward spontaneous recovery.	9. Remains stationary or progresses.

Pustular eczema may be mistaken for impetigo contagiosa and sycosis.

Impetigo Contagiosa.	Pustular Eczema.
1. Contagious; may occur in epidemics.	1. Not contagious.
2. Begins as blebs or vesicles.	2. Begins as pustules or vesicles.
3. Lesions are discrete.	3. Tend to form patches.
4. Lesions very superficial.	4. Lesions deeper.
5. Surrounding skin not inflammatory.	5. Inflammatory areola.
6. Crusts flat and loosely attached—look as if "stuck on."	6. Crusts profuse and firmly attached.
7. Itching slight or absent.	7. Itching more severe.
8. Curable in 1 or 2 weeks.	8. More refractory to treatment.

Sycosis.	Pustular Eczema.
1. Confined to bearded region.	1. Involves other portions of face.
2. Begins in the hair follicles.	2. Begins superficially. Involves hair follicles secondarily.
3. Interfollicular skin free.	3. Skin uniformly involved.
4. Slight itching or burning.	4. Itching more marked.
5. Tendency to recur after cure.	5. No such tendency.

Eczema erythematosum may be mistaken for erysipelas.

Erysipelas.	Eczema Erythematosum.
1. Sudden onset with chill and marked constitutional symptoms.	1. No constitutional symptoms.
2. Eruption sharply marginated.	2. Fades into surrounding skin.

Erysipelas.	Eczema Erythematosum.
3. Glazed, shining surface; great edema.	3. Dull, scaly surface; slight infiltration.
4. Color, violaceous.	4. Bright or dull red.
5. Burning pain.	5. Itching more marked.
6. Occurrence of discrete vesicles or blebs.	6. Vesicles occur in patches, if at all.
7. Progressive peripheral spreading.	7. Spreading irregular.
8. Runs an acute course.	8. Course, chronic.
9. Contagious.	9. Not contagious.

Eczema squamosum may be confounded with psoriasis and ringworm.

Psoriasis.	Eczema Squamosum.
1. Predilection for elbows, knees, and scalp.	1. No seat of predilection.
2. Patches small, round, and sharply marginated.	2. Patches large, irregular, and ill defined.
3. Scales abundant, firmly attached, and mother-of-pearl in color.	3. Scales scanty, loosely attached, and grayish or yellowish in color.
4. Moisture never present.	4. Often history of antecedent moisture.
5. Itching slight, often absent.	5. Itching marked.
6. Often lasts throughout a lifetime.	6. More amenable to treatment.

Tinea Circinata (Ringworm).	Eczema Squamosum.
1. Contagious.	1. Noncontagious.
2. Patches circular.	2. Patches irregular.
3. Patches marginated.	3. Patches ill defined.
4. Patches ring-shaped; clear in center.	4. Patches not clear in center.
5. Eruption proceeds with uniform peripheral extension and central healing.	5. Irregular extension and healing.
6. Trichophyton fungus in scales.	6. Scales free from fungus.

Prognosis.—Eczema very often runs a chronic course. If untreated, it may continue indefinitely. Nearly all cases will yield, however, to judicious and persevering treatment. Factors influencing the prognosis are: (1) Type of the disease; (2) duration and extent of the eruption; (3) history of previous attacks; (4) removability of the cause or causes; (5) ability of the patient to care for himself properly.

Treatment.—The principal point in connection with the treatment of eczema is not only to recognize the disease, but fully to appreciate the stage at the time it is observed. It certainly does not require an expert dermatologist to determine whether it is acute, subacute, or chronic, and yet the general principles of treatment depend, in great part, upon an accurate determination of this question, for it will govern the external or local treatment and the agents that should be employed. In acute conditions soothing applications are demanded; in subacute, stimulating; and in chronic, more stimulating, or even irritating.

In addition to the proper recognition of the stage of the disease, an effort should always be made to discover its cause. It is necessary to fix it either as external, internal, or mixed. Then it is equally necessary to find whether it is parasitic, traumatic, or neurotic, either directly or in a reflex manner. The occupation, the habits, the food, and similar accidents will be found to add much to a proper understanding of a case as well as to a proper and clear appreciation of the functions of the various organs. It is the sum of all these factors that is absolutely necessary to arrive at a proper knowledge of the modes of treatment to apply in a given case and from which a successful result is to be expected. Having obtained this preliminary knowledge of the patient and his disease, treatment may be intelligently applied with almost certain success.

The gastrointestinal tract most frequently needs attention, as functional derangements, with autointoxication as a result, at times, will certainly act in a reflex way. The liver also frequently requires attention, more especially in the way of improving the portal circulation. It must never be forgotten, that rational treatment is always demanded and not mere haphazard. Purgatives should be carefully chosen, as well as those remedies indicated in disturbances of digestion.

Diet.—The diet in all cases of extensive eczema should be carefully regulated. Such articles as salted meats, pork, shell-fish, sugar, pastries, confections, pickles, sauces, condiments, cheese, and excess of starchy foods should be assiduously avoided. Tea and coffee should be reduced to a minimum and alcoholic beverages entirely prohibited.

Laxatives.—Laxatives are frequently necessary to keep the bowels in proper order. This is a matter of great importance.

In acute eczema it is desirable to inaugurate the treatment with free catharsis. This is best done by means of the salines, either alone or preceded by calomel.

A very useful preparation in the treatment of eczema complicated by constipation and anemia is the "acid mixture of iron." It combines the advantages of a tonic and a laxative:

℞.	Iron sulphate,	gr. xxxvj
	Magnesium sulphate,	ʒ jss
	Dilute sulphuric acid,	♏ ij
	Compound tincture of cardamom,	ʒ iij
	Water, q. s.	ʒ vj.

Tablespoonful in a tumbler of water before breakfast.

The saline waters, of which Hunyadi János is the best, are both efficient and convenient of administration.

In infantile eczema the following is efficient:

℞. Powdered rhubarb, Bicarbonate of sodium, each, ʒ j to iij
Peppermint water, ʒ iv.
Teaspoonful in water after meals.]

Or—

℞. Calomel, gr. 1/100
Castor oil, Chalk-mixture, Water, each, ♏ xv.

Stomachic Tonic and Digestives.—Stomachic tonics and digestives are required in many cases of eczema. The following formula is useful in cases suffering from atonic dyspepsia and constipation:

℞. Tincture of nux vomica, Dilute hydrochloric acid, each, ʒ ss
Compound tincture of cardamom, Fluidextract of cascara sagrada, each, ʒ j.
One teaspoonful in water after meals.

Diuretics.—Diuretics are of value both in acute and subacute eczema. The acetate, citrate, and bicarbonate of potassium, in from 10- to 20-grain doses, may be given a half hour before meals, or the alkaline mineral waters may be employed.

Alteratives.—Arsenic has but a limited field of usefulness in the treatment of eczema. It is of most value in the chronic papular and squamous varieties and in the recurrent vesicular eczemas involving the fingers. It is contraindicated in acute eczema and whenever the degree of inflammation is high.

Small doses of mercuric chlorid are sometimes of value in certain chronic thickened eczemas (Duhring).

The wine of antimony is often given with good results in the treatment of acute eczema in plethoric individuals.

Tonics.—In strumous individuals with glandular enlargement cod-liver oil is a remedy of the greatest efficacy. In anemic and chlorotic patients iron, in the form of the tincture of the chlorid, is extremely useful.

Strychnin and quinin are at times employed with great benefit in eczema.

Local Treatment.—The local treatment of eczema is perhaps the more important in the majority of cases. The selection of remedies and their strengths must be governed by the grade of inflammatory reaction present. In an acute eczema the remedies cannot be too soothing. Too strong an application works immediate injury; too weak an application can do no worse than fail to do good.

Water is an irritant in all acute and subacute eczemas, and is to be used as infrequently as is compatible with cleanliness. It may be made less irritant by the addition of bran, starch, or borax. In indolent chronic eczemas soap and water are of therapeutic value. They are useful at times, also, to remove crusts in the acute varieties. It is, however, a better plan to remove crusts by the process of softening. Pieces of flannel soaked in linseed or olive oil kept in contact with crusts for some hours will soften and loosen them; if they are very adherent, a lukewarm starch or flaxseed poultice may be applied. Pastes and salves should likewise be removed from the skin by oily and unguentous substances. Petrolatum (vaselin) or olive oil, and not soap and water, should be employed for this purpose.

Acute Eczema.—At the onset of a vesicular eczema *dusting-powders* may be used with advantage. Many substances have been employed for this purpose: wheat starch, corn-starch, rice flour, bismuth subnitrate, talcum magnesium carbonate (most absorbent), zinc oxid, boric acid, kaolin, etc. The following is a useful combination:

℞. Venetian talcum, Zinc oxid, each, ʒ ss
Starch, ʒ j.

Or, if a more astringent one is desired:

℞. Bismuth subnitrate, Boric acid, each, ʒ ij
Starch, ʒ ss.

Lotions are of paramount value in moist eczemas. They are, as a rule, borne much better than ointments. The simplest is a saturated solution of boric acid. This has been found as soothing to the skin as it is to mucous membranes. Sopped on every hour in acute eczema, it acts admirably in reducing inflammation. The calamin lotion is also a most efficacious application:

℞. Pulverized calamin, Pulverized zinc oxid, each, ʒ j to iij
Glycerin, ʒ ij
Lime-water, q. s. ad ʒ vj.
This leaves a powdery precipitate upon the skin.

A 2 percent aqueous solution of resorcin is a valuable antipruritic and antiphlogistic lotion.

When there is much itching, carbolic acid may be added to any of the above washes:

℞. Carbolic acid, ʒ ss to j
Boric acid, ʒ j
Glycerin, ʒ j
Water, q. s. ad ʒ vj.

A favorite treatment with many dermatologists is the use of the "lotio nigra" (black wash), either pure or diluted one-half with lime-water; this to be followed by the plain zinc-oxid ointment. The "liquor carbonis detergens," in the strength of 1 dram to 4 ounces, is a most useful application in papular eczema.

Its formula is as follows:

℞. Tincture of soap-bark, ʒ ix
Coal-tar, ʒ iv.
Allow to digest for 8 days and filter.

Either of the following formulas may be used with good results:

℞. Boric acid, gr. xxx
Cold cream, ℥ j.

Or—

℞. Salicylic acid, gr. x
Lassar's paste. { Starch, Zinc oxid, Petrolatum, } each, ℥ ij, ℥ ss.

A very old and efficient remedy in acute eczema is the diachylon ointment of Hebra. It must be freshly prepared, and should be applied upon strips of soft linen.

Subacute Eczema.—When the stage of acute inflammation has subsided, more stimulating applications may be used.

Carbolic acid, menthol, and the tar preparations are the most valuable antipruritics. The following formulas containing carbolic acid are useful in the subacute forms of eczema:

℞. Carbolic acid, gr. x
Pulverized starch, Zinc oxid, } each, ℥ ij
Petrolatum, ℥ ss.

Or—

℞. Carbolic acid, gr. x
Calomel, gr. xv to xxx
Zinc oxid ointment or Lassar's paste, ℥ ij.

Or the following may be employed:

℞. Resorcin, gr. xv
Menthol, gr. v to x
Zinc oxid ointment, ℥ j.

The annexed formula is particularly useful in squamous eczema:

℞. Salicylic acid, gr. xx
Lanolin, Petrolatum, } each, ℥ ss.

Chronic Eczema.—In this form of eczema strong applications are required to promote absorption of the infiltrate. Here the tar preparations find their greatest field of usefulness. They are never to be used in acute eczema, and only with caution in the subacute form. Tar is of great value in relieving the itching of obstinate papular eczemas. It may be incorporated in ointments, lotions, or paints:

℞. Oil of cade, ℥ j to ij
Zinc oxid ointment, ℥ j.

The "liquor picis alkalinus" is an excellent remedy in sluggish and thickened eczemas:

℞. Liquid pitch, ℥ ij
Caustic potash, ℥ j
Water, ℥ v.

Dissolve the potash in water and add slowly to the tar in a mortar, with friction. To be diluted 20 times or more.

In recurrent papular eczemas the following is highly recommended:

℞. Oil of cade, ℥ j
Collodion (flexible), ℥ j.

In leathery patches the pure oil of cade may be rubbed in with excellent results.

In pustular eczema the preparations of mercury are particularly valuable:

℞. Ammoniated mercury, gr. x to xxx
Zinc oxid ointment, ℥ j.

In addition to the foregoing local measures used in the treatment of eczema, *baths*, *plaster-mulls*, and *gelatin fixed dressings* are sometimes resorted to. The most frequently employed medicated baths are those containing starch, soda, borax, or bran. X-rays have been found of value in intractable chronic cases.

Staphylococcus vaccine has been injected with success in persistent pustular eczema. Cures are reported in lichenoid eczemas as a result of radium therapy.

Regional Treatment.—In the consideration of the treatment of eczema it is perhaps best to deal with the subject according to the region affected. In other words, the various regions involved and the forms of the disease that present themselves, together with appropriate local treatment, will be considered. The use of water or of soap and water to parts affected with eczema should be strictly prohibited. Exposure of diseased surfaces to the air should also be avoided. Another good rule to follow is to avoid the use of evaporating remedies, as they generally irritate; or, if irritation is intended, they are not of a sufficiently fixed nature to bring about the desired end.

In the treatment of the regional forms of eczema special therapeutic measures are indicated.

Eczema of the Head and Face.—In infants and young children this is generally crustaceous or pustulocrustaceous. Usually, the stools are greenish and frothy, indicating intestinal fermentation. Small doses of calomel and bicarbonate of sodium will readily correct this. The crusts on the scalp and face should be softened with a bland oil and separated, and an ointment applied at least twice daily.

The following is a useful formula:

℞. Carbolic acid, gr. iv
Bismuth subnitrate, ʒ jss
Cold cream, ℥ j.

Apply twice daily.

Should there be excessive or marked itching, the following may be lightly applied immediately before the ointment:

℞. Mercuric chlorid, gr. j
Ammonium chlorid, gr. ij
Carbolic acid, ℥ j
Glycerin, ℥ ij
Rose-water, q. s. ℥ vj.

For external use.

This treatment is also applicable to the erythematous, vesicular, and pustular forms of eczema of the head, face, and ears of infants.

Eczema of the scalp in adults occurs as a pustular, pustulocrustaceous, or squamous eruption, and usually the scalp about the ears and the fold between the ear and scalp are affected. In the scalp affection the hair should be cut in males. In the pustular and pustulocrustaceous forms it is of advantage to use a wash for the itching, which is intense. Of course, the crusts should first be removed. They may be softened with oil, vaselin, or warm water. A good wash for the pruritus is as follows:

℞.	Mercuric chlorid.	gr. jss
	Ammonium chlorid,	gr. iij
	Carbolic acid,	ʒ ij
	Glycerin,	ʒ ij
	Rose-water, q. s.	ʒ vj.

Apply twice a day.

An ointment to be employed after each application of the wash will be found useful in the following form:

℞.	Carbolic acid,	gr. x
	Liquid pitch,	gr. xij
	Ichthyol,	gr. x
	Bismuth subnitrate,	ʒ jss
	Cold cream,	℥ j.

Apply twice a day.

In the squamous form the scales must be removed by the aid of sapo viridis and the foregoing treatment utilized.

In eczema of the face the same treatment may be used, with the exception of the ointment, in which the liquid pitch should be omitted. In the erythematous form of facial eczema, which usually occurs in the old, and in which there is a great thickening of the skin, much difficulty is encountered in the treatment. One of the best methods is the persistent use of Hebra's diachylon ointment, made after the original formula. By combining this with the compound antipruritic solution, a good result will be obtained.

In eczema of the beard the hair of the site of the disease should be pulled out and Lassar's paste with 15 grains to the ounce of salicylic acid should be applied; or, if there is much scaling, 20 drops of oil of cade in 1 dram of olive oil.

Eczema of the eyelids is a distressing condition seen both in children and adults, the cause being either the so-called scrofulous habit, irritation from light, ametropia, or ill-fitting glasses. Proper correction of the cause and the application of benzoated oxid of zinc ointment or yellow oxid of mercury ointment (1 percent) will readily relieve the disease. A bichlorid lotion is of value.

Eczema of the auditory meatus should be treated by checking the discharge and applying diachylon ointment, or if fissures are present, silver nitrate (15 grains to the ounce).

Eczema of the arms and legs occur in all the different forms that have been mentioned, being often accompanied by edema. The treatment already outlined will be found quite efficient. Fissures, however, will occur at the bends of the elbows and knees, and in these localities it is necessary to soften the integument by means of soothing ointments before more energetic measures are employed. The fissures will readily heal, and then the appropriate measures will act. So far as the legs are concerned, it will be found that the presence of varicose ulcers, as well as of varicose veins, will prevent remedies acting, and these conditions must be treated by appropriate measures. Locally, there should then be applied the compound antipruritic solution, followed by a stimulating ointment like the following:

℞.	Carbolic acid,	gr. x
	Salicylic acid,	gr. v
	Liquid pitch,	ʒ ss
	Vaselin,	℥ j.

Apply twice a day.

Methylene-blue in 1 to 3 percent aqueous solution may be applied to the area with advantage, followed by liquid collodion.

The palms and soles offer peculiar forms of eczema, there being but little itching, but, on the other hand, a marked thickening of the skin, with the formation of deep fissures or cracks that bleed upon the slightest contact and are exceedingly painful. Washerwomen, bricklayers, bakers, and those in similar occupations are prone to this form, so far as the hands are concerned. The first step that is absolutely necessary is to abandon the occupation causing the trouble. Next, avoid all contact with water. Then procure a softening of the skin by an ointment made as follows, the strength being graded in accordance with the amount of thickening present:

℞.	Salicylic acid,	gr. xx
	Green soap,	gr. x
	Benzoated lard, Cold cream, each,	℥ j.

Apply well twice daily.

This will soon bring about a desquamation, and then a mild ointment can be profitably employed. It may be necessary to repeat these measures once or twice, but final success will follow their use.

Eczema of the nails frequently occurs in connection with eczema of the hands or feet. A thickening occurs, often accompanied by brittleness, fissuring, or ridges on the nail. The nails are rugous and are very often deformed. While the assiduous application of a soothing ointment will do some good, the internal administration of a phosphorus pill (1/50 of a grain) *during* each meal will greatly aid the local treatment. The fissures, which occur at the ends of the fingers and toes, will also be greatly aided by this treatment. The thickening of the skin at the extremities of the digits must receive the same local treatment as that of the palms and soles.

Eczema of the trunk is very likely to be of the so-called "weeping" form, in which a serous discharge

occurs that stiffens the linen. Or it may be vesicular, or papular, or small pustular, leading to the formation of crusts. In all these forms, with the exception of the first, the general methods that have been described will be found sufficient. For the "weeping" form there is, perhaps, nothing superior to dusting-powders, which should be liberally applied. A powder after the following formula will be found advantageous:

℞. Powdered camphor, ʒ j
Powdered Venetian talcum, gr. xx
Magnesium carbonate, } each, ʒ ss.
Sodium bicarbonate, }
Apply liberally.

This is especially serviceable in eczema of the mammæ between the mammary and pectoral surfaces. In eczema of the axillæ it will serve an equally good purpose. Should it be found necessary to wash the surfaces upon which the powder has been employed, a 5 percent carbolic acid solution will be found to be the best. This, however, is rendered more efficient in allaying the pruritus by placing the acid in a 1 : 1000 bichlorid solution containing some glycerin and a little menthol, the latter not to exceed 2 scruples to 6 ounces of the mixture.

Eczema of the genitoanal region is among the most stubborn forms of the disease. It usually involves the region about the anus, the perineum, and the scrotum in the male, it is erythematous in character, with crusts and excoriations due to scratching, and sometimes crusts. The skin becomes very much thickened, especially that of the scrotum. It begins as an intense itching, and it is always proper to locate any rectal disease, such as fissure or hemorrhoids, and correct it previous to other local treatment. For the rectal involvement an ointment of 10 grains of hydrochlorid of cocain to the ounce of lanolin is excellent. For the scrotum and perineum an ointment like the following is of advantage:

℞. Boric acid, ʒ j
Carbolic acid, gr. x
Bismuth subnitrate, ʒ jss
Cold cream, ʒ j.
Apply twice daily.

If there is exudation, the powder may be applied over the ointment.

Universal eczema, fortunately, is not a common condition, for it is one difficult to combat successfully. The best method is, no doubt, by means of baths, followed by inunctions. The condition presented is erythematous and squamous, a very great thickening of the skin being present. These conditions make a recovery very slow, and the intense itching present renders internal treatment highly necessary. In the old, tincture of gelsemium in 10-drop doses thrice daily seems to act well; and in earlier adult life chlorid of calcium in doses of 20 to 30 grains in milk after meals is also good. A bath containing mucilage of flaxseed, borax, and bicarbonate of sodium twice daily, and followed immediately by inunctions of the diachylon ointment of Hebra, will be followed by diminution of the thickening of the skin and increased softness, if accompanied by a certain amount of massage.

General Hints.—It should always be borne in mind that internal treatment is often indicated in eczema.

The portal circulation should always be looked after in eczema of the legs and in varicose eczema. Solid rubber bandages should be carefully eschewed, as they are a positive detriment.

Ordinary roller bandages should not be employed for eczema dressings. For the arms and legs, white cotton stockings are the best dressings. For the buttocks and thighs, thin, knit white drawers should be used. For the hands, white cotton gloves are the best.

Contiguous affected parts should be kept separated by means of pieces of old thin linen. Opposing surfaces of the axillæ, mammæ, nates, scrotum, and thighs should receive particular attention in this regard.

Insistence should be made that patients implicitly follow directions. This is important in order to obtain good results.

ECZEMA SEBORRHŒICUM.—Dermatitis seborrhœica; pityriasis capitis. A mild eczematous inflammation combined with seborrhea occurring primarily on the scalp and frequently extending to other regions, differing from ordinary eczema by the absence of decided inflammation and the absence of infiltration and by the fact that the primary site is the scalp. It is thought to be of parasitic origin, impaired health being an important predisposing factor. Contrary to ordinary eczema it frequently is readily amenable to treatment. It is important to improve the general condition, paying attention to digestion and the bowels; the best drugs to apply locally are salicylic acid, resorcin and sulphur.

EDEMA.—Swelling due to the effusion of serous fluid into the areolar tissues. Venous obstruction, cardiac feebleness, pressure in the lymphatics, the state of nutrition of the capillaries, peculiar composition of the blood, and a general predisposition are the most general factors in the production of edema. The two varieties are (1) simple or serous, and (2) inflammatory or plastic edema. The former occurs in renal and cardiac disease, and in local obstruction to the circulation. Tissues infiltrated with serum are paler than natural, pit deeply on pressure, and look glistening and jelly-like, and on section or puncture, the fluid rapidly escapes. The looser the texture of the tissue, the more marked is the swelling.

Edema developing suddenly is instanced in *edema of the larynx* and in *chemosis of the conjunctiva*. Edema follows fracture of the bones, and may be increased by injudicious bandages and splints. Edema may last for a few minutes or be long abiding, as from (1) long continuation of the cause, (2) permanent occlusion of blood-vessels, and (3) coagulation and organization of the inflammatory effusion.

Hysterical edema does not pit on pressure.

Angioneurotic edema is a localized but transient,

firm swelling closely allied to urticaria and erythema nodosum, not ordinarily pitting on pressure, found in various regions of the body. It may be periodic, but is more often irregularly recurrent. It is usually associated with gastrointestinal symptoms. See ANGIONEUROSIS.

Treatment.—The chief indication for treatment is the removal of the causes impeding the circulation. Pressure, evenly and continuously applied, as by elastic bandages, is the best method. Elevation of the limb is of material benefit. In cases due to thrombosis, massage, systematically carried out, together with after-pressure, will help in absorption. In acute inflammatory edema free incisions will prevent sloughing. The serous edema from renal or cardiac disease may be overcome by posture and drugs, and fine punctures made in the skin with a darning or other needle will benefit, or Southey's tubes may be inserted. Scarification may be practised, as in the sudden edema of the throat. An emetic may be given at the onset of edema of the larynx, and leeches, ice, or, if preferred, hot sponges, applied over the thyroid cartilage. The laryngeal lancet may be used to scarify the edematous part, or laryngotomy or tracheotomy may be performed as a last resort. Bleeding after scarification may be encouraged by the inhalation of steam. See LARYNGITIS (Edematous).

EHRLICH'S DIAZO-REACTION.—See TYPHOID FEVER.

EHRLICH'S SIDE-CHAIN THEORY.—According to this explanation of the phenomena of immunity, each living cell possesses a central molecular mass and a number of other groups attached as side-chains (*receptors*), the latter capable of combining with materials, *i. e.*, foods or toxins, which come in contact with them. In order to combine with these *receptors* the food or toxin must be homologous, that is, it must possess certain groups called *haptophores*. The toxic part of the toxin is called the *toxophore*. This can act on the cell only when its haptophore group finds an affinity for receptors. If this combination takes place, the cell endeavors to produce a fresh and more abundant supply of receptors to supplant those lost in the combination. These receptors (haptines) are liberated and pass into the circulation forming *antitoxin*. If they come in contact with the homologous toxin material they combine with it and render it inert. See IMMUNITY.

ELATERIN.—The active principle of elaterium. It is irritant to mucous membranes, and causes profuse watery stools with little pain. It is the most powerful hydragogic cathartic; and in toxic doses it causes emesis, spasmodic respiration, great prostration, and death. It is useful in cardiac, pleural, and local serous effusions, in dropsy and ascites, in cerebral effusions, and in congestion of the brain. It should not be used when marked exhaustion is present. The dose of elaterin is 1/20 to 1/12 of a grain.

The triturate of elaterin (10) with sugar of milk (90) is given in the dose of 1/4 to 1 grain.

ELBOW, DISEASE.—Tubercular disease is very common in children, and is usually assigned to accident. As a rule, it begins in the synovial membrane; the epiphyses are not so frequently involved as in other bones. The early symptoms are obscure and ill defined. There is a little fulness on each side of the tendon of the triceps, the muscles of the upper arm are wasted, complete extension cannot be carried out, though the other movements may appear fairly free, and the joint is held rigidly flexed at an angle of about 135°. After a little time the fulness makes its appearance over the head of the radius on the outer side of the joint as well; the swelling becomes more distinct; rotation at the shoulder-joint replaces pronation and supination; the temperature of the skin is distinctly raised, and the diagnosis is beyond dispute. As time passes the swelling, if the case is neglected, grows larger and larger until the joint is completely involved in a spindle-shaped mass the size of which is exaggerated by the wasting of the muscles; caseation sets in, and is followed by liquefaction; the skin becomes thin and undermined; and at length the abscesses break externally, leaving sinuses filled with a mass of soft, pulpy granulation tissue. Finally, suppuration occurs, and the pus makes its way into the synovial cavity, destroying utterly the cartilages and bones, which are already in great measure eroded and replaced by the tubercular deposit.

Treatment.—If the treatment is commenced at once, recovery may be expected, with a fair range of movement. The joint must be enveloped in cotton-wool and fixed with plaster-of-Paris or gum and chalk, so that not the slightest movement is possible. Scott's dressing may be applied underneath for a week or two, but care must be taken, especially in children, that it does not irritate the skin too much. If this treatment is maintained for some months, the splints being changed as often as necessary, the inflammatory exudation disappears, and though the muscles waste considerably, the joint is rarely much stiffened or seriously reduced in strength. When the case is not seen until the disease is further advanced, the same treatment should be tried, but the hope of success is not nearly so good; at the best, a large amount of the exudation must become organized, leaving the joint more or less rigid; and for this reason it is essential to maintain the flexed position. When abscesses make their appearance, they must be opened and drained, or if they are limited in size, and the tissues around them are fairly firm, they may be thoroughly scraped out and filled with iodoform. Finally, EXCISION (*q. v.*) may be performed, either with the view of removing the whole tubercular mass, and therefore during the course of the disease, or afterward, for ankylosis in a faulty position, especially as the results of this operation are exceedingly good, even in the case of children.

ELBOW, DISLOCATIONS.—Dislocations of the elbow-joint are chiefly recognized through the relationship of the olecranon process to the condyles of the humerus, which is necessarily modified in every such dislocation. Comparison with the opposite side is of the utmost importance.

Posterior dislocation of the forearm is frequent,

and results generally from force that produces hyperextension and a backward push. The coronoid process of the ulna drops into the olecranon fossa of the humerus, and the head of the radius occupies the posterior surface of the external condyle. The arm is flexed; the olecranon projects markedly; the lower end of the humerus can be indistinctly felt at the bend of the elbow; the distance between the olecranon and the condyles is increased; the forearm is shortened, while the humerus is not; there is rigidity of the elbow (elastic fixation). The diagnosis of a recent dislocation of this nature is not very difficult unless

Dislocation of the Radius and Ulna Backward (Cooper's Dislocation).

complicated by fracture of the coronoid process or by supracondylar fracture.

Reduction is effected by first hyperextending the forearm, to free the coronoid process of the olecranon fossa; downward traction is made, and followed by flexion, which now meets with no resistance, the dislocation having disappeared. The arm is now fixed in an anterior, angular splint for 2 weeks, with frequent change of dressings and massage, and then passive and active movements practised.

Lateral dislocation of the forearm is also not infrequent, the outward variety occurring oftener than the inward. Both are often associated with fracture of a condyle—the inner condyle in outward luxation, and the outer condyle in inward luxation. While the displacement may be complete, it is usually incomplete, the forearm remaining partly in contact with the humerus, this contact being, however, abnormal. Generally, the forearm is displaced backward at the same time. The lateral ligaments are usually extensively torn, or a condyle is fractured, as already mentioned.

The symptoms of complete lateral dislocation are clear; incomplete luxation may be more difficult to determine. If partially displaced outward, the head of the radius will be unmistakably prominent, with a corresponding projection of the inner condyle, while the olecranon will be further removed from the inner condyle and more closely apposed to the outer. In partial inward dislocation these relations are, of course, reversed.

Reduction is effected by the very careful employment, under anesthesia, of hyperextension, with lateral pressure with the hand, followed by traction and flexion. When irreducible, arthrotomy is indicated, from which a good joint frequently results. A well-applied bandage, with a sling, may suffice for dressing, or 2 lateral angular splints may be necessary (best made of cardboard or leather).

Anterior dislocation of both bones of the forearm without fracture of the olecranon is very rare, and results from a blow on the olecranon with the forearm flexed. The condyles of the humerus are felt behind, from which position the olecranon has disappeared, while the olecranon and radius are felt anteriorly. Reduction is effected by direct pressure, assisted by moderate extension. In some cases forced flexion will be necessary.

Divergent dislocation—the ulna backward, the radius forward, the end of the humerus between the two—is very rare, and permits of direct palpation of the luxated bones. Reduction of the ulna is effected by hyperextension and traction, and then the radius is reduced by direct pressure, with traction and flexion.

Dislocation of the ulna, isolated, is very rare, always backward, and results from a fall on the hand with forearm pronated and hyperextended. The forearm is in a varus position and its ulnar side is shortened; otherwise the symptoms are like those of backward dislocation of both bones, except that the head of the radius remains in its normal position. Reduction may be accomplished by traction and hyperextension.

Dislocation of the radius, isolated, occurs more frequently, and in several directions—forward, backward, and outward.

Forward dislocation is most frequent; in this the forearm is slightly flexed, pronated, supination being impossible; the forearm cannot be further flexed because the radial head strikes against

Dislocation of the Radius Forward.—(*From Walsham.*)

the humerus, sometimes with a distinct blow. Reduction is effected by vigorous traction with the elbow bent, the radial head being helped back to its position by direct pressure of the thumb.

Backward dislocation is very rare; the forearm is slightly flexed, pronated; flexion and extension are impaired; the radial head is felt behind the condyle. Reduction by traction with the forearm in the varus position, and by direct pressure over the head.

Outward dislocation rarely occurs except in conjunction with fracture of the upper third of the ulna. In intractable and old cases replacement by incision (along the radial aspect of the joint) may be necessary.

Subluxation of the radial head occurs in children from 2 to 4 years old, as a result of traction on the forearm (lifting a child violently by one hand)

The arm hangs at the side, the elbow slightly flexed, and the forearm between pronation and supination. Complete flexion and extension are painful, and are resisted. There is no deformity at the elbow. The symptoms disappear with supination and traction followed by flexion.

ELBOW, EXCISION OF.—See EXCISION OF JOINTS.

ELBOW, FRACTURE INVOLVING.—See ARM, FORE-ARM, FRACTURE.

ELECTRICITY.—One of the forces of nature developed or generated by chemical action, magnetism or friction, and probably a mode of ethereal vibration, closely analogous to and convertible into heat and light. It has been largely employed in its various forms for therapeutic purposes. Most animal and vegetable fibers (living) contract when an electric current is passed through them, and, in fact, no substance is known that does not offer some resistance to the passage of an electric current. By the *conducting power* of a substance is meant the ability of a given length and area of a cross-section of that substance to conduct electricity, as compared with an equal length and area of a cross-section of some other substance, such as pure silver or copper. This power may, in various substances, be pronounced partial or absent. *Good conductors* are silver, copper, other metals, charcoal; *partial conductors* are water, the human body, cotton, wood, marble, paper; *nonconductors*, oils, porcelain, dry wood, silk, resins, dry air, shellac, gutta-percha, ebonite, paraffin, glass.

The electric current is a term in electricity applied to the transference of electric force, which is arbitrarily likened to the flow of a liquid in a confined passage. The galvanic and the faradic or induced currents are those most used in medicine.

The galvanic current is generated by the decomposition of acidulated water by means of metallic plates, is continuously evolved, flows always from the anode, or positive pole, to the kathode, or negative pole, which is in connection with the zinc or generating plate of the battery; it always gives well-marked and thermal and electrolytic effects. The cell known as "Leclanché" is commonly used by medical men. See BATTERY.

The induced current is momentary in duration; its direction is constantly changing; it has no chemic, thermal, or electrolytic effect; its tension is greater than that of the galvanic current—that is, it overcomes the resistance of the body with far greater ease, and hence it causes the contraction of the healthy muscle far more readily than the galvanic current. "An induced current acts only during the indefinitely short time of its passage. It is a series of slight excitements. With constant currents real excitement is determined only at the times of making and breaking. It is during the silent period, however, that the principal action of the continuous current makes itself felt."

To apply electric currents a conducting wire and rheophore, or current carrier, terminal, or electrode, are necessary. Rheophores should have insulated handles, made of metal and not of carbon, and are made in the form of discs, balls, or points for reaching particular organs, as the ear, larynx, bladder, etc. They are usually covered with wash-leather. A sponge-holder is a most generally useful rheophore. A wire brush is useful for application to the skin.

High Frequency Currents.—These are alternating currents produced primarily by the continuous charging and discharging of a pair of Leyden jars or condensers. The jars are charged by means of large induction coils or influence machines (static machines). The charge is applied to the inner coating of the jars. This charging current is allowed to spark between two metallic balls connected to the inner coating of the two jars. This produces an extremely rapid oscillation estimated to be about one million per second, from which this current derives its name.

From the outer coatings of the jars the current is usually passed to an Oudin resonator or a Tesla coil, which increases the voltage to the extent of from hundreds of thousands to over a million. From the Oudin resonator or Tesla coil the current is passed to the patient. As long as the jars are not punctured the patient cannot at any time receive the primary current.

There are four methods of applying this current for therapeutic purposes:

1. Derivation (closed circuit).
2. Auto-conduction (large solenoid).
3. Auto-condensation (mattress with tin under the patient forming a dielectric).
4. Unipolar or bipolar local applications.

The first three are used chiefly for their constitutional effects. Of these auto-condensation is most efficient. By this current no direct sensation is felt, except that there is a general feeling of warmth, and if the area of contact of one of the poles is not perfect there will be felt some local heat. As a result metabolism is increased, blood-pressure is restored more nearly to normal, there is often an increased perspiration and an increase of the waste products in the urine. The *blood-pressure can be lowered* rather uniformly (where abnormally high) about ten points in ten minutes. It remains lower about two days, and usually does not rise quite to its original point. In this way a permanently lower blood-pressure is obtained. This treatment is therefore indicated in all the groups of symptoms which result from abnormally high blood-pressure. This form of application is also indicated in those diseases or symptoms resulting from inactivity and improper habits of life, associated with which the secretions have become inactive, as in rheumatism and gouty affections.

Local applications of these currents are of two kinds, the effleuve and the spark (fulguration). The electrodes consist of metal or glass vacuum tubes. The glass vacuum tubes are used when one wishes to produce a local hyperemia, or dilatation of the blood-vessels, or for a local sedative effect, and are used in the treatment of pruritus, prurigo, eczema, acne, etc. The metal electrodes are used especially to produce a localized spark, which is used for the destructive effect. It is certainly one of the very best methods of destroying warts, moles, epitheliomata, nævi, lupus

nodules, boils, carbuncles, etc. The resulting scars are nearly or quite invisible, and resemble very closely those obtained by means of the Roentgen rays. The result is obtained more rapidly than from the X-rays, but the applications are somewhat painful. The pain can be avoided by producing a preliminary local anesthesia by means of cataphoric cocainization.

Local applications by means of vacuum electrodes or the effleuve are used in the treatment of chronic rheumatism and rheumatoid arthritis with some excellent results.

Static currents are obtained from frictional or influence machines. They are high potential currents.

The currents obtained from the static machine are:

1. The static wave current.
2. The static induced current.
3. Convective discharges or effleuve.

The static wave current is produced by grounding one of the prime conductors; the other is connected with an electrode applied to the patient, who is on an insulated stand. The current received by the patient is due to the spark discharge between the knobs of the prime conductors. The patient forms one coating of a Leyden jar condenser, the other coating of which is the earth and surrounding objects, and walls connected electrically therewith.

By means of this current strong localized contractions of tissue are obtained, followed by relaxation. In this way by their own contractility the tissues force out their fluid contents (lymph and blood) and during relaxation are again refilled. Thus chronic congestion is dissipated, induration is relieved, stagnant blood and lymph is replaced by fresh blood. The tissues regain their normal tone. Spasmodic conditions of muscles are relieved, as well as the pain resulting therefrom.

Based upon the above physiologic action, the following diseases have been treated with success: Old inflammatory lesions, lumbago, sciatica, chronic rheumatism, enlarged prostate, constipation, etc.

The static induced current is obtained by connecting the rods to the inner coating of the Leyden jars. The patient is connected to the outer coating of the Leyden jars. The rods are brought close together so that short sparks pass. The local effects of this current are somewhat similar to those from the wave current, but less powerful. It is used chiefly on damp days when the long sparks cannot be obtained for a satisfactory wave current.

The convective discharge or effleuve is obtained from the static machine and consists of the *spray* (from a point); the *brush* from a metal or wooden terminal is passed through or over a wooden electrode. The brush is much the same, but less irritating than when obtained from a metal point. The brush discharge has a distinctly disruptive characteristic, as if multitudes of little sparks were passing in rapid succession, producing a feeling when projected against the surface as if sharp particles of sand were thrown against the skin. This modality is administered with the patient seated upon the insulated platform. The discharging rods should be widely separated and the patient hold the shepherd's crook in the hands or having the feet bare upon a metal plate, connected with the negative side of the machine, and the positive side should be grounded. The effects are rubefacient, antiseptic. It relieves local stasis, softening the underlying tissues, by removing the induration that is present and thereby restoring normal circulation to the parts and instituting an active local metabolism. This form of current is used successfully in the treatment of superficial skin diseases, lupus vulgaris, lupus erythematosus, eczema, psoriasis, herpes, sycosis, favus, ulcerations, etc. It should not be used in acne and furunculosis. In these latter conditions the Roentgen rays are indicated.

Static Sparks.—These are best administered by connecting the patient upon the insulated platform to the positive side of the machine. The negative side is grounded and a second ground is connected to the ball electrode which is used in drawing sparks from the patient at the affected areas.

The effects are counterirritation, without damage to the skin, thus relieving pain; strong local contractions of the tissues, thus relieving congestion, spasm and induration; increasing the local blood supply and local metabolism, thereby removing exudates. These sparks are indicated and successfully used in the treatment of chronic joint affections, lumbago, sciatica, chronic neuritis, and at times for stimulating effects upon the spine.

As a whole the results in electrotherapy depend more upon the skill and careful technic of the operator than anything else.

The two methods for applying electric currents are general and local. In the former the current is passed through the entire or greater part of the body. Its utility is doubtful. The latter method influences special nerves, muscles, or organs. The method is a direct one, since it may influence a muscle itself, or an indirect one by stimulating the nerve supplying the muscle.

No one should use electricity without first acquiring a knowledge of the **electric units.** They are as follows: **Ampere,** the unit of measurement of an electric current. It is the electromotive force of 1 volt produced in a circuit having 1 ohm of resistance, equal to 1/10 C.G.S. electromagnetic unit. It is sufficient to deposit 0.3 grain of copper a minute on the plate of a copper voltameter, or to decompose sufficient acidulated water to generate 10.32 c.c. of mixed hydrogen and oxygen a minute. For convenience, the one-thousandth part is used in medicine: namely, the *milliampere.* This equals 1 volt divided by 1000. **Ampere-hour,** a unit of electric quantity equal to 1 ampere flowing for 1 hour; it is the equivalent of 3600 coulombs. **C.G.S. System:** centimeter gram second units; the system of fundamental units in which a centimeter is adopted as the unit of length, a gram as the unit of mass, and a second as the unit of time. **Coulomb,** the unit of measurement of electric quantity; the quantity of electricity that passes during 1 second through a conductor

having a resistance of 1 ohm, with 1 volt of electromotive force. The *microcoulomb* is the millionth part of this amount. **Unit of Current,** a conductor 1 cm. long, which, if bent into an arc of 1 cm. radius, will act with the force of 1 degree on a unit magnet pole at the center. **Dyne,** the unit of force; *i. e.*, the force that, if it acted for 1 second on a mass of 1 gram, would, if the mass was previously at rest, give it a velocity of 1 centimeter a second; or if it was previously in motion in the direction of the force, would in that time alter its velocity by that amount. **Erg.** See UNIT OF WORK. **Ergten,** 10,000,000,000 ergs. **Farad,** the unit of electric capacity. Practically, a capacity sufficient to hold 1 coulomb of current having a potential of 1 volt. The *microfarad,* one-millionth part of the theoretic farad is commonly used. A practical form of condenser of 1 farad capacity consists of 300 leaves of tin-foil, each 16 centimeters in diameter, separated by leaves of mica. The entire surface has an area of about 1.1 square meters. **Joule,** the unit of electric energy or work. The volt coulomb. It equals 10,000,000 ergs. **Unit Magnet Pole,** a magnet having a strength of pole sufficient to repel a similar pole at a distance with a force of 1 degree. **Megalerg,** 1,000,000 ergs. **Megavolt,** 1,000,000 volts. **Microcoulomb.** See COULOMB. **Microfarad.** See FARAD. **Microvolt,** one-millionth part of a volt. **Milliampere.** See AMPERE. **Ohm,** the unit of resistance. Practically, it is the resistance of a pure silver wire 1 meter in length and 1 millimeter in diameter. The theoretic or absolute unit is one-millionth part of the unit practically used. **Volt,** the unit of electromotive force, or the force sufficient to cause a current of 1 ampere to flow against a resistance of 1 ohm. The following is the voltage of several popular cells: Smee 0.65; Bunsen, 1.90; Daniell, 1.05; Callaud, 1.60; Leclanché, 1.50. **Volt-ampere,** the unit of electric work. It is the amount of pressure developed by a current of 1 ampere having an electromotive force of 1 volt. Its mechanic equivalent is about 44.2 foot-pounds a minute. It is sometimes called a *watt.* **Voltcoulomb,** the unit of electric work. **Watt.** See VOLT-AMPERE. **Weber,** an ampere or coulomb; not much used. **Unit of work,** the erg; it is equal to the work required to move a body through 1 centimeter against a force of 1 dyne. The reciprocal relations of these electric units may be expressed thus:

1 volt × 1 coulomb	= .....1 joule
1 volt × 1 ampere	= .....1 watt
1 volt × 1 ohm	= .....1 ampere
1 ampere × 1 ohm	= .....1 volt
1 volt × 1 ampere × 1 ohm	= .....1 watt
1 volt × 1 ampere × 1 ohm × 1 second	= .....1 joule
1 ampere × 1 second	= ...1 coulomb

Electrotherapeutics.—Electricity is used in medicine as a stimulant, to excite muscular and nervous tissue, normal or diseased. It is used as a sedative to allay pain. It is employed to promote absorption, coagulation, and dissolution of the fluids and tissues of the body. It is used as a cautery and as an illuminant.

Electricity is of undoubted service to distinguish between paralyses of central and peripheral lesions. The electric current may remove the cause of paralysis by influencing the nutrition of the parts, by stimulating absorption of a blood-clot in the brain, or by acting upon the chronic degenerative changes in the cord or brain.

The following rules should be heeded in the use of electricity for the treatment of paralyses: (1) The aim should be to preserve the muscular part of the locomotive apparatus in a state of health and readiness; (2) that form of current should be employed to which the muscles most readily respond; (3) the weakest currents which will cause muscular contraction are to be used, and the risk of exhausting a muscle by causing a too prolonged contraction is not to be taken; (4) if the paralysis remains absolute to the will, and the contractility of the muscle is perfect, perseverance with electric treatment is of no avail; (5) if the paralysis to the will remains absolute, and if the irritability to the muscle is diminished, electricity is useful in so far as it improves the nutrition of the muscles and helps to restore their normal degree of irritability; (6) if irritability to both forms of current has completely disappeared, perseverance is not justified, and false hopes must not be held out to the patient. A trial, nevertheless, is advised.

The power of electricity to relieve pain is usually temporary, sometimes permanent. The anode, or positive pole, is applied to the painful spot. It may divert the mind from troubles, real or fancied, or act as a counterirritant. It may give relief when every known remedy has failed. All three forms of electricity relieve pain, but the galvanic current is most practical. In neuralgia, the pains of which muscular movements increase, in headaches of all kinds, in lumbago, sciatica, and tinnitus aurium, the galvanic current often benefits when other remedies fail. Writer's cramp has yielded to the electric treatment, and tonic spasms of the bladder and bowel have been benefited by the galvanic current. In the paroxysms of angina pectoris, the burning pains of herpes zoster, obstinate skin-diseases, such as dilated acne rosacea, diabetes, exophthalmic goiter, postpartum hemorrhage, ovarian pain and tenderness, and amenorrhea the electric current has been used with benefit; also in gouty arthritis, myalgia, enuresis, nocturnal incontinence of urine, constipation, inflammatory exudations, ascites, suspended animation, and as a test for death. Its absorbent action has been utilized in nearly every form of inflammation. When it is used as a cautery the advantages are obvious. The method of galvanopuncture has the advantage of the hemostatic action of the heated knife or needle.

The practice of electrotherapeutics is in the hands of skilled specialists, who follow prescribed rules and use exact quantities measured by milliamperemeters, etc.

ELECTRICITY, ANESTHESIA.—Professor Leduc, in 1902, announced the possibility of passing electric currents through the unopened skull, the brain, and higher nerve centers, producing a form of anesthesia which he called "*electric sleep.*" For

the most part the experiments have been performed upon animals. The results have not been uniformly satisfactory. At times, however, surgical operations can be performed without any evidence of pain, and the animal regains consciousness immediately after the current is cut off. It is clearly in an experimental stage, and is not without danger.

ELECTRICITY, INJURIES.—The alternating and direct currents are the forms most often employed for commercial purposes. The former supplies incandescent-lighting systems, requiring voltage from 1600 to 2000; the latter is used in arc-lighting systems and as motive power in railways, factories, etc., requiring voltage ranging from 500 to 3000. The lethal force of electricity is almost entirely dependent upon voltage, or electromotive force, being actually the result of the current in amperes that is caused to flow through the body, against its resistance, by the electromotive force. There are cases on record in which a pressure of 500 volts has proved lethal, but by far the greater number of fatalities have been produced by pressure exceeding 1000 volts. From 1500 to 2500 volts have been employed in electrocution, the skin resistance brought to the minimum by contact sponges of large surface wet with saline solution.

Of the various human tissues, the skin presents the highest resistance to electric penetration; different thicknesses produce resistance of varying degree. When not removed, destruction is markedly intensified. Skin resistance is increased by dryness; when moistened, especially by saline solution, it is decidedly diminished. Experience tends to show that a current of 1 or 2 amperes is fatal to the majority of individuals. The fact that comparatively low voltages have proved fatal in some cases, and that victims of shock from relatively high voltages have recovered, does not necessarily show that some systems can withstand more current than others, but rather that the skin resistance was greater, or the area of contact smaller or drier, in the more fortunate cases (according to Ohm's law).

Any current sent through the body being dependent upon resistance offered (the skin remaining the chief factor), it follows that the larger the area of contact, the less resistance and a proportionally greater amount of current is received. It has been proved that a 2 percent or 3 percent saline solution offers a resistance equal to about one-twentieth of that of pure water, and that sea-water offers about one-fortieth. It is also known that a resistance of 80 ohms—60°—is offered to an alternating current by a cubic foot of pure water at 60° F., while a cubic foot of pure water plus 0.15 of a pound of rock-salt produces but 7 ohms' resistance to the same current. If these waters are elevated to 212° F., it will be seen that pure water resists to the extent of 24 ohms, the saline solution to but 4.2 ohms. From these and other data it is justifiable to deduce that (1) the salinity of the sweat, (2) temperature, (3) atmospheric humidity, and (4) season of the year are all important determinant factors in the intensity and gravity of trauma and shock due to electricity. Of the two more important and ordinarily utilized currents, the direct has the greater electrolytic intensity, while from the alternating permanent chemic change does not occur. In cases of fatal exposure to either current, sudden and profound shocking of the sympathetic system is, without doubt, the lethal agency.

Electricity produces injuries, ranging from insignificant burns to death, of which an overwhelming percentage consists of burns. They occur, as do all other injuries, upon the most exposed portions of the body, and differ from ordinary burns or scalds in (1) appearance, (2) accompanying pain, (3) concomitant shock, (4) prognosis, (5) subsequent manifestations, (6) reaction to treatment, and, frequently, (7) the result (Sharpe).

1. *Appearance.*—The majority of electric burns, seen early, present a dry, crisped aspect, excavated and bloodless, with a surrounding zone characterized by pallor. This condition changes within 36 hours; serous oozing exists, the tissues soften, and hyperemia replaces the pallor.

2. *Pain* is, as a rule, very moderate, in some cases practically absent; from 24 to 48 hours after contact it is usually present.

3. *Shock.*—The systemic shock is from the contact—there is none from the burn itself.

4. *Prognosis.*—In regard to time, electric burns average from 1 1/2 to 3 times as long in recovery as do other burns. In severe cases, dependent upon locality, such as proximity to bones and joints, the ratio is as 5 or more to 1. Prognosis of result is as uncertain as time-prognosis; severe cases may progress relatively rapidly; mild cases are often persistently rebellious to recovery; usually, both mild and severe cases are tedious and prolonged.

5. *Subsequent Manifestations.*—The rule of the electric burn is that it changes within 36 hours from contact to a serum-saturated area, with disintegrating walls and floor, progressing to profuse purulent secretion, with continued tissue degeneration. This degeneration will frequently involve nerve, muscle, tendon, joint capsule, ligaments, articular surfaces, periosteum, and bone itself; exuberant granulations springing up, the entire surface is bathed in pus.

6. *Reaction to treatment* is very unsatisfactory, it being an apparent impossibility to check the disorganizing process, especially in severe cases, with most scrupulous antisepsis or asepsis. After a varying period of from 15 to 50 or 60 days, and often much longer, firm granulation will slowly proceed; and—

7. *The result* will be as good as is ordinarily secured in other burns. In some cases, however, owing to the disintegrating process involving bones and joints and producing necrotic masses, amputation is necessary.

Sloughing is almost invariably present.

General Rules for Guidance in Electric Accidents.—(1) Break the circuit at once, if there is an interrupter close at hand. If not, lose no time, but proceed to rule 2. (2) Do not touch the body with the bare hands, but if india-rubber gloves are not at hand, pull the body off the cable by

the coat tail, or fold a coat or some dry article into two or three thicknesses, and, using this as a pad to take hold of the body, pull it away from the circuit, and resort to rule 5. (3) If unable to get the body off, raise, with covered hand, that part of the body that touches the earth, or one of the poles of the circuit. This will break the circuit, and it will usually be thus possible to get the body easily away, and, if so, proceed to rule 5. (4) If still unsuccessful, make another pad, and, placing it between the ground and that part of the body in contact with the ground, continue the efforts to detach the body. (5) Having pulled the body away from the cable, free the neck of clothing, and treat the case as one of drowning. If the teeth are clenched and cannot be separated with the fingers, gently insert the handle of a pocket-knife or a small piece of wood, cork, etc.

The treatment of profound shock from an electric current should be instituted upon lines analogous to those pursued in shock from other agents. The patient will be found pulseless, or nearly so; respiration of the most feeble character, or absent; a warm skin, which rapidly cools, with pallor, immobile pupils, and absolute muscular relaxation. Laborde's method of tongue traction in the horizontal position, or with the head upon a lower plane than the body, is advised. Friction, heat to the trunk and extremities, hypodermic injections of brandy, digitalis, etc., are valuable. In cases in which respiration is not absolutely suspended, inhalations of amyl nitrite, until the face flushes, followed by a large dose of strychnin hypodermically, will bring the vital forces together. This effect should be followed by nitroglycerin. Electric applications are *not* advised.

Dissatisfied with the poor results of classic aseptic treatment of these cases of burns, among other agents the following are utilized by Sharpe: Bichlorid solutions, carbolic solutions, pyrozone solutions, zinc chlorid solutions, in varying strength; hydrogen dioxid; sterilized water, hot and cold; iodoform, dry, in emulsion, and in glycerin; salicylic and boric acids; sodium bicarbonate, loretin, aristol, iron and potassium tartrate in solution; and for digestion of the sloughs, pepsin, trypsin, and pancreatic extract in appropriate media. Both moist and dry dressings are employed.

Conclusions (Sharpe).—

1. The skin is the chief factor of resistance in an individual sustaining an electric shock.

2. Moisture of the skin, and especially marked salinity of sweat, favors access of the current.

3. Humidity and temperature of the atmosphere and season of the year, are important factors in determining individual resistance.

4. Electric trauma differs from ordinary burns or scalds in duration.

5. Electric trauma differs from ordinary burns or scalds in results (noticeable in severe cases).

6. Prognosis in all cases should be guarded.

7. Rigid asepsis should be followed in the manipulation of all cases.

8. Sloughs are best removed by solution of pepsin, thus:

℞. Scale pepsin, ʒ j
Hydrochloric acid (U. S. P.), ʒ ss
Distilled water, ʒ viij.

This should be washed off in 2 hours with hydrogen dioxid, pyrozone, or hydrozone; the application should be repeated as may be necessary.

9. Deep disintegration demands especial watchfulness for the detection of bone invasion or joint invasion.

10. Necrosis of bone should be combated by injecting a 3 percent solution of hydrochloric acid, in distilled water, repeated not more frequently than every 2 hours. Every second day the acid pepsin solution described should be used, until the necrotic masses are cleared away, when gauze packing should follow. When a case is complicated by tuberculosis, a 10 percent solution of iodoform in ether should be subsequently employed.

11. Persistent bone invasion or joint invasion, with necrosis, requires amputation, or, in some cases, resection.

12. Degenerative division of important nerves should be subsequently repaired by Levering's method; degenerative division of important arteries and veins should be repaired by Murphy's method, whenever this is possible.

13. Granulating areas, after sterilization, should, when feasible, be covered by large skin flaps.

14. When the healing process has started, peripheral skin-growth is hastened by the use of a layer of sterile gauze, saturated with an iodoform glycerin mixture, covered by rubber tissue.

15. For the treatment of profound shock Laborde's method of tongue traction, application of heat and frictions, inhalations of amyl nitrite, hypodermic injections of large doses of strychnin, together with nitroglycerin internally, are recommended.

ELECTROLYSIS.—The dissolution of a chemic compound by an electric current; the dissolution of any morbid growth by means of an electrochemic current. Most forms of electricity cause electrolysis, and the amount of decomposition is proportional to the intensity of the current, which intensity is determined by the amount of electricity generated and the resistance offered to its passage. Electrolysis has been used in the treatment of aneurysm, for the destruction of morbid products, the disintegration of urinary calculi, and in hydrocele. In aneurysm the aim is to coagulate the blood in the sac. The constant current should be used. Both poles, when inserted, are more effective, accurate, and painless, but the needles should be insulated when in contact with the tissues, to prevent pain, inflammation, and the risk of hemorrhage. Steel needles are sometimes used, but a platinum or gold-pointed needle will not be affected by acids. A duration of from 1/2 of an hour to 1 1/2 hours is usually necessary for an application. When properly performed, electrolysis is free from risk. Embolism has never occurred, and the hemorrhage from the puncture is easily checked by gentle pressure. The operation cannot be preferred to compression or ligation in surgical aneurysm.

In blood tumors it brings about cure, by, first, cauterizing the tissues, and, secondly, by coagulating the blood. It is the best treatment for cirsoid aneurysms. For the cure of subcutaneous nevus without scar electrolysis is safe, and often certain; several operations are required, extending over a space of about 6 weeks. Vascular goiter is amenable to electrolysis, but this is not true of the cystic and fibrous varieties. For solid tumors electrolysis presents no advantages over the knife, cautery, or caustic, and it is less certain, more tedious, and not more safe than the knife. In some chronic hypertrophies and inflammations it may be useful. Enlarged lymphatic glands may be treated by electrolysis. Electrolysis is frequently used to remove superfluous and aberrant hairs. It is also employed in the treatment of urethral, lacrimal, esophageal, and rectal stricture.

The *negative* electrode or pole of the battery is that used for destructive purposes (electrolysis), while the *positive* electrode or pole is sedative in character. The galvanic battery is the one used. While not absolutely essential, the best and most satisfactory results are obtained by the use of a milliamperemeter—an instrument to measure the exact strength of current. Any make of galvanic battery may be used. The current is made or broken by the patient grasping the positive electrode with either hand and releasing it as indicated by the operator.

Superfluous hairs must be removed one at a time. Insert the needle carefully into the hair channel until it pierces the bulb or bottom of the hair follicle. This is indicated by a peculiar resistance at first, followed by a slight sensation of freedom of the needle-point that is so characteristic that it must be practised to be appreciated. Always introduce the needle with an open or unclosed current. When the hair follicle is pierced, the current is closed, and in from 2 to 6 seconds a small bubble or two is seen about the needle. This usually suffices to destroy the hair-root. Always break the current before withdrawing the needle, otherwise the patient will experience an unpleasant shock or stinging pain. If successful, the hair will come out readily without pain to the patient. If it is necessary to use traction, the hair follicle is not destroyed and the hair will return. The strength of current used should be from 3 to 6 milliamperes, or about the strength obtained from one or two of the small bichromate battery cells. Never remove at one sitting 2 hairs that are closely approximated, but select them at least 1/4 to 1/2 of an inch apart to prevent too much local irritation. From 10 to 75 hairs may be removed at a sitting. Bathe the face afterward with hot water and apply a soothing unguent. A current of 10 to 20 milliamperes will destroy surrounding tissue and leave white scars, while the lighter current will leave none. Moles are removed by piercing the base on several sides and using a current of from 10 to 15 milliamperes; but weaker currents will often suffice. The change of color will indicate success or failure. Too strong currents will leave scars. Warts and small tumors are removed in the same way as moles. Birth-marks are dependent upon enlarged capillary vessels, and, if not too large, can be readily removed by introducing the negative electrode needle into the layer of tissue containing these vessels. If from 4 to 6 milliamperes of current are used, the vessels surrounding the needle are contracted and destroyed, and, with the following contraction of the scar tissue formed, will be permanently effaced. Small areas must be treated at each sitting until the result is accomplished. Enlarged veins of the face, nose, or ears may be removed by introducing the needle into the caliber of the vein as far as it can be seen; with a current of from 4 to 6 milliamperes gradually withdraw the needle, and a small white line is left, without the loss of any blood. In a day or two this line will disappear, and no trace of the vein be left. The so-called "whisky nose" can be treated by this method (Stewart).

The olive-tipped metallic bougie is probably best for electrolysis in urethral stricture, and the stem should be covered with hard rubber. Test the caliber of the stricture first, and use an electrode slightly larger than will ordinarily pass. If it is impermeable, use the smallest electrode. Remember that mechanic force must not be used. Introduce the aseptic electrode, anointed with glycerin as an emollient, until the olive tip is in contact with the stricture. Place the positive pole over the pubes or on the perineum. With a rheostat or current controller gradually turn on the current until 5 or 6 to 8 milliamperes are registered. Another guide is the feelings of the patient. If there is too much pain or burning, the current is too strong. Use only the mildest pressure on the bougie electrode, and in almost every case it will slip past the stricture in from 2 to 8 minutes. When the current is broken and the instrument withdrawn, the back of the olive tip will be covered with a frothy substance, which is part of the disintegrated scar tissue and the fluids present in the urethra. Never continue a treatment over 10 or 12 minutes. Give treatments every third or fourth day, and use a larger electrode each time until the urethral caliber is normal, which will require from 6 to 10 treatments. Contrary to some recent reports published, from 10 to 15 milliamperes will cause severe pain, will destroy too much tissue at one time, will be liable to produce more scar tissue in healing, and can be likened only to division with large bougies. With weak currents the patient should experience no discomfort, and should be able at once to resume his business pursuits.

ELECTROTONUS.—The change of condition in a nerve during the application of a current of electricity. A decrease in the electromotive force of a nerve effected by sending a current through the nerve in the opposite direction to that of the nerve-current is termed the *negative phase* of electrotonus, while an increase in the electromotive force of a nerve effected by sending a current through a nerve in the same direction as the nerve-current is termed the *positive phase* of electrotonus.

TABLE OF CHEMIC ELEMENTS.

Name.	Symbol.	Atomic Weight.	Valence.	Name.	Symbol.	Atomic Weight.	Valence.
Aluminum	Al	27.1	III	Mercury (*hydrargyrum*)	Hg	200.6	I or II
Antimony (*stibium*)	Sb	120.2	V	Molybdenum	Mo	96.0	II or VI
Argentum. See *Silver.*				Natrium. See *Sodium.*			
Argon	A	39.88		Neodymium	Nd	144.3	III or IV
Arsenic	As	74.96	V	Neon	Ne	20.2	
Aurum. See *Gold.*				Nickel	Ni	58.68	II or VIII
Barium	Ba	137.37	II	Niobium. See *Columbium.*	Nb		
Berylium. See *Glucinum.*	Be			Niton (*radium emanation*)	Nt	222.4	
Bismuth	Bi	208.0	V	Nitrogen	N	14.01	V
Boron	B	11.0	III	Osmium	Os	190.9	II or VII
Bromin	Br	79.92	I or VII	Oxygen	O	16.00	II or VI
Cadmium	Cd	112.40	II	Palladium	Pd	106.7	II or IV
Calcium	Ca	40.07	II	Phosphorus	P	31.04	V
Carbon	C	12.005	IV	Platinum	Pt	195.2	II or IV
Cerium	Ce	140.25	III or IV	Plumbum. See *Lead.*			
Cesium	Cs	132.81	I	Potassium (*kalium*)	K	39.10	I
Chlorin	Cl	35.46	I or VII	Praseodymium (*didymium*).	Pr	140.9	III or IV
Chromium	Cr	52.0	II or VI	Radium	Ra	226.0	II
Cobalt	Co	58.97	II or VIII	Rhodium	Rh	102.9	II or VIII
Columbium (*niobium*)	Cb	93.5	V	Rubidium	Rb	85.45	I
Copper (*cuprum*)	Cu	63.57	I or II	Ruthenium	Ru	101.7	II or VII
Coronium (*hypothetical*).				Samarium	Sa	150.4	III
Didymium. See *Praseodymium.*	Di			Scandium	Sc	44.1	III
Dysprosium	Dy	162.5		Selenium	Se	79.2	II or VI
Erbium	Er	167.7	III	Silicon	Si	28.3	IV
Europium	Eu	152.0		Silver (*argentum*)	Ag	107.88	I
Ferrum. See *Iron.*				Sodium (*natrium*)	Na	23.00	I
Fluorin	F	19.0	I or VII	Stannum. See *Tin.*			
Gadolinium	Gd	157.3	III	Stibium. See *Antimony.*			
Gallium	Ga	69.9	III	Strontium	Sr	87.63	II
Germanium	Ge	72.5	IV	Sulfur	S	32.06	II or VI
Glucinum (*beryllium*)	Gl	9.1	II	Tantalum	Ta	181.5	V
Gold (*aurum*)	Au	197.2	I or III	Tellurium	Te	127.5	II or VI
Helium	He	3.99		Terbium	Tb	159.2	III
Holmium	Ho	163.5		Thallium	Tl	204.0	I or III
Hydrargyrum. See *Mercury.*				Thorium	Th	232.4	IV
Hydrogen	H	1.008	I	Thulium	Tm	168.5	III
Indium	In	114.8	III	Tin (*stannum*)	Sn	118.7	II or IV
Iodin	I	126.92	I or VII	Titanium	Ti	48.1	V
Iridium	Ir	193.1	II or IV	Tungsten (*wolframium*)	W	184.0	IV or VI
Iron (*ferrum*)	Fe	55.84	II or IV	Uranium	U	238.2	II or VI
Kalium. See *Potassium.*				Vanadium	V	51.0	V
Krypton	Kr	82.92		Wolframium. See *Tungsten.*			
Lanthanum	La	139.0	III	Xenon	Xe	130.2	
Lead (*plumbum*)	Pb	207.20	II or IV	Ytterbium (*neoytterbium*)	Yb	173.5	III
Lithium	Li	6.94	I	Yttrium	Yt	88.7	III
Lutecium	Lu	175.0		Zinc (*zincum*)	Zn	65.37	II
Magnesium	Mg	24.32	II	Zirconium	Zr	90.6	IV
Manganese	Mn	54.93	II or VII				

ELEPHANTIASIS (Elephantiasis arabum; Barbados Leg; Pachydermia).—A chronic hypertrophic disease of the skin and subcutaneous tissue, due to obstruction of the lymphatic channels, and resulting in enormous enlargement and thickening of the part, with papillary outgrowth.

Symptoms.—The most frequent seats of elephantiasis are the leg and foot, although the penis, scrotum, clitoris, and other parts are at times involved. The affection usually begins as an erysipelatous inflammation, accompanied by fever, lymphangitis, pain, swelling, and heat, and followed by more or less permanent enlargement of the part. Such attacks recur at intervals of a few months, the affected area each time becoming larger. Finally, a state of chronic hypertrophy is reached, the limb is greatly enlarged, the skin and subcutaneous tissue are enormously thickened, and the surface is pigmented and covered with papillomatous growths and fissures. The maceration of the epidermis and the collection of decomposing sweat, sebum, and effete products give rise to an offensive odor.

There is, as a rule, no pain, although during the acute exacerbations it may be severe. The enormous weight of the hypertrophied part may make locomotion difficult or even impossible. The course of the affection is chronic.

Etiology.—The disease is most common in tropical countries, where it occurs chiefly in those inhabitants who are subject to bad hygiene and improper food. It is due to inflammation and obstruction of the lymphatic vessels by the filaria sanguinis hominis. Sporadic cases may be due to obstruction of the lymphatics from other causes, such as recurrent erysipelas, ulcers, cicatrices, tumors, etc.

Pathology.—There is a hyperplasia, participated in by the subcutaneous tissue and by all the layers of the skin. The chief change is in the subcutaneous tissue, which is enormously hypertrophied and is traversed by irregular bundles of connective tissue. When the surface of the skin is warty, the papillæ are greatly elongated. Both blood-vessels and lymphatics are enormously distended, the latter leading to dilated lymph spaces. The neighboring lymphatic glands are enlarged. In advanced cases the muscles undergo fatty degeneration and the bones become enlarged.

Diagnosis.—The history of recurrent erysipelatous inflammation, with slowly progressing hypertrophy, is peculiar to elephantiasis. In advanced cases the appearance is unmistakable.

Prognosis.—In the beginning the process may at times be arrested. When the growth is far advanced, treatment accomplishes but little.

Treatment.—The erysipelatous attacks are best treated by rest, hot or cold applications, and the internal administration of salines and quinin. Good food and hygiene, tonics, and change of climate are important matters in endemic cases. Elastic compression by means of a well-applied rubber bandage is the most efficient therapeutic measure. Green soap and the mercurial ointments may be rubbed into the skin.

In advanced elephantiasis of the leg resort may be had to stretching or partial exsection of the sciatic nerve, or to digital or instrumental compression, or even ligation, of the femoral artery. Elephantiasis of the Scrotum (*q. v.*) is best treated by amputation.

ELIXIR.—A sweetened, aromatic, spirituous preparation, which is practically a flavored syrup, designed as an excipient for extracts and tinctures. There are three official elixirs:

Elixir Adjuvans (adjuvant elixir). Fluidextract of glycyrrhiza, 120 c.c.; Aromatic elixir, 880 c.c.

Elixir Aromaticum (aromatic elixir). Compound spirits of orange, 12 c.c.; syrup, 375 c.c. (Purified talc, 30 grams, for filtering); alcohol, 238 c.c.; distilled water, q. s. to make 1000 c.c.

Elixir Ferri, Quininæ et Strychninæ Phosphatum.—Soluble ferric phosphate, 17.5 grams; quinin, 8.75 grams; strychnin, 0.275 grams; phosphoric acid, 2 grams; ammonium carbonate, 9 grams; alcohol, 60 c.c.; acetic acid, 28.65 c.c.; ammonia water, to neutralize distilled water; aromatic elixir q. s. to make 1000 c.c. Average dose, 4 c.c. (1 fluidram).

McMunn's elixir is a preparation of the deodorized tincture of opium of 10 percent strength, the dose of which is 5 to 30 minims.

Yvon's hypnotic elixir is made thus:

℞.	Paraldehyd,	♏ ijss
	Alcohol (99 percent),	♏ jss
	Tincture of vanilla,	♏ ss
	Water,	♏ j
	Simple syrup, enough for	♏ iv.

A teaspoonful or two every hour until sleep results.

The substances generally used in elixir form are arsenic, bismuth, ammonium bromid, lithium bromid, potassium bromid, calisaya bark, hydrated chloral, coca, gentian, guarana, ferric chlorid, ferric phosphate, ferric pyrophosphate, pepsin, quinin phosphate, strychnin phosphate, taraxacum, ammonium valerate.

Many of these agents are often combined with one another, as the elixir of bismuth and strychnin; elixir of calisaya, iron, and strychnin; elixir of gentian and tincture of iron chlorid; elixir of iron, quinin, and strychnin phosphates.

EMACIATION (Leanness).—Loss of the fat and flesh of the body. In chronic wasting diseases calcium phosphate is serviceable. Arsenic is used to fatten oxen and cattle quickly. Arsenic, iodin and the salts of iron improve the digestion and appetite. Cinchona, in small doses, also improves the appetite and the general tone. Inunctions of olive oil are useful in many wasting diseases, and cod-liver oil may be given internally and externally, with friction. It is especially useful in marasmus in children, and is effective in malnutrition. Pepsin directly promotes the digestion of food.

EMBEDDING.—The fixation, in order to preserve it intact, of a tissue specimen in a firmer medium before freezing, or otherwise hardening, and section. See Pathologic Technic.

EMBOLISM.—The sudden plugging of a blood-vessel by a foreign body (embolus) transported in the blood stream. Emboli are usually detached portions of thrombi, but they may be vegetations from the valves of the heart, detached atheromatous plates, fat globules, air bubbles, portions of tumors, cells from some of the normal structures of the body, masses of bacteria, or parasites.

EMBROCATION.—A preparation similar to a liniment, but of thinner consistence. The term is not much used now. See Liniments.

EMBRYO.—See Fetus, Abortion, etc.

EMBRYOCARDIA.—See Heart disease, functional.

EMBRYOTOMY.—Some form of mutilating operation upon the fetus to reduce its size and thus render possible its extraction through the birth canal.

The important varieties of embryotomy are *craniotomy, decapitation, evisceration, cleidotomy* (division of the clavicles), *rachidotomy* (perforation of the spine), and *amputation of extremities.*

Craniotomy consists in perforating the skull and evacuating its contents, thus securing sufficient reduction in size to accomplish delivery. Crushing should rarely be resorted to.

The indications for craniotomy are: (1) If the child is dead, and by the operation the mother can be saved risk or injury; (2) in faulty cephalic presentations, as face or brow with chin persistently posterior; (3) when there is great disproportion between the fetal head and maternal pelvis.

Craniotomy is contraindicated when the true conjugate measures less than 6.5 cm., since the amount of traumatism necessarily inflicted upon the lower birth canal by the forcible extraction of the crushed head and trunk would be so great as to render cesarean section preferable. Craniotomy

upon the living fetus is rarely indicated when the true conjugate measures more than 8 cm. The size and compressibility of the child's head are always important factors in determining an obstetric operation.

The instruments ordinarily required for craniotomy are a large volsella forceps, a perforator (Blot's), and a cranioclast (Hirst's). Rarely a cephalotribe (Braun's) will be necessary.

The steps of the operation are as follows:

(1) Anesthetize the patient. (2) Sterilize hands, instruments, vulva, and vagina. (3) If the head is loose above the superior strait, grasp the scalp with volsella forceps to steady it. (4) Introduce two fingers of the left hand into the vagina; locate a fontanel or suture and perforate the skull. Enlarge the opening in the skull and break up the skull contents by moving the perforator freely about in all directions. (5) Apply the cranioclast—one blade being introduced into the opening in the skull, the other being applied to the outer part of skull and locked over it—and extract as with forceps. Rarely it may be necessary to crush the skull with a cephalotribe before extraction—(cephalotripsy).

In case of necessity craniotomy may be performed by perforating the skull with sharp-pointed scissors and extracting with forceps.

Decapitation consists in division of the child's neck when delivery and version are both impossible.

The indications for decapitation are: (1) An impacted shoulder presentation; (2) twin presentations with locking of the chins; (3) monstrosities.

The best instrument for the purpose is Braun's blunt hook. A piece of strong twine or thin wire may act as a substitute.

The steps of the operation are as follows: (1) Anesthetize the patient; (2) sterilize hands, instruments, vulva, and vagina; (3) locate the neck with two fingers of the left hand; (4) pass the hook, guarded by the fingers, back of the symphysis and turn it so that it lies over the neck; (5) break the neck with a sharp twist or two of the hook, and, finally, tear through the soft structures; (6) extract the trunk by making traction on the arms; (7) extract the head with forceps, cranioclast, or cephalotribe.

Evisceration and amputation of extremities may be indicated in certain forms of monsters.

Cleidotomy (division of both clavicles after perforation and extraction of the fetal head) is sometimes of vital importance when additional shock must be reduced to a minimum.

EMESIS.—See Vomiting, Antiemetics.

EMETICS.—Agents that produce vomiting. They may be subdivided into 2 groups: (1) *local emetics*, or those that act by irritating the end-organs of the gastric, pharyngeal, or esophageal nerves, such as alum, mustard, salt, ammonium carbonate, zinc sulphate, copper sulphate, subsulphate of mercury, tepid water in quantity, and vegetable bitters, as quassia, in strong infusions; (2) *general* or *systemic emetics*, which act through the medium of the circulation. Both these classes produce the emetic action by irritation of the vomiting center in the medulla—the first by reflex, the second by direct stimulation. The principal systemic emetics are the following: ipecacuanha, emetin, ouabain, apomorphin, tartar emetic, veratrin, senega, and squill. Ipecacuanha, tartar emetic, and probably apomorphin act locally as well as systemically, irritating the gastric nerves as well as the vomiting center. Pilocarpin is a local emetic, and digitalis and muscarin are systemic emetics, but no one of them is used medicinally for that purpose. Opium, morphin, and codein produce emesis as an after-effect. Emetics are employed to remove food causing irritation or not properly digesting; in poisoning; to expel bile from the gall-bladder or from the body; and to expel false membranes from the air-passages. For removing irritating food, large drafts of lukewarm water, of mustard (1/2 of an ounce) and water, of salt (1 ounce) and water, or an infusion of camomile are usually beneficial. In poisoning, mustard (1/2 of an ounce), sulphate of zinc (30 grains), sulphate of copper (5 to 10 grains), or ammonium carbonate (30 grains), are used. For croup or diphtheria, ipecacuanha is most generally used (30 grains of the powder or 1 dram of the wine). A teaspoonful of powdered alum and honey is often useful. Three grains of tartar emetic or 1 dram of the wine may be given. Apomorphin (1/6 of a grain) may be used hypodermically. See Antiemetics, Vomiting.

EMETIN.—See Ipecac.

EMISSIONS.—See Nocturnal Emissions.

EMMENAGOGS.—Remedies that restore the menstrual function, either directly by stimulation of the uterine muscular fiber, or indirectly by improving the blood and toning up the nervous system. Menstruation can only be restored by removing conditions that prevent it. Tonics, like cod-liver oil, quinin, and fresh air, exercise, sea-air and sea-bathing, may reestablish suspended menstruation; iron may act by removing anemia. Menstruation arrested by cold or shock may be restored by means promoting dilatation of vessels of the pelvic region and favoring a free circulation over this vascular area. Warm hip-baths and sitz-baths and hot poultices to the lower part of the abdomen are such means. Hot mustard foot-baths, with a small quantity of hot, dilute alcohol at bedtime, are domestic remedies.

The direct emmenagogs are ecbolic in large doses. The principal members of this class are enumerated in the following lists, viz.:

Direct emmenagogs.—Ergot, savin, tansy, digitalis, cantharis, pulsatilla, asafetida, alcohol, indigo, biniodid of mercury, caulophyllum, rue, apiol, borax, myrrh, guaiacum, polygonum hydropiperoides, potassium permanganate, cimicifuga, oxalic acid, hedeoma, origanum, viscum flavescens.

Indirect emmenagogs.—Iron, manganese, cinnamon, quinin, strychnin, aloetic purgatives, cod-liver oil, hot hip-baths, leeching the genitals, rubefacients to thighs, tonic remedies.

In simple atonic amenorrhea:

℞.	Dried iron sulphate,	gr. xlviij
	Powdered aloes,	gr. xij
	Oleoresin of turpentine,	gr. xxvij
	Oil of turpentine,	♏ x.

Divide into 30 pills. Give 2 pills 3 times daily.

℞. Tincture of iron chlorid, ℥ iij
Tincture of cantharides, ℥ j
Ammoniated tincture of guaiac, ℥ jss
Tincture of aloes, ℥ ss
Syrup, enough to make ℥ vj.
Give a tablespoonful thrice daily.

℞. Extract of aloes, ℥ j
Dried sulphate of iron, ℥ ij
Asafetida, ℥ iv.
Make into 100 pills. Give 1 after each meal, gradually increasing to 3.

EMMETROPIA.—Normal or perfect vision. The condition of an eye whose shape and refractive media are such that, with suspended accommodation, parallel rays of light are brought to a focus upon the retina. For practical tests, rays of light from a point 20 feet away are considered as parallel.

EMOLLIENTS.—Substances that soften and relax the tissues to which they are applied. They relieve tension, dilate vessels, diminish pressure on the nerves, and protect inflamed surfaces from the air and from friction.

The principal emollients are: Hot fomentations, poultices, glycerin, lard, linseed oil, olive oil, spermaceti, almond oil, petrolatum, soap liniment, starch, cacao butter. See DEMULCENTS.

EMPHYSEMA, CUTANEOUS, OR SUBCUTANEOUS.—The presence of air or other gas in the subcutaneous tissues. The swelling begins at some point near the upper air passages, and may extend to the entire body. A characteristic crackling sensation, like that of brown paper, is imparted to the palpating fingers, and there is no pitting on pressure. The causes are: ulcerations of the upper air passages or of the esophagus; ulceration or rupture of tuberculous cavities; rupture of the lungs from hard coughing (whooping cough), crying, severe exertion, traumatism. It is frequently associated with fractured ribs.

EMPHYSEMA, GANGRENOUS.—Malignant cutaneous emphysema of microbic origin.

EMPHYSEMA, PULMONARY.—An abnormal condition of the lungs, in which excess of air is the feature. The bulk of the lungs is increased, while elasticity is lowered and the total respiratory surface is diminished.

Varieties.—(1) Vesicular or hypertrophic emphysema; (2) interstitial or interlobular emphysema; (3) atrophic emphysema; (4) compensatory emphysema.

Vesicular (Hypertrophic) Emphysema.—A disease of the lungs in which the alveoli and smaller bronchial tubes become overdistended with air; this is manifested clinically by enlargement of the chest, dyspnea, and hyperresonance of the percussion-note and prolonged expiration.

Etiology.—(1) Congenital weakness of alveoli and bronchial tubes; (2) high pressure in air-cells, caused by increased resistance on expiration, as in glass-blowers and those who blow wind-instruments; (3) the sequel of spasmodic asthma or chronic bronchitis (common).

Pathology.—The emphysematous chest is characterized by an increase of the antero-posterior and proportionately lesser increase of the transverse diameter of the thorax. The respiratory excursions are diminished, the thoracic cage being elevated instead of expanded during inspiration. The lungs are soft, like cotton, greatly enlarged, and do not collapse after being removed. The alveoli are greatly overdistended with air, giving rise to a thinning of the elastic coat. Frequently, the elastic tissue between two alveoli ruptures, and the two become converted into one sac. The epithelium of the bronchial tubes often shows a degree of fatty degeneration. The pleura is pale and frequently edematous. This pathologic condition gives rise to increased pressure in the blood-vessels, causing hypertrophy of the right ventricle.

Interstitial (Interlobular) Emphysema.—In this variety the air vesicles rupture from overdistention, and the air escapes into the surrounding interlobular tissue, forming small beads or bullæ. If the lungs collapse, a condition of atelectasis is produced. The lungs are soft and on pressure the air escapes with a creaking sound. According to the site and degree of extension of this escape of air, the emphysema may be even subcutaneous, or pneumothorax may be found. Interstitial emphysema occurs around wounds in which the tissues become gangrenous.

Atrophic Emphysema.—Occurs principally in the old. The lungs are greatly diminished in size and are filled with large air vesicles, the walls of which contain the remnants of air-cells.

Compensatory Emphysema.—Increase in size and function of one lung or part of a lung to compensate for loss of function due to disease in other portions.

Symptoms and Clinical Course of Emphysema.—The onset is gradual, marked by a distressing cough, with expectoration of whitish and very tenacious mucus. Respiration is labored and there is a great effort to get rid of residual air in the lungs, and forced respiration gives no relief. Slight exertion causes dyspnea and early exhaustion is the rule. The pulse is soft and accelerated and cyanosis about the lips may be observed.

Physical Signs. Inspection.—The emphysematous chest (barrel-shaped) with the anteroposterior diameter increased. During respiration the chest moves up and down as if in one solid piece. There is absence of the apex-beat.

Palpation shows diminished vocal fremitus and a feeble or entirely absent impulse over the precordia.

Percussion.—The percussion-note is hyperresonant. Cyanosis of the lips, ears, and hands is present; in long standing cases the fingers are club-shaped. Owing to the increase in the size of the left lobe, the upper border of the cardiac dulness is depressed and the excess of air in the lung may make it difficult to outline accurately the upper border of the liver.

Auscultation.—Inspiration is short; expiration is prolonged, low pitched and soft. The slight

amount of mucus nearly always present in the bronchial tubes gives rise to rales such as are found in bronchitis (sonorous and sibilant), to which the condition is often due. The heart-sounds are distant; usually there is accentuation of the pulmonary second sound of the heart.

Complications.—Bronchopneumonia, lobar pneumonia, dilatation of the right ventricle, tricuspid regurgitation, and dropsy.

Diagnosis.—

Emphysema.	Chronic Bronchitis.	Pneumothorax.
1. Frequently sequel of chronic bronchitis; disease bilateral.	1. Sequel of acute bronchitis; disease bilateral.	1. Sequel of tuberculosis; empyema may result from traumatism; disease unilateral, as a rule.
2. Great expiratory dyspnea; prolonged expiration.	2. Dyspnea slight or absent; expiration normal.	2. Dyspnea; expiration prolonged, more feeble than in emphysema.
3. Emphysematous chest.	3. Chest normal, except in later stages.	3. Phthisical chest or normal.
4. Diminished vocal fremitus.	4. Vocal fremitus normal.	4. If due to phthisis, vocal fremitus is increased.
5. Percussion-note hyperresonant.	5. Percussion-note normal.	5. Percussion-note hyperresonant.
6. Succussion produces no abnormal sound.	6. Succussion produces no abnormal sound.	6. Succussion produces a splashing sound; metallic tinkling may be heard.
7. Heart seldom displaced; upper border of heart dulness depressed.	7. Heart seldom displaced.	7. Heart generally displaced.

Prognosis is, on the whole, unfavorable, and is influenced by the complications.

Treatment.—The patient should avoid overexertion or excitement in every form. Short periods of absolute rest in bed may, therefore, be indicated. Systematic sponging with cold water, or cold douching if patient is strong enough, assists in toning up the tissues. Breathing exercises maintain the functional power of the unaffected portions of the lungs. That diet should be selected that is most nourishing, and that produces the least amount of flatulence. Sufferers from emphysema should spend their winter in a mild, equable region of low altitude where the air is dry.

As a rule, the great desire to get rid of the retained air in the lung is one of the troublesome symptoms, which a rest in bed may partially relieve. Frequently, there is an excess of mucus in the bronchial tubes, giving rise to a distressing cough. Prescriptions similar to the following may be indicated:

℞.	Tincture of digitalis,	ʒ ij
	Aromatic spirit of ammonia,	ʒ iv
	Simple elixir,	ʒ iv
	Water enough to make,	ʒ iij.

Two tablespoonfuls every 4 hours.

℞.	Strychnin sulphate,	gr. 1/4
	Tincture of belladonna,	ʒ j
	Elixir of curacoa,	ʒ iij
	Water, enough to make	ʒ iij.

Two teaspoonfuls every 3 or 4 hours.

For anemia:

℞.	Strychnin sulphate,	gr. 3/4
	Reduced iron,	ʒ j.

Divide into 30 capsules; 1 after each meal.

Or—

℞.	Strychnin sulphate,	gr. 3/4
	Mass of ferrous carbonate,	ʒ j.

Divide into 30 capsules; 1 after each meal.

For further treatment see Bronchitis (Chronic).

EMPLASTRUM.—See Plaster.

EMPROSTHOTONUS.—See Opisthotonus.

EMPYEMA.—Pus in the pleural cavity or in the chest. It may be *primary*, which is rare, or *secondary*. There is associated a hectic type of fever, with chills and sweating. Rarely empyema may rupture spontaneously through the lung or chest wall. Empyema is most frequently encountered in children, but may arise from pleurisy, tuberculosis, septic conditions, and infectious fevers in any individual. See Pleurisy, Tuberculosis. For **Empyema of the Antrum, or of Frontal Sinus.** See Nose.

EMULSIONS.—Aqueous, liquid preparations containing some insoluble medicinal substance in a state of minute subdivision, suspended by the aid of some viscid excipient, such as gum, that may be contained in the medicinal ingredient itself, or may be added by the pharmacist.

The chief emulsifying agents are: Acacia, tragacanth, yolk of egg, Irish moss, quillaja bark, extract of malt, casein, pancreatin, and gelatin. There are six official emulsions:

Emulsum Amygdalæ (emulsion of almond). Sweet almond, 60 grams; acacia, 10 grams; sugar, 30 grams; water, to make 1000 c.c. Demulcent. Average dose, 4 ounces.

Emulsum Asafetidæ (emulsion of asafetida). Asafetida, 40 grams; water to 1000 c.c. Antispasmodic. Average dose, 4 drams.

Emulsum Chloroformi (emulsion of chloroform). Chloroform, 40 c.c.; expressed oil of almond, 60 c.c.; powdered tragacanth, 10 grams; water to make 1000 c.c. Anodyne. Average dose, 4 drams.

Emulsum Olei Morrhuæ (emulsion of cod liver oil). Cod liver oil, 500 c.c.; acacia, 125 grams; syrup, 100 c.c.; oil of gaultheria, 4 c.c.; water to make 1000 c.c. Average dose, 4 drams.

Emulsum Olei Morrhuæ cum Hypophosphitibus (emulsion of cod liver oil with hypophosphites). Cod liver oil, 500 c.c.; acacia, 125 grams; calcium hypophosphite, 10 grams; potassium hypophosphite, 5 grams; sodium hypophosphite, 5 grams; syrup, 100 c.c.; oil of gaultheria, 4 c.c.; water enough to make 1000 c.c. Other appropriate flavors may be used. Average dose, 4 drams.

Emulsum Olei Terebinthinæ (Emulsion of oil of

turpentine). Rectified oil of turpentine, 15 c.c.; expressed oil of almond, 5 c.c.; syrup, 25 c.c.; acacia, 15 grams; water enough to make 100 c.c. Average dose, 1 dram.

Natural emulsions comprise two classes of substances: (1) Those emulsions that exist ready formed in nature, as milk, yolk of egg, the milky juices of plants, etc.; and (2) the mixtures formed by rubbing up gum-resins (as ammoniacum, myrrh, asafetida) with water. Each of the latter substances contains, together with its resin, enough gum to make a perfect emulsion when triturated with water. The manufactured emulsions are simply imitations of the natural ones, sufficient gum being added, in case of a resinous substance, to cause its suspension in the aqueous diluent.

Emulsification consists in the division of the oily or resinous substance into very minute globules, and the surrounding of each globule with a thin envelope of the excipient. If properly done, the globules will remain mechanically suspended in the water, without any tendency toward recombination. Milk is the best illustration of a natural emulsion, its butter existing in the aqueous portion as very minute globules, each surrounded by a thin film of casein. Yolk of egg is a dense emulsion, consisting of oil suspended in water by means of albumin.

A cod-liver oil emulsion:

℞. Cod-liver oil, ℥ ij
White wine, ℥ jss
Dilute phosphoric acid, ℥ iij
Syrup, ℥ v
Yolk of 1 egg,
Almond water, q. s. ad ℥ viij.

Mix and make an emulsion. Tablespoonful doses.

An alkaline emulsion of copaiba:

℞. Copaiba, Liquor potassæ, each, ℥ ij.

Mix and add—

Pulverized acacia, Pulverized sugar, each, ℥ ij
Peppermint water, q. s. ad ℥ iv.

Mix and make an emulsion. Tablespoonful doses.

ENCEPHALITIS.—See BRAIN (Inflammation).

ENCEPHALOCELE.—A congenital protrusion, containing in its sac some extracerebral fluid and a portion of the brain with its membranes. It is small, does not fluctuate, has a broad base, pulsates, becomes tense on forced expiration, is opaque, and when reduction is attempted, symptoms of brain-pressure are caused.

The treatment consists in the use of electrolysis. The following injection (Morton's fluid) is used:

℞. Iodin, gr. x
Potassium iodid, gr. xxx
Glycerin, ℥ j.

Mix thoroughly.

Pressure and excision are also employed.

ENCHONDROMA.—A tumor arising from or resembling cartilage in texture, etc.; chondroma. See TUMORS.

ENDARTERITIS.—Inflammation of the intima, or innermost coat of an artery. The *acute form* is rare, and occurs only in the aorta and the larger arteries. Ulceration is very rarely present. The *chronic form*, also named *atheroma*, and *arteritis deformans*, is a peculiar change or degeneration occurring in the arterial coats of the aged, and is preceded by a fatty degeneration of the tissues of the arteries. Syphilis is supposed to play an important part in the production of this condition. The immediate cause, however, is mechanic irritation due to the force of the circulation. The fatty débris and the cholesterin that are formed during the degenerative process accumulate in spaces beneath the intima, and constitute the so-called *atheromatous abscesses*. The so-called *atheromatous ulcer* is formed by one of these abscesses breaking through the intima. The sequels of *atheromatous degeneration* are very grave. Aneurysm, thrombosis, embolism, and apoplexy frequently result, and hence the ultimate prognosis is bad. **Arteriocapillary fibrosis, or arteriosclerosis,** is a peculiar change occurring in the small vessels throughout the body, and consists in a thickening of the adventitia and intima by a deposit of a hyaline-fibroid material that diminishes the caliber of the vessels, increases the arterial tension, and thus gives rise to the hypertrophy of the heart that is present in this condition. See ARTERIOSCLEROSIS.

ENDOCARDITIS.—Inflammation of the endocardium or lining membrane of the heart. Acute rheumatism and tonsillitis are frequent causes, though pneumonia, gout, or any infectious disease may precede. The valves are nearly always the parts affected, and usually those of the left heart. The disease is prone to terminate fatally or to result in permanent injury to the valves. Fibrinous deposits or vegetations project into the cavity of the heart; the thickened endocardium is liable to become atheromatous, with chronic ulceration. Acute endocarditis may be divided into *simple* and *malignant*. *Acute endocarditis* includes chronic disease of the valves of the heart. There is a fibrous or cirrhotic thickening of the latter, associated with contraction and calcification. Usually this chronic disease, like the acute, is confined to the left heart, and it is generally rheumatic in origin. *Malignant* or *ulcerative endocarditis* is also called *diphtheritic*, *infectious*, and *septic endocarditis*. It is a rapidly fatal type, due to septic infection. It is marked by high fever, chills and profound prostration. This is followed by the development of a murmur, purpuric skin eruptions, hematuria, delirium, convulsions, hemiplegia, enlargement of the spleen, the typhoid state, and death. Frequently no cause can be found. Ulcerations are found around and in the valves, and in these ulcers microorganisms are present in large quantities. See HEART-DISEASE (Organic).

ENDOCERVICITIS.—See CERVIX UTERI, UTERUS.

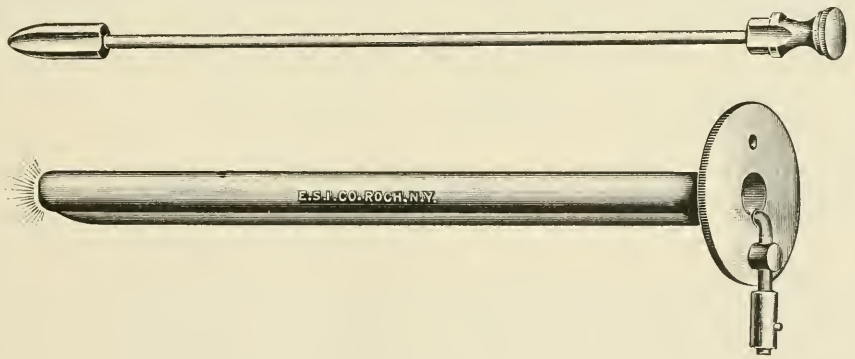
ENDOMETRITIS.—Inflammation of the lining membrane of the uterus. Endometritis may attack the cervix or the body of the uterus. See Uterus.

ENDOSCOPE.—An instrument designed for the direct exploration by sight of internal organs and cavities. It is not for general use, but intended as a means of *diagnosis* and *treatment* in exceptionally obscure cases. The urethral tube is the most generally used, but special tubes are employed for examination of the rectum, nasal fossæ, stomach, and other cavities and organs.

In Diagnosis.—A tube or speculum is first introduced, at one extremity of which is placed a mirror of polished silver, perforated in the center, and placed at an angle of 45 degrees. This mirror reflects the light, placed laterally into the tube so as to illuminate its end. A most brilliant light is required, since the caliber of the tube is small. To obtain the best effects, the light should slightly converge upon the mirror, which may be effected by placing a planoconvex lens of suitable focal length between the light and mirror.

Sunlight, daylight, and magnesium and electric lights are used. For electric illumination a power of from 8 to 12 volts is needed, while from 20 to 30 volts is useful for cautery. Carbolized oil or glycerin is needed for lubricating the tube. Direct illumination of the urethra may be obtained with the instruments of Nitze, Oberländer and Valentine. In Koch's urethroscope which also affords direct illumination, a small auxiliary tube for the light carrier and lamp is placed alongside the tube proper. As the lamp is thus outside the latter, it does not obstruct the view nor cast shadows. Applications can be made directly to the urethra; otherwise its walls are blanched and pain results.

In a number of cases examination with the endoscope has demonstrated that the inflammatory process does not extend deeper than to the mucous membrane, even after long duration; in such instances the urethra will not lose its elasticity nor suffer impairment of its extensibility, even after years. When the process advances deeper, the infiltration and the subsequent shrinkage will produce more intense thickening, and, later on, shrinkage, with loss of elasticity and narrowing of the lumen of the urethra itself, conditions usually called stricture. Endoscopy enables one to determine with a high degree of exactness how far inflammation has advanced in every single case and on every single spot, and thereby suggests the proper means for treatment. When the final stage is reached, and a true organic stricture has been found, the endoscope may still be of great value for diagnosis, in clearing up the configuration of the entrance of the stricture and sometimes to locate the spot through which an entrance by a bougie may be gained. The endoscope has confirmed beyond doubt the existence of the so-called spasmodic stricture, which had always formed a weak spot in the defenses of those who claimed perfection or superiority for the examination with bougies, etc. This spasm usually yields by the aid of the endoscope, and proves the absence of all pathologic conditions that might account for the obstruction to the progress of the instruments. Of great importance also have been the conclusions obtained by urethroscopy in regard to the participation of the different portions of the urethra in the continuation of chronic inflammation; it has



Koch's Urethroscope.

diseased parts under the guidance of the eye without having the applicator catch on the lamp when it is withdrawn. Instruments for illuminating the posterior urethra have been devised by Swinburne and Wossidlo. These urethroscopes have a curve conforming to the shape of the posterior urethra.

In examinations of the urethra a sound or bougie larger in its caliber than the tube of the endoscope, should be passed before using the tube, to encounter constrictions and to accustom the urethra to the presence of instruments. The caliber of the tube should not be large enough to stretch the

been demonstrated that every part from the meatus to the bladder may be the seat of pathologic conditions, and that therefore for a thorough diagnosis it is necessary to subject the full length of the channel to examination before decision as to diagnosis and appropriate treatment can be given.

In Treatment.—The endoscope is of practical value in three different ways: (1) The determination of the nature and of the location of pathologic conditions supplies, in the most exact manner, information, by means of which those therapeutic measures that promise the best and quickest

results may be selected and applied to the proper spot; (2) by freely exposing the diseased portions to the eye and bringing them within easy reach, endoscopy naturally renders possible and invites the application of suitable drugs with great exactness to those parts, and to them only, thereby allowing of the use of much stronger and more effective remedies, which would injure any but the affected portions; (3) the surgeon is enabled by the endoscope to control the effects of any treatment, applied through the endoscope or otherwise, so that he is enabled to tell whether the adopted treatment is successful or not. The field for the endoscopic treatment proper is, perhaps, a limited one, but not so limited as some believe. It is principally indicated in those superficial inflammations in which circumscribed patches of the mucous membrane, wherever located, have undergone certain changes, which cannot be affected any more by the usual injections of astringents or parasiticides, because those remedies are powerless in the solutions that may be syringed into the urethra without injury to the healthy or less seriously affected portions. By using as a brush the simple cotton tampon twisted around a wooden stick or a wire, much stronger solutions or powders, or even caustics, may be applied to the diseased spot. Surgical instruments and the cautery may be used.

ENEMA.—A liquid injected by means of a suitable instrument into or through the rectum. Enemata are demulcent, laxative, nutritive, stimulant, or vermifuge in character. Warm or tepid water, with medicaments incorporated therein, is chiefly used, but plain water may be used as a wash for the bowel.

A simple domestic enema consists of soapsuds with a little common salt, or a pint of cold water. Warm water or gruel is sometimes used; or to one or the other of these is added soap, turpentine, or castor oil, with soap or gruel, to suspend the two latter. Very cold water may be used without inconvenience. Starch, boiled or raw, of cream consistence, temperature 100° F., with a few drops of laudanum may be used in extreme cases of choleraic diarrhea, or that of phthisis or typhoid fever.

The instruments used for administering enemata are (1) An elastic bottle with ivory or gum-elastic pipe; (2) an india-rubber bottle with flexible tube at either end and double action; (3) an ordinary piston syringe, worked by the hand, which is either simple or provided with a double action so as to supply a continuous stream; (4) a French instrument, known as the irrigator, worked by a spring; (5) the hydraulic enema (fountain syringe, consisting of a piece of rubber tubing about 6 feet long). The tube, filled with the injection, has one end placed in the containing reservoir, while the other end is connected with the bowel. When the vessel supplying the injection is elevated, the liquid gravitates into the bowel, filling the large intestine. The patient should lie first on the left side, when a large quantity is to be injected into the bowel, then on the back, and finally on the right side, to promote the filling of the intestine. Care should be exercised that the nozzle of the injecting pipe is not in contact with the sphincter nor thrust against the sacrum nor into feces. The injection must be carried on slowly, with occasional pauses, otherwise expulsion of the enema will result.

Anthelmintic Enemata.—Injections of salt and water or of lime-water, or 2 to 4 drams of spirit of turpentine, held in suspension by the yolk of an egg in 4 ounces of water, are used to expel thread-worms. An enema of aloes, quassia, or asafetida may likewise be employed.

A vermifuge enema:

℞. Fluidextract of quassia, ʒ jss
Water, ʒ ijss.

A tablespoonful with an equal quantity of warm water as an enema, to be retained as long as possible.

Antispasmodic Enemata.—Chloral hydrate (1/2 of a dram or more) is injected in puerperal convulsions. Injections of asafetida or of rue are also useful. Sulphuric ether (2 or 3 drams) in warm water may relieve spasmodic invagination of the bowel. Enemata of turpentine or of asafetida will act as stimulants and carminatives.

Astringent Enemata.—An enema of opium is useful to check diarrhea. Ice-cold water used as an enema will arrest intestinal hemorrhage. Enemata of silver nitrate (5 grains to the pint of distilled water), of zinc sulphate or alum (1 or 2 grains to the ounce of water), or copper sulphate (1 grain to the ounce), are especially useful in ulcerative conditions with mucous discharges.

Emollient Enemata.—Decoctions of starch, linseed, or barley, or of pure linseed oil, will soothe irritable mucous membranes. From 4 to 6 pints of warm water, or of milk and water, will make an internal fomentation.

A demulcent enema:

℞. Tincture of opium, ♏ xx
Decoction of starch, ʒ iv to vj.

Nutritive Enemata.—Peptonized milk, beef-tea, and eggs beaten up together make a good nutritive enema. From 4 to 6 ounces are to be used at once. If there is rectal irritability, a few drops of laudanum may be added to each enema. Preparations of pancreatin and pepsin facilitate assimilation of nutrient enemata. Brandy and water, or beef-tea and brandy, are of benefit in prostration from uterine hemorrhage or other causes.

Nutrient enema:

℞. Beef-tea, ʒ iv
Hydrochloric acid, ♏ x
Glycerite of pepsin, ʒ ij.

If the rectum is irritable, add 10 to 20 drops of laudanum.

Sedative Enema.—The enema of opium is very useful.

Purgative Enemata.—As many as 4 or 5 pints

can be forced into the bowel, when the process is gradual, with occasional intervals and pressure on the anus. As a rule, a pint is enough for an adult, 4 to 6 ounces for a child of 4 years, and 1 ounce for an infant. Glycerin is now used commonly for injection into the rectum, 1 or 2 drams being employed. There is always more or less straining and expulsion of flatus. Glycerin suppositories are more practical, and are taking the place of enemata. Injections of large volumes of soap and water—sometimes with oil added—are used in intestinal obstruction; in combination with massage of the abdomen, obstruction due to impacted feces is speedily overcome.

Frequent use of large injections is undesirable, while the habitual use of injections washes away the mucus designed to lubricate the bowel.

ENOPHTHALMOS.—A term applied to retraction of the eye within the orbit. It depends upon the absorption of the orbital fat, decrease in the contents of the orbital vessels, or great loss of fluid from the body after intense purging. Traumatism involving the walls of the orbit may produce enophthalmos on the side affected. Senile enophthalmos is bilateral, and is due to the gradual absorption of orbital fat in old persons.

ENTERALGIA.—Pain in the bowels. See Colic, Dysentery, Enteritis, etc.

ENTERECTOMY.—See Intestines (Surgery).

ENTERIC FEVER.—See Typhoid Fever.

ENTERITIS.—A catarrhal inflammation, usually affecting the small intestine, but occasionally involving the large bowel as well.

Varieties.—(1) Acute catarrhal enteritis; (2) chronic catarrhal enteritis; (3) croupous (or diphtheritic) enteritis.

Synonyms of Acute Catarrhal Enteritis.—Acute diarrhea; acute intestinal catarrh; acute ileocolitis.

Synonyms of Chronic Catarrhal Enteritis.—Chronic enterocolitis; chronic diarrhea.

Etiology.—(1) Improper food or overeating; (2) organic or mineral poisons; (3) spring or summer season, with sudden change in the weather; (4) nervous conditions; (5) certain diseases, as tuberculosis, typhoid fever, dysentery, septicemia.

Pathology of Catarrhal Enteritis.—The mucous membrane is hyperemic and swollen. The surface is covered with a serous or purulent material, containing a large number of leukocytes and desquamated epithelial cells. Peyer's patches are usually swollen and are distinctly outlined, and in their centers may be seen slight erosions. In chronic enteritis, usually, there is an overgrowth of the connective tissue. In membranous enteritis shreds of membrane, of a yellowish or grayish color, are detached from the lumen of the bowel.

Symptoms and Clinical Course. Acute Catarrhal Enteritis.—Diarrhea is the most common symptom of acute catarrhal enteritis. The stools are generally thin or watery in character, brownish or yellowish in color, and often stained with bile. The odor, which at first may be very offensive, later becomes less so. The stools may contain particles of undigested food (lienteric diarrhea), and the evacuations are accompanied by a great deal of flatus. Pain is mainly abdominal and of a colicky character. Fever is generally absent. The duration of the disease is from 2 to 3 days.

Chronic Catarrhal Enteritis.—This may follow the acute form. Diarrhea is present, but pain is not so severe as in the acute form. If the upper portion of the small intestine is affected, large quantities of undigested food may be passed in the stools. The mucus is excessive, whitish in color, and often semisolid in character.

Croupous (or Diphtheritic) Enteritis.—This is generally a sequel of typhoid fever, nephritis, cirrhosis of the liver, or carcinoma. In one variety the membrane may be yellowish or grayish, and firmly adherent to the mucous coat of the bowel. It may be detached and passed off with the feces. In another group it may be flaky or appear in crusts, and at times no membrane is formed, but the process attacks the lymphoid follicles, giving rise to necrosis and ulceration.

Diagnosis.—

Acute Catarrhal Enteritis.	Dysentery.	Enterocolitis.
1. Stools thin and brownish in color, often containing mucus and sometimes particles of undigested food.	1. Stools variable; generally contain a large quantity of mucus tinged with blood; bright red blood may be passed from bowel.	1. Stools yellowish in color or variable in the beginning, later become greenish, and finally whitish mucus may be passed; chiefly occurs in children.
2. Pain located in abdomen, of a colicky character.	2. Tenesmus often extreme.	2. Tenderness exists over area of colon.
3. Fever slight or absent.	3. Moderate fever (100°–102° F.).	3. At first fever high, attended by convulsions; later, collapse ensues and temperature may be subnormal.

Prognosis.—In the acute form the prognosis is good; in chronic enteritis and membranous enteritis it is unfavorable.

Treatment of Acute Catarrhal Enteritis.—Absolute rest and a liquid diet, principally composed of milk, soups, and beef-broth, are indicated. In the beginning it is always well to give a purgative, such as magnesium sulphate (4 drams), Rochelle salts (4 drams), or castor oil (4 drams), to remove all products of putrefaction and irritating particles that might otherwise give rise to autointoxication.

Subsequently, if the bowels should move too frequently and the pain increase, tincture of opium (10 minims) may be given every 3 hours. If the pain is severe, morphin (1/4 of a grain) should be given hypodermically.

Intestinal antisepsis should be secured so far as possible, and naphthalin or salol may be given:

℞. Codein sulphate, gr. iij
Bismuth subnitrate, ʒ ss
Naphthalin, ʒ ss.
Divide into 6 powders; 1 powder every 2 hours.

Salol (3 grains) may be substituted for the naphthalin in the foregoing prescription.

The "sun cholera mixture" may also be given. See CHOLERA.

Treatment of Chronic Catarrhal and Croupous Enteritis.—The patient should be put upon the strictest regimen possible, and in order to do this successfully, rest in bed is best. The diet should be mainly composed of pure, fresh milk, and if the digestive powers are good, the milk may be boiled. No article of diet should be allowed that can in any way irritate the congested bowel, and those foods should be chosen that have the least residue, such as carbohydrates, soups, beef-juice, sweet milk, cooked fruits, and vegetables. Beef-juice is very nourishing, and may be obtained in the following manner: Take a piece of tender-loin or porterhouse steak cut an inch thick; after sprinkling with a small quantity of pepper and salt, and spreading over it a sufficient amount of butter, the steak is placed in a pan upon a hot stove and allowed to brown on one side; it is then quickly turned, and after a moment or two is removed and cut in small pieces, which may be chewed by the patient, permitting only the juice to be swallowed. Soft-boiled eggs may also be given. The white portion of the eggs may be prevented from hardening by placing them in hot water in a tin bucket (covered and surrounded by a blanket), and letting them stand 10 minutes.

Hot biscuits and hot bread are to be forbidden. Bread a day or two old is best. Crackers may be substituted for bread.

In beginning the treatment the bowels should first be cleansed by means of a saline purge: *e. g.*, by magnesium sulphate (4 drams), or calomel in fractional doses (1/4 grain), combined with bismuth subnitrate (4 grains). Subsequently, it is well to prevent putrefaction in the digestive tract by administering intestinal antiseptics, such as naphthalin (5 grains), salol (5 grains), and iodoform (3 grains). Bismuth salicylate or bismuth subnitrate may be combined with any one of these substances. It should be remembered that salol contains over 30 percent of carbolic acid, and should not be given continuously for periods longer than 5 days, on account of its irritating effect on the kidneys. Silver nitrate (1/4 grain) is valuable when taken before meals in half a glass of water. It may also be given by high enema once every day or two in doses of 5 grains. Argyrol is a suitable form of silver for this purpose; ten grains in three ounces of water may be injected twice a day, or a colonic irrigation with 1 to 4 pints of a 1 to 1000 solution may be substituted. The high injection can best be given by means of a rectal tube and a fountain syringe. Lavage may be of great benefit in combination with other measures.

ENTEROCLYSIS.—Injection of salt solution or nutrient material into the intestine in cholera, collapse, etc.; more generally, any rectal enema or clyster. See ENEMA, TRANSFUSION.

ENTEROCOLITIS, ACUTE.—An acute catarrhal inflammation of the intestinal tract due to bacterial infection and characterized by fever, diarrhea, rapid loss of flesh and a strong tendency to a fatal termination.

Synonyms.—Acute ileocolitis; follicular enteritis; follicular dysentery; summer diarrhea; milk-infection; food-infection.

Etiology.—The direct cause is infection by bacteria introduced in most cases with the milk; the most important are the bacillus coli communis and others of the same group, staphylococcus and streptococcus, colon bacillus and bacillus pyocyaneus. Tyrotoxicon, a poisonous ptomain contained in stale milk is an occasional cause. Among predisposing and exciting causes are: prolonged summer heat with excessive humidity; sudden changes of weather; the presence of simple indigestion; general want of cleanliness and faulty hygiene. Bottlefed babies show less resistance than infants reared on breast milk who are comparatively rarely attacked. The great majority of cases are caused by infected milk.

Symptoms.—During the initial stage the symptoms are those of acute indigestion—vomiting, diarrhea, moderate fever, thirst, anorexia, and abdominal pain. The fever soon rises to 103° or 104°, the diarrhea increases in severity, and tenesmus is added to the abdominal pain. The urine is scanty and of high specific gravity; albumen and casts are usually present. The stools number from 4 to 12, or even more, in the 24 hours and occur immediately or soon after taking food. The most conspicuous change in the stools is the green color due to the presence of chromogenic bacilli; the consistence is watery; particles of mucus, curds and occasionally blood, are present. The odor is sour and the discharges may be frothy from the presence of yeast. The disease may abate here and convalescence be established, though recovery is protracted; or the symptoms may increase in severity, the fever persist, the stools be painful and small, consisting mainly of mucus and blood. The child wastes away to a skeleton, the skin becomes loose and flabby, and the senile appearance is assumed. Absolute inability to take food is soon followed by the gravid symptoms of intoxication, convulsions, head-rocking, stiffness of the neck, strabismus and other signs suggesting meningitis. Coma and death may occur at any time even, during the first week, or the case may last 5 or 6 weeks, terminating fatally, or in recovery. Relapses after convalescence are not uncommon, and should be guarded against.

Diagnosis.—The diagnosis presents no difficulties. Acute enterocolitis is characterized by greater severity than simple *acute indigestion* or dyspeptic diarrhea—high fever, a large amount of mucus in the stools, greater pain, suffering, and more rapid decline. From *cholera infantum* it differs in its lower hyperpyrexia, the infrequency and milder character of the vomiting, of the colliquative diarrhea, and of collapse.

The stools alone are characteristic, showing a change from normal yellow color to green. Prostration shows itself early and removes any remaining doubt. The acute infections, pneumonia, typhoid fever, may begin with symptoms pointing to the intestinal tract, and pneumonia is a not uncommon late complication in summer diarrhea. In *typhoid fever* there is as a rule less vomiting, the temperature is higher, splenic enlargement is usually present in children; the stools do not exhibit the characteristic green color. A positive serum reaction and the appearance of rose spots will clear up the diagnosis after the first five days. Severe cases of enterocolitis may suggest *intussusception*, in which, however, the paroxysmal pain, prostration, and evacuation of mucoid, bloody stools precede the fever, and a tumor is present in the left iliac region.

Prognosis.—This is very much influenced by early, appropriate treatment and by *social conditions*—the possibility of improving the hygiene enforcing cleanliness, suitable food, ventilation and, if necessary, a change to country or seashore. *Age* is an important factor, babies in their second summer, when teething is most active, being proverbially a source of anxiety. "Being a baby must be classified as an extra-hazardous occupation." *Previous vigor*, which is dependent upon previous methods of feeding and the care or neglect of digestive disturbances during the winter, is an important factor; the prognosis in bottle-fed infants and in those who have had repeated attacks of diarrhea is distinctly more grave. The average *duration* is from 3 to 4 weeks, but with careful management recovery is not impossible even after a long and severe attack. The violent, dysenteric forms, with early prostration and bloody stools from the outset, usually end fatally in a week or earlier.

Treatment.—*Prophylactic* measures are obviously directed toward maintaining a favorable hygienic environment. The first departure from health must receive immediate attention.

The *indications* are: (1) removal of the cause, which is an infected food supply; (2) prevention of reinfection; (3) maintenance of the patient's strength. The first is met by immediate *withdrawal of milk* and all other foods except barley or rice-water, albumen water, beef-juice or peptone preparations, until the diarrhea is under control. The strictest attention to *hygiene* is imperative; the room must be well ventilated or, if possible, the baby kept out of doors most of the time. If the heat is excessive, the air must be cooled by means of electric fans, ice, etc., and in grave cases immediate removal to the seashore is to be urgently advised. The discharges must be disinfected, clothing treated with antiseptic solutions, such as 1 to 1000 bichlorid of mercury, the drinking-water boiled, and fly-pollution combated in order to *prevent reinfection*. When feeding with milk is resumed, all the rules of infant-feeding must be observed until complete recovery, and the advent of cool weather removes the danger of reinfection.

Medicinal and Local Treatment.—The intestinal tract must be emptied at the outset by administering *castor oil* in 1- or 2-dram doses, or fractional doses of *calomel* (1 to 1 1/2 grains in 1/4-grain doses at intervals of 1/4 hour), and this treatment repeated according to indications every 3 or 4 days. *Bismuth subnitrate* or *subcarbonate* is usually recommended; it must be given in large doses, frequently repeated (10 grains for a child of one year to eighteen months every hour or every 2 hours) in order to have any effect. The addition of 3 drops of castor oil to each powder adds to the astringent effect. *Salol, salicylic acid*, and other so-called intestinal antiseptics have their adherents; sulphocarbolate should not be given to infants on account of the danger of intoxication. More effective than any medicinal treatment is thorough and systematic irrigation of the intestinal tract. An initial *enteroclysis* should never be omitted and, if necessary, may be repeated 2 or 3 times in the twenty-four hours, according to indications. Simple salt solution, boric acid or a mild solution of bicarbonate of sodium may be used, and the quantity may vary from 2 to 4 pints for each enteroclysis. Besides cleansing the intestines, this treatment restores the fluid that has been drained from the tissues and neutralizes the acidity of the body-juices. If prostration is extreme, *hypodermoclysis* may be substituted for the colonic irrigations, from 1 to 2 ounces of salt solution being injected 2 or 3 times in the twenty-four hours. *Fever* is controlled by hydrotherapy. *Convulsions* sometimes occur and sedatives are required; sodium bromid, 5 to 10 grains, and 2 to 5 grains of chloral hydrate, administered by the rectum, make a suitable prescription. A hot mustard bath or mustard compresses to the extremities are sometimes needed if the child goes into *collapse*, with cold hands and feet. If alcohol is given as a stimulant, *brandy* should be given the preference, administered by the rectum or, if necessary, subcutaneously. Finally, to check an excessive diarrhea that threatens to kill the patient by exhaustion, opium may be demanded. The drug should not be given, however, unless the indication is imperative. Diarrhea is to a certain extent a necessary eliminative act and must not be interfered with too soon; the character of the stools is more significant than the daily number of evacuations.

ENTEROPTOSIS.—See Visceroptosis.

ENTEROTOMY.—See Intestines (Surgery).

ENTROPION.—Inversion of the eyelid so that the lashes rub against the globe of the eye, producing inflammation, pannus, etc. It may be cicatricial, organic, or spastic in origin. See Eyelids.

ENURESIS.—Incontinence of urine. A frequent affection of early childhood, due to a variety of pathologic conditions, including the presence of ascarides, phimosis, and vulvitis. See Urine (Incontinence).

ENZYMOL.—A glycerin aqueous acid extract derived from the fresh animal gastric mucous membrane. It is said to be efficient when applied to suppurative and necrotic surfaces for the removal of pathologic material.

EOSINOPHILIA.—See Blood (Examination).

EPHELIS.—See FRECKLES.

EPICARIN.—A combination of betanaphthol and creosotic acid. It is a nonpoisonous parasiticide, which has been used as a 5 to 10 percent ointment with lanolin as a base, for scabies and prurigo with most satisfactory results.

EPIDIDYMITIS.—See TESTICLE (Inflammation).

EPIGASTRIUM.—The region at the upper and central part of the abdomen, just below the ensiform cartilage, between the sloping margins of the thorax down to the level of the ninth cartilage, corresponding to the "pit of the stomach." The structures occupying the epigastrium are the greater part of the stomach, a small portion of the liver, a part of the pancreas, the aorta giving off the celiac axis and superior mesenteric branch, the vena cava inferior, the veins forming the commencement of the portal vein, the receptaculum chyli, and the solar plexus. See ABDOMEN.

The abnormal sensations referred to the epigastrium are generally associated with the stomach. Sensations of throbbing or sinking at the pit of the stomach are usually of a nervous character, and generally occur in women. The sensation of hunger is referred mainly to the epigastrium, and the pain felt here is usually relieved by the taking of food. Vomiting or retching causes pain or aching in this region, and heartburn is referred to the epigastrium. Pain deeply situated and shooting toward the back is usually due to disease of the posterior part of the stomach or pancreas or to aneurysm. Extreme emphysema, and collections of air or fluids in the pleura, or extensive pericardial effusions, give pain just below the ensiform cartilage. In Addison's disease and in pernicious anemia a deep pain is referred to the epigastrium, probably connected with the sympathetic plexuses.

Physical examination of the epigastrium shows:

1. The rate of respiration.

2. Morbid conditions of the abdominal wall. The recti muscles are often hard and rigid on examination, and serious lesion may be suspected.

3. Growths connected with the peritoneum, especially the great omentum, may be felt.

4. Abnormal states of the stomach, such as dilatation, carcinomatous infiltration or thickening, localized tumor, etc.

5. Disease of the liver, in which the abnormal physical signs are noticed especially in this part. The gall-bladder may be displaced.

6. Pulsation, which may be due to displacement of the heart, enlargement of its cavities, pulsating aorta, enlarged pancreas, or abscess of the liver, etc. A murmur may sometimes be heard here, usually a conducted cardiac murmur, occasionally an aneurysm.

See ABDOMEN (Examination, General Physical Diagnosis).

EPIGLOTTIS.—A thin fibrocartilaginous valve that aids in preventing food and drink from passing into the larynx. See NECK (Injuries), LARYNX (Examination).

EPILEPSY. Synonyms.—Sacred disease; morbus comitialis; great disease; falling sickness; grand mal.

Definition.—Epilepsy is a disease manifested or characterized by a periodic disorder of consciousness and by muscular convulsions, either of which may be absent in exceptional cases. There are all possible gradations of disorders of consciousness, from complete loss to that of a perfect retention of it. A complete loss of consciousness for a longer or shorter period of time is the general rule. The muscular phenomena in epilepsy are similarly subject to variation, but are less frequently absent than a loss of consciousness.

The epileptic population in the United States is estimated as 1 in 500. In France the percentage is still higher, while in many European countries no accurate estimate can be made, through lack of reliable data. The existence of epilepsy in ancient times is well established.

The muscular convulsions of epilepsy may be tonic (continuous rigidity) or clonic (muscular contraction alternating with more or less complete relaxation). Usually a tonic stage begins the convulsion, being a severe form of spasm. There is no fixed and constant rule for the order of occurrence of tonic and clonic spasm. Severe convulsions rarely consist of prolonged tonic contraction throughout; a continuous clonic spasm is much more common.

Classification.—The existing classifications are not satisfactory. The simplest and most universally recognized is the division into *organic*, based upon a definite brain-lesion or condition, and *idiopathic*, a name implying ignorance of the cause of the disease.

The etiology of epilepsy is conveniently divided into the *immediate* and the *remote* cause. The *remote* cause consists mainly of hereditary factors favoring a predisposition in the individual epileptic. An inherited tendency, indicated in epilepsy or insanity or other nervous and mental diseases in some immediate or collateral branch of the patient's family, is found in over three-fourths of all cases. Low physical and mental types with criminal or delinquent tendencies are very frequently found in the family history. Inebriety and syphilitic conditions play a very important rôle, as well as many other unhygienic vices. Degenerative bodily diseases, such as neoplasmic growths and tuberculosis, are of very frequent occurrence in the neurotic family types.

Women suffer from epilepsy a little more frequently than men—about in the ratio of 7 to 6. Seventy-five percent of all cases begin in childhood, under the age of 16. It is especially frequent in early infancy. It is not limited to any particular period of life, although it seems to occur most about the physiologic epochs. So-called retarded epilepsies may be seen in advanced life, even after 80 years of age. Much doubt rests upon the nature of seizures occurring for the first time in extreme old age. Frequently senile convulsions are mistaken for true epilepsy. The two conditions are probably analogous in many respects.

Of the *immediate* cause, a poor physique, with a handicap of neurotic hereditary factors, is most often found. Abnormal and difficult labor plays no small part in the causation in many cases,

and prolonged labor is doubly as injurious as the possible injury of instrumental delivery. Almost all cases having convulsions at birth are due in greater part to prolonged labor. The presence of unilateral convulsions of series in infancy, with history of after-palsy, however slight or transient, of one side, should always lead one to suspect a palsy lesion of the brain. This fact was mentioned by Bravais half a century ago, and Sachs and Freud, of our day, have urged the point anew.

In many cases eyestrain has been found to be the reflexly exciting cause of epilepsy, the wearing of the correct lenses required effecting a cure.

Rachitis and malnutrition aggravate many epileptic predispositions into a distinct disease. The infectious diseases cause about 1 percent of epilepsies, and more cases of epilepsy owe their origin to scarlet fever than to all other infectious diseases combined. Intestinal worms may cause convulsions in infancy, which may persist later as true epilepsy. Masturbation is no longer looked upon as causing epilepsy so much as aggravating the disease when it once becomes established. This last statement is also true in regard to sexual excesses.

Trauma of the cranium, although it may not cause a distinct fracture or immediate pressure-symptoms of the brain, may still disarrange the component molecules of the cerebrum in such a manner as to provoke epileptic symptoms with a predisposition to the disease.

Disorders of menstruation sometimes favor the onset of epilepsy, especially at the age of puberty. Puerperal women with eclampsia without a very marked predisposition rarely become epileptic from the bearing of children.

There are many cases provoked by seemingly slight and altogether insignificant causes. This phenomenon can only be explained by supposing that the patient was strongly predisposed to the disease; as to what chemicobiologic change or state lies back of this is not clear.

Pathology.—The etiologic pathology of epilepsy is still unknown.

Symptoms and Diagnosis.—In considering symptoms manifest in attacks, the **premonitory signs** are the first encountered. They may be present for hours, days, or weeks before the paroxysm actually occurs. They may even become constant, and these form the epileptic disposition. They may consist either of a motion, sensation, or, more commonly, a peculiar irritable, disagreeable, depressed, or exalted mental state in various combination.

The aura is found in about 75 percent of all epileptics, although but one-half of this number have the aura for a sufficient length of time before the seizure to make it of practical value in avoiding the disagreeable consequence of an epileptic paroxysm or in preventing accidents from falls in attacks. The aura of epilepsy is always a subjective symptom, and signifies that the pathologic physiology of an epileptic fit has already begun in the cerebral cortex. Sometimes seizures are aborted at the aura, and then attacks consist only of this symptom in the varied sensory, motor, and psychic manifestations.

Auras are divided into sensory, psychic, and motor. In the order of their frequency, *sensory auras* comprise three-fourths of the whole phenomena. All known possible physiologic sensations of the body may serve for the aura, and it may manifest itself in any part of the body.

The psychic auras generally consist of emotions of fear, joy, hate, anger, pleasure, or pain. *The motor auras* consist of muscular twitchings in the extremities or face, or about the mouth and eyes. Just before the spasm becomes general, and as the patient is about to fall, is heard the epileptic cry, or, better, groan.

It is very necessary to observe the order of *muscular invasion.* The new era of cerebral localization has really made this study of paramount importance. All possible variations of the invasion are fairly constant in the same cases. The spasm generally begins at the free end in one extremity, and quickly involves all muscles of that side, finally crossing to involve the opposite side in like manner. In a severe seizure the muscular spasm generally begins by the body becoming fixed in severe tonic spasm for a few seconds, and then the condition gradually gives way to a fine, general tremor, which grows coarser until the typical clonic condition is present. In a few seconds the clonic spasm becomes less marked until it finally ceases altogether in one or two general jerking movements, which toss the head and extremities about with more or less violence, and the patient once more breathes deep and loudly, snoring like one in narcosis of chloroform or ether. This last stage is the stertor period.

In the majority of all cases there is an initial pallor during the convulsion, best noticed in the face, which is quickly followed by a deep suffusion and congestion, ending in extreme cyanosis, which, in turn, may persist in a more or less marked degree for hours. In the clonic period the tongue is usually bitten at one side or the other, which side is, for the most part, constant in the individual patient. Frothing at the mouth or nose occurs in the clonic period. Vomiting may occur in many patients at any time throughout the paroxysm. Care must be exercised to prevent vomited matter from entering the trachea. Frequently, accompanying the depression of seizures there is marked constipation for days. The contents of the rectum may be expelled, and urine frequently voided, sometimes during the attack.

Undue sudden physical or mental strain may cause an attack to appear at any time. The emotional element is often markedly prominent. Attacks are often prevented or postponed, when naturally presenting themselves, by applying some slight mental or physical shock to the patient, thus increasing the inhibitory control of the nervous centers.

Minor attacks of epilepsy consist of a lessening of all the exaggerated symptoms seen in major epilepsy, or *grand mal* attacks. They may consist entirely of a disorder or loss of consciousness.

Epileptiform seizures, or epilepsy following gross brain-lesions, are often mild, and localized to the side partially paralyzed. The paralytic symptoms are almost always increased after epileptic fits, from exhaustion of the previously weakened center. Palsy is often very difficult of detection. Too much attention cannot be given to the search for it. In the mild cases it frequently appears to be idiopathic epilepsy.

The very temporary character of the exhaustion —paralysis after certain kinds of epilepsy—is sufficient to differentiate it from a chronic palsy, however slight.

The mental disturbance following one attack, or oftener a series of fits, may vary all the way from mild mental automatism into delirium or stupor and persistent coma, delirious mania, mania, and systematized epileptic insanity. There are frequently fury and violence in the automatic state after fits. Occasionally, this condition precedes seizures.

The occurrence of one epileptic fit presupposes that another will follow in a more or less short period of time. Thus the disease quickly establishes itself, and soon becomes chronic in its course.

Epilepsy may be stimulated by hysteria, but the main differences are shown in the following table:

Epilepsy.	Hysteria.
1. No apparent cause.	1. Cause, emotional.
2. Sudden and rapid onset.	2. Onset gradual, usually after some mental excitement.
3. Aura generally present.	3. Globus hystericus or palpitation.
4. Consciousnesss lost.	4. Consciousness generally preserved.
5. Pupils generally dilated.	5. Pupils normal.
6. Tongue often bitten.	6. Tongue never bitten.
7. Patient very liable to hurt himself.	7. Patient not liable to hurt himself; may injure others.
8. May be involuntary bladder and bowel discharges.	8. Never.
9. Of short duration.	9. Duration longer.

The prognosis of epilepsy as to recovery is poor; only about 2 percent of patients recover. The absence of attacks for a few months is not unusual in epilepsy; if a period of 2 years elapses, the patient will probably not have any more seizures. The prognosis as to life is variable. Epilepsy may last a few years or throughout a long life. It not infrequently persists for over half a century. Patients most frequently die of some intercurrent disease; death during a convulsion is very rare. The mental sequels of epilepsy are by far the most to be dreaded. Progressive mental enfeeblement is the rule, but this cannot be charged to any particular kind of epilepsy in origin or course. Most mental failure occurs in those epileptics having the most frequent *grand mal* attacks. Patients having psychic attacks are not predisposed to mental failure more than other epileptics with *grand mal* or *petit mal* attacks.

Epileptics are particularly susceptible to valvular lesions of the heart, mitral insufficiency being most frequent. Of lung affections, epileptics die most frequently of tuberculosis and congestive disorders, such as lobar and lobular pneumonia.

By far the greater danger to the epileptic lies in the disease itself—that is, in the repeated occurrence of seizures one after the other in rapid succession until exhaustion and death occur. The condition is called *status epilepticus*. It is the necessary climax or acme of the disease. There are many grades of the condition and many varieties in different cases, but the essential symptoms of the status are as follows: Repeated attacks, followed by increasing stupor until coma is reached; an increasing rise in temperature, pulse-rate, and respiratory frequency; the temperature may rise to 107° or even higher; the pulse-rate may reach 180 or 200, the respiration 60, or even higher as death approaches.

A scheme for case-examination in epilepsy is as follows:

Number, name, age, religion, social status, address of nearest relative.

Family History.—Phthisis, rheumatism, inebriety, consanguinity, feeble-mindedness, rachitis, insanity, epilepsy or other convulsive diseases.

Number of brothers and sisters, which child in order of birth, number of deaths in family and their cause, habits of parents and relatives.

Habits of Patient.—Diet, appetite, digestion, sleep, alcohol, tobacco, narcotics.

Personal History.—Prenatal causes, if any; injury at birth; convulsions at birth; convulsions at dentition; diseases of childhood—scarlet fever, measles, typhoid fever; bottle- or breast-fed; laryngismus stridulus; croup.

Cause of Epilepsy.—Syphilis, masturbation, sexual excesses, headaches, epistaxis, trauma.

Disorders of sleep in family or patient, night-terrors, paralysis in infancy.

Kind and quality of work while at school, degree of education, occupation and regularity of work.

First Seizure.—Character of disorder in consciousness, aura, subsequent stupor, subsequent mental state, subsequent paresis or aphasia, character and duration of subsequent seizures, time of day when attacks occur most frequently.

Primary Movements.—Order of invasion and side most affected, sphincters, conditions that cause or arrest attacks, mental state in interim, memory, disposition, frequency of attacks at present, date of last attack.

Manifestations of Hysteria.—Automatism, hallucinations, pallor, flushing.

Heart, pulse, circulation, lungs, respiration, bodily condition, hearing, sight, pupils, speech, skin, bowels, tongue, superficial reflexes, deep reflexes, motion and coordination, dynamometer (right, left), stigmata of degeneration.

Menstruation.—First occurrence, character, length of time present, regularity, relationship

of seizures to menstruation or pregnancy, anomalies of menstruation at present, if any.

Treatment.—Surgical operation upon the cranium is no longer practised except when distinct evidences are obvious that the brain has been injured. Operations can be of but little value unless done within a few months of the injury, while the seizures are distinctly localized, of the character of Jacksonian spasm or monospasm affecting a single extremity. Even then the previous neurotic family history and inherited predisposition to epilepsy may render useless any operative interference. Simply because an idiopathic epilepsy has a slow and distinct order of invasion is no good reason why it should be included in operative cases.

The surgeon who, without great cause, as of depressed fractures or the like, operates upon the cranium of epileptics does so without the best scientific sanction. Various other surgical procedures upon special organs of the body have been practised, but are no longer fully justifiable. We have no right to look beyond the nervous mechanism of the brain for the explanation of the epileptic paroxysm.

The general management of a case of epilepsy demands close attention. The proper regulation of the diet, exercise, and sleep of the epileptic is absolutely essential. Many of the wonderful results obtained from the *colonization* of epileptics, both abroad and in this country, notably in Ohio, Pennsylvania, Massachusetts, and New York, are directly credited to the careful regulation of the patient's life. At the Craig Colony, Sonyea, N. Y., by the establishment of small homes, the industrial form of education, and occupation suitable for epileptics, great success has been attained. Too much cannot be said for this rational plan of caring for epileptics and for properly treating the disease.

A scientific **dietary** is given for regulating the patient's meals:

Breakfast.—Oranges; apples—raw, baked; peaches—raw or with milk; oatmeal, cracked wheat, hominy, to be thoroughly cooked and eaten with milk or small portion of cream; eggs—soft-boiled, scrambled, poached; toast—dry or lightly buttered; baker's bread, Graham bread, corn muffins; coffee—moderate strength; milk—hot or cold.

Dinner.—Oysters—raw; soup—bouillon, tomato, vegetable, oyster; chicken or mutton broth, meats—roast beef (rare or well done, as taste demands), roast lamb, roast chicken or turkey, baked white- or blue-fish, or shad; vegetables—potatoes (white or sweet), spinach, carrots, turnips, tomatoes (raw sliced), onions, stringbeans, lima-beans, peas, squash, asparagus (all vegetables well cooked); relishes—onions, celery, lettuce; dessert—puddings; bread, farina, rice, tapioca; cup custard; cheese—Edam, American, cream; crackers.

Supper.—Toast—dry, buttered, milk; crackers, corn bread; eggs—soft-boiled, poached, scrambled; stewed prunes, baked apples, apple sauce; milk, tea (made weak), coffee.

Articles Prohibited.—Pastry of any kind, rich puddings, cake of any kind, pork, veal, ham, anything fried in grease, high seasoning, alcoholic beverages of all kinds.

Tea should be drunk sparingly, and should be weak; coffee may be allowed for breakfast, but not for supper if it causes wakefulness.

The epileptic should eat slowly, masticate thoroughly, and not overeat.

The medicinal treatment forms a very desirable adjunct to the foregoing treatment of epilepsy. Chief among all medicines are the bromin salts, singly or given in various combinations. One salt is as effective as another; change from one form to another is advisable. The bromids should be systematically employed only when other drugs have been found ineffective, as they frequently do no more than postpone the fits for a longer or shorter period of time.

A modified combination of the Brown-Séquard remedy has proved one of the best bromid mixtures:

℞.	Potassium iodid,	ʒ ij
	Potassium bromid,	ʒ j
	Ammonium bromid,	ʒ ijss
	Potassium bicarbonate,	ʒ j
	Tincture of calumba,	ʒ j
	Fowler's solution,	ʒ ij
	Water, q. s.	ʒ v.

One to 4 drams night and morning, as the case demands.

Solution of ammonium bromid (containing 5 grains of bromid to the dram) is a pleasant and efficacious remedy.

The treatment of the status period, the climax of the disease, is of paramount importance. It is arranged under 2 heads—dietetic and medicinal.

Food must be given early, and in the most highly nutritious form, before the interparoxysmal stage of coma is continuous. Subsequently, enemata may be required. It must always be remembered that the secretory and nutritional activity of the brain is at a minimum; therefore nutrition and medicine must be given early. A good plan is to give the following prescription to the patient's relatives, with instructions that it is to be administered under certain specific directions when the seizures are frequent and prolonged (8 to 12 in 4 to 5 hours).

℞.	Deodorized tincture of opium,	♏ v
	Potassium bromid,	gr. xxv
	Chloral hydrate,	gr. xx
	Solution of morphin sulphate (containing 1 grain to the ounce),	ʒ jss.

One dose; repeat in 2 hours if necessary.

The temperature, pulse, and respiration must be taken hourly, to measure the progressing exhaustion, which is the one great danger above all others in serial or status periods. Chloral, given alone in large doses, always depresses the heart-action, which is the organ bearing the brunt of status, and which should not be hindered more than is absolutely necessary. Finally, when all else fails, hypodermic injections of bromids

must be given, and strychnin and whisky in the same manner for stimulation.

Sedative medication in status for the convulsion is contraindicated for the stupor and coma following; therefore all sedatives should be administered with great caution, and the behavior of the vascular system toward these depressants closely observed.

EPINEPHRIN.—See Adrenalin.

EPIPHORA.—See Lacrimal Disease.

EPISCLERITIS.—See Scleritis.

EPISIOTOMY.—Incision through the vulva during childbirth for the purpose of preventing rupture of the perineum. It consists of two lateral incisions upon the mucous membrane just within the vulvar opening. They should be from 3/4 to 1 inch in length, and from 1/4 to 3/8 of an inch in depth. This is supposed to relieve vulvar and perineal tension and thus to facilitate the birth of the head. The incisions should be closed immediately after labor.

Episiotomy cannot be recommended, since injury to the perineum presents fewer disadvantages than incision of the vulva.

EPISPADIAS.—See Penis.

EPISTAXIS.—Bleeding from the nose, occurring spontaneously or from injury.

Causes. General.—1. Disease of the vascular system and the blood, such as is found in scurvy, purpura, hemophilia, etc.

2. Fragility of the blood-vessels following acute infectious diseases (acute exanthems, typhoid, diphtheria); also subacute and chronic infectious diseases (malaria, pyemia, septicemia).

3. Those diseases that lead to obstruction of the circulation (valvular disease of the heart, diseases of the lungs, tumors of the mediastinum, cirrhosis of the liver, Bright's disease, amyloid degeneration of the kidneys and liver, and, lastly, also the physiologic process of pregnancy).

4. Vicarious menstruation.

Local.—1. Erosions and superficial ulcerations of the mucous membrane.

2. Varicose dilatation of the veins on the anterior portion of the nasal septum.

3. Perforating nasal ulcer.

4. Ulceration of the mucous membrane and of the bones in the course of syphilis, tuberculosis, lupus, and other destructive processes.

5. New growths—especially sarcoma and soft carcinoma.

6. A certain fragility of the mucous membrane, for which, microscopically, no cause can be assigned.

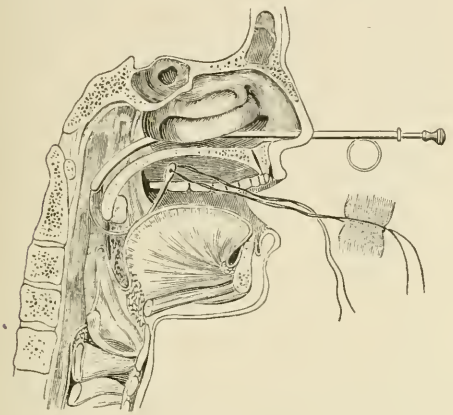
7. Trauma.

Treatment.—Usually, the bleeding will cease without the interference of the physician, if the patient will lie quiet—better with the head hanging, so the blood will flow from the nostril instead of running back—and apply cold to the spine, or douche the nose with cold or very hot water, with a little salt or vinegar, lime- or lemon-juice in it, or plugging the nostril with some cotton or linen. A method strongly advised by Hutchinson is to soak the patient's hands and feet in water as hot as can possibly be borne. If the physician is summoned, occasionally his presence will be all that is necessary, as the bleeding often ceases when fears are quieted; but if this is not the case, it will be necessary to resort to measures for relief.

Cleanse the nostrils by douching with very hot water, and let the patient blow gently, yet forcibly enough to expel the plugs and foreign substances; contract the tissues, using a few drops of 2 to 4 percent cocain applied with the spray, medicine dropper, or on cotton (sometimes this will control the bleeding), so that the place of bleeding may be seen, and a styptic applied directly to it. Hydrogen dioxid applied in the same manner will sometimes control the bleeding entirely; it surely cleanses the nares and makes them aseptic. When the hydrogen dioxid comes in contact with the blood it foams, and afterward becomes more solid, often hanging in long pieces from the nostril; this portion should be cut away with scissors, leaving the plug in place. Adrenalin chlorid sometimes proves successful. Lapat, of Savannah, Ga., says that if epinephrin chlorid is applied by a cotton-tipped applicator to the side of the septum from which the hemorrhage occurs, the whole mucous membrane, except in those spots in which the bleeding takes place, becomes blanched. If it is a vessel that has caused the bleeding, it will stand out strongly in contrast to the rest of the mucous membrane. If it has been due to capillaries, a red circular spot about the size of half a ten cent piece stands out prominently. This procedure makes it a simple matter to find the bleeding spot and cauterize it with 90 percent trichloracetic acid. The acid obliterates the vessel or capillaries, and in a few days it heals over, removing with very little trouble the source of bleeding. If these measures do not prove effective, cleanse the nostril and apply lime-juice or lemon-juice pure, a strong solution of tannic, acetic, or gallic acid, persulphate of iron, antipyrin, or a saturated solution of ammonio-ferric-alum. If these measures fail, then it will be necessary to resort to posterior and anterior plugging.

Remembering the size of the posterior nares, it will be necessary to make a plug of absorbent cotton or fine linen, about the size of the end of the thumb, when tied firmly in the middle, with a strong, preferably twisted, string, doubled, extending about 18 inches from the plug in both directions. Then, having cleansed the nostril again, pass a Bellocq's cannula, a soft-rubber catheter or tubing, or any suitable instrument, or a wadded string, through the bleeding nostril into the pharynx and below the soft palate; grasp it with the fingers or forceps and draw through far enough to tie the string of the plug to it; then, placing the finger above the string and at the base of the soft palate, draw the plug in; when it reaches the end of the finger, pass the latter behind the soft palate, drawing it toward the front, and pull the plug above it into position in the naris. If the plug is in the proper position, it will be impossible for the patient to breathe through it. Sometimes it is necessary, after the plug has passed the soft palate, to push it into the proper place with the finger; then, by a quick, firm pull, set it tightly. Having accomplished the

posterior plugging, it will be necessary to plug anteriorly with absorbent cotton, fine linen, or a small piece of handkerchief, made umbrella shape, filled with any material that may be convenient. The absorbent cotton is loosely rolled to about the size of the little finger, on a cotton carrier, probe, knitting-needle, or smooth wire, dipped into the desired styptic, and pressed firmly into the nostril below the posterior plug string, which latter is then divided and firmly tied over it, that neither may become loosened.



Application of Bellocq's Cannula.

The posterior plug should never be left in place over 40 hours, and, on account of the odor, seldom over 24 to 30, as there is danger of septicemia. The removal of the plug is quite as difficult as its insertion. The string over the anterior plug should be severed and the dressing softened with hot water, so that it may be removed without disturbing the mucous membrane or the clot. After the anterior plug has been removed, flush the nostril with hot water until some of it passes into the throat, when the plug is soft enough to remove by gentle traction on the other end of the string tied to the plug when it was introduced, placing the finger between the string and soft palate that the latter may not be injured, and that the plug may be pulled *downward* into the oropharynx and out of the mouth. Occasionally there will be some slight bleeding immediately after the removal of the plug, but this generally ceases in a moment.

EPITHELIOMA. **Synonyms.**—Epithelial cancer; carcinoma epitheliale; rodent ulcer.

Symptoms.—Three varieties of epithelioma are recognized—the superficial, deep, and papillary.

Superficial Epithelioma (Flat or Discoid Variety).—This form of the disease makes its appearance as one or more grouped yellowish or reddish papules, or as flat infiltrations, warty outgrowths, or degenerative seborrheic patches. These show a tendency to become excoriated and covered with brownish or yellowish crusts. In the course of several months or years the deposit increases, or new lesions appear, which undergo degeneration, with the formation of superficial ulcers. The ulcer is usually roundish, with sharply defined, flat or raised, indurated, rounded, pearly edges. The base is hard, reddish, uneven, easily disposed to bleed, and secretes a scanty, yellowish fluid. The general health is unimpaired, pain slight, and lymphatic involvement absent.

Rodent ulcer (Jacob's ulcer), a peculiar form of superficial epithelioma, almost invariably limited to the upper two-thirds of the face, occurs in old age, and begins as a little nodule, at first covered by normal skin, which eventually ulcerates. It contains cells similar to those of sebaceous glands presenting a picture resembling that of a squamous-celled carcinoma with the exception that a cell-nest is but rarely present. Ulceration and extension continue without involvement of lymphatic glands or other organs. The disease progresses very slowly, sometimes lasting thirty or forty years, and occasionally cicatrizes in spots, the scars later breaking down.

Deep-seated Epithelioma (Infiltrating Variety).—This form develops from the superficial variety or from a nodule having its seat in the corium and subcutaneous tissue. The nodule varies in size from that of a pea to a walnut, firm, indurated, rounded or flat, shining, and of a reddish or purplish color. After a lapse of some months ulceration takes place. The ulcer is deep, rounded, or irregular in shape, with an uneven, reddened, easily bleeding base, and hard, everted, purplish edges. An areola of redness and infiltration indicates the spreading infiltration. The lymphatic glands become involved, the pain is severe and of a lancinating character, and the patient slowly succumbs through marasmus, hemorrhage, or exhaustion.

Papillary Epithelioma.—This form may develop from the superficial or deep variety or from an ordinary wart. It appears either as a small verrucous elevation, or as a larger, coin-sized, lobulated, spongy, papillary growth. The surface may be dry and covered with horny yellow scales, or moist and covered with uneven, exuberant granulations, secreting a sanguineous or translucent fluid. Disintegration occurs, with the production first of fissures and later of ulcers. The course is progressive and malignant.

Epithelioma involves with predilection the face, particularly the lower lips, eyelids, and nose. The penis, labia, and other parts of the body are not infrequently affected.

Etiology.—Obscure. It occurs after middle life, and more frequently in men than in women.

Pathology.—The process consists of an abnormal downgrowth into the corium of the interpapillary projections of the rete mucosum, a proliferation of the rete cells, their isolation in the corium in the form of nests, the occurrence of "pearly bodies," and certain secondary inflammatory changes.

Diagnosis.—Epithelioma may be confounded with warts, the ulcerating syphiloderm, and lupus vulgaris.

The age of the patient, the occurrence of ulceration, the general appearance of the growth, the history, and the course will usually distinguish an epithelioma from a wart.

Epithelioma may be differentiated from syphiloderm as follows:

Epithelioma.	Tubercular Ulcerating Syphiloderm.
1. Occurs late in life.	1. Occurs in early and middle life.
2. No history or concomitant signs.	2. History and concomitant signs of syphilis.
3. Evolution slow.	3. Evolution rapid.
4. Ulceration single.	4. Ulceration usually multiple.
5. Edges of ulcer hard and indurated. Discharge scanty, bloody and stringy.	5. Edges of ulcer not indurated. Discharge abundant, yellowish, and creamy.
6. Lancinating pain.	6. No pain.
7. Yields only to destruction.	7. Heals under the use of iodids and mercury.

The differential diagnosis from lupus vulgaris will be found under that disease.

Prognosis.—The superficial form resulting from seborrheic degeneration may be permanently cured by early and thorough destruction. In the other forms the prognosis is more grave, and will depend upon the age of the patient, the extent of the disease, the rapidity of the process, etc.

Treatment.—The treatment consists of thorough destruction of the diseased tissues. One of the best methods of accomplishing this end is erasion by means of the dermal curette, followed by cauterization of the part; or, if in a convenient situation, the growth may be excised. In some cases such caustics as caustic potash, pyrogallic acid, arsenic trioxid (*i.e.*, arsenous acid), acid nitrate of mercury, and zinc chlorid may be employed. Arsenic trioxid seems to possess some selective action in the destruction of epithelioma; for this destruction 9 to 24 hours is required—the paste applied consisting of 50 to 75 percent arsenic trioxid, 50 to 25 percent powdered acacia and water. Methods that are intensely destructive are dangerous, because they merely promote additional growth.

Carbon dioxid snow has been used with excellent results especially in the rodent ulcer type. It is in this form of cancer that X-ray treatment has proved particularly successful. Rodent ulcers have also been treated successfully by means of the Finsen light, radium and the electrolytic introduction of zinc ions from the positive pole. The light-treatment, however, in a true chronic epithelioma causes a more rapid growth.

See Tumors.

EPULIS.—See Jaws (Diseases).

ERGOT.—The sclerotium (compact mycelium or spawn, intermediate fibrous stage) of *Claviceps purpurea*, replacing the grain of rye. It occurs in fusiform, curved, grain-like bodies, of purplish-black color, peculiar, heavy odor, and oily, disagreeable taste. When more than one year old it is unfit for use. Dose, 10 to 60 grains.

The composition of ergot and the nomenclature of its supposed constituents are subjects upon which there exists a great diversity of opinions, and about which there is nothing settled. According to Kobert, it contains three active principles, viz.—*ergotinic acid*, a nitrogenous glucosid, which has no ecbolic action but affects the nervous system, the heart and the respiration; *sphacelinic acid*, a nonnitrogenous resin, which stimulates the vasomotor center and causes uterine contraction; and *cornutin*, an alkaloid, found in very small quantity, and believed to be the ingredient which causes the convulsions. Ergot also contains *trimethylamin*, tannic acid, and a fixed oil.

Ergot is a powerful vasoconstrictor, a cardiac sedative, a motor excitant, and a stimulant of involuntary muscular tissue. It is hemostatic, ecbolic, anhidrotic, and convulsant. The most familiar use of ergot is to promote uterine contraction in protracted labor due to inertia of the womb, but as it produces continuous (tetanic) contractions instead of the intermittent natural ones, it is dangerous when there is much resistance in front of the child, the probable results being rupture of the uterus or severe laceration of the perineum, and stoppage of the placental respiration of the fetus. Toward the end of the second stage, when the head is beginning to emerge at the vulva, is the proper time for its administration, if used at all, in order to promote firm uterine contraction, thereby preventing postpartum hemorrhage, promoting the expulsion of the placenta, and guarding against puerperal infection by closing the uterine lymph-spaces and thus opposing a barrier to the entrance of infectious material. It is used in many uterine affections, as chronic metritis, subinvolution, congestive dysmenorrhea, hemorrhages, fibroids, and polypi, to produce firm contraction and promote the absorption of inflammatory products. It is efficient in many cases of amenorrhea in plethoric subjects, and in the atonic type of spermatorrhea.

Ergot is extensively employed in all forms of hemorrhage in which no direct styptic application can be made, and even when such is possible it is a useful hemostatic adjuvant. It is particularly efficient in uterine hemorrhages, purpura hemorrhagica, and in venous, capillary, and atonic arterial bleeding; but may be injurious in active arterial hemorrhage. Hemorrhoids are well treated by its local application, but in this affection it should not be used internally as it promotes venous congestion. In aneurysm it aids coagulation by slowing the blood-current, and in cardiac hypertrophy without valvular lesion it acts well by slowing the heart. In diabetes insipidus full doses of ergot are often curative, and it has been used with benefit in diabetes mellitus. In epilepsy it increases the efficiency of the bromids, and often gives good results. It is very efficient in enlargement of the spleen, and is said to have even cured leukemia. In conjunctivitis, gonorrhea, and inflammations of mucous membranes generally, it is of striking benefit, if used both locally and internally. It is an excellent remedy in acute and chronic dysentery, chronic diarrhea, mania due to cerebral hyperemia, headache and migrain of congestive form, myelitis, spinal congestion, cerebrospinal meningitis, lax sphinc-

ters of the rectum and bladder, and incontinence of urine from paralysis of the sphincter vesicæ.

Incompatible with *ergot* preparations are: Tannic acid and other alkaloidal precipitants; also caustic alkalies, metallic salts. Physiologically incompatible with its action on the circulation are: aconite, amyl nitrite, lobelia, tobacco, veratrum.

Preparations —Extractum ergotæ. Dose, 2 to 10 grains. **Fluidextractum E.** Dose, 10 to 60 minims. **Vinum E.,** has of the fluidextract 20 percent. Dose, 1 to 4 drams. **Ergotinin citrate** is said to be an efficient substitute for ergot. Dose, 1/200 to 1/100 grain hypodermically.

ERGOTISM.—A disease due to the action of ergot taken in food made from contaminated rye-meal. The appearance and severity of the disease vary with the amount of ergot consumed. Children at the breast are never attacked. The symptoms are of an irritant character, including vomiting, purging, and colic, giddiness, headache, formication, and itching of the skin. Hematuria and jaundice often occur. The severe cramps—affecting chiefly the legs, and leading to tonic contractions of the affected muscles—persist after the previous symptoms subside. Gangrenous forms affect the fingers, nose, and ears. The removal of the cause is the first requisite to treatment, and vomiting should be encouraged or induced. Spasm must be combated by opiates or potassium bromid. Gangrene is best treated according to the rules of surgery. Spasmodic ergotism may last for 2 weeks or for as many months. The gangrenous variety is very protracted and variable.

ERICHSEN'S DISEASE.—Railway spine; railway brain. A train of symptoms following accidents, which may assume the form of traumatic hysteria, neurasthenia, hypochondriasis, or melancholia. See Spinal Cord (injuries).

ERIODICTYON.—Yerba santa, or mountain-balm. The leaves of *E. glutinosum*, a shrub of California; an excellent expectorant, and valuable as an excipient for quinin, the taste of which it largely conceals. It is useful in bronchial affections. Dose, 5 to 30 grains. There is one official preparation, the fluidextract, dose, 5 to 30 minims.

ERRHINES AND STERNUTATORIES.—Agents which produce increased nasal secretion and sneezing, when locally applied to the mucous membrane of the nose. The first term is usually applied to substances which cause increase of the mucus without sneezing, the latter to those which invariably produce sneezing. The drugs should be applied in powder. The stimulus produced by these agents is transmitted by the nasal branches of the fifth nerve to the respiratory center, exciting the sudden and forcible expiratory effort called sneezing; also to the vasomotor center, contracting the smaller vessels throughout the body and producing a general rise in the blood-pressure. The principal are—

Tobacco (as snuff),	Euphorbium,	Capsicum,
Ipecacuanha,	Sassy bark,	Hellebore,
Sanguinaria,	Saponin,	Ammonia,
Veratrum album,	Ginger,	Cubebs.

The last two named may be used as simple errhines, as the vapor of dilute ammonia-water, and the smoke of burning cubebs, do not excite sneezing generally.

ERUCTATIONS.—The sudden escape or expulsion of gas from the stomach through the mouth, with or without admixture of portions of liquid or solid foods, of gastric juice or other liquids. It occurs in all gastric diseases attended by an undue formation of gas. It is constantly complained of in atonic dyspepsia, more especially in elderly persons.

The indications are to prevent the decomposition of food and the formation of gases and other products, to restore tone to the stomach, and to treat any morbid condition of this organ. Of drugs, nux vomica, charcoal, bismuth, chloroform, carbolic acid, turpentine, strontium bromid, asafetida, valerian, sodium sulphocarbolate, dilute phosphoric acid, oil of anise, and ether, are all of service.

A diet free from sugar, starchy food, and tea, with slow eating, in small quantities and regularly, and general abstention from alcoholic drinks and from vegetables, especially cabbage, is recommended. Pepsin or ingluvin after meals will promote digestion.

℞. Tincture of nux vomica,
Tincture of physostigma,
Tincture of belladonna, } each, ʒ j.

Fifteen drops twice daily in a little water.

℞. Gum camphor,
Powdered ginger,
Powdered pepper, } each, gr. j.

Make into 6 pills. Give 1 as required for gastric and intestinal flatulence.

See Flatulence.

ERUPTION.—Applied especially to the chief symptom of certain skin-diseases, consisting in pimples, vesicles, rash, etc.; the breaking forth of a tooth from the gum. See Exanthems, Drug Eruptions, Skin-diseases.

ERYSIPELAS (St. Anthony's Fire).—An acute infectious and contagious dermatitis, characterized by severe local inflammation of the skin with a tendency to spread, and accompanied by fever and constitutional disturbance.

Etiology.—The affection is due to the introduction into the skin of the streptococcus erysipelatis, identical with the streptococcus pyogenes. The disease is transmitted by direct contact, through a third person or through the air. Depression of the vital forces, as in chronic diseases and alcoholism, and the existence of wounds or abrasions act as predisposing causes. Women during or after labor are readily inoculated. The disease may be engrafted on leech-bites, or vaccination punctures. Certain individuals seem prone to acquire it. After one attack a person seems rather predisposed to another. In the recurrent variety, due to nasal infection, catarrhal conditions of that organ predispose.

Streptococcus of Erysipelas.—(*Coplin and Bevan.*) × 800 diameters.

Symptoms.—The disease is usually ushered in with a chill, malaise, anorexia, headache, and elevation of temperature (102° to 105° F.). The erysipelatous eruption is highly characteristic. The affected area is sharply defined, of a shining crimson or violaceous hue, elevated above the surrounding skin, and firm, hot, and tender to the touch. In addition, vesicles or blebs are prone to develop. The patient complains of pain, burning, or itching. The eruption tends to spread by peripheral extension, the older parts first undergoing involution, the maximum of inflammation being found at the periphery. In any one locality it runs its course in 4 or 5 days, ending in desquamation. The disease, however, may last for weeks, owing to constant extension. Albuminuria may be present. There is marked leukocytosis.

The form commonly met with is the so-called *idiopathic erysipelas* in which the abrasion through which the infection enters is not discovered. The face is by far the most frequently affected region. In this location the eruption is extremely likely to spread over the forehead and scalp to the nape of the neck.

Erysipelas ambulans or migrans is a variety that tends to subside rapidly in one region, reappearing in another, the whole process continuing for several weeks.

There is a mild recurrent form of erysipelas that is prone to attack the cheeks and the alæ of the nose. The constitutional disturbance is mild or entirely absent. The eruption does not tend to spread beyond the face, and disappears in 3 or 4 days. It is due to microorganismal infection through the mucous membranes of the adjacent cavities, particularly the nose.

Prognosis.—Favorable in the vast majority of cases. In rare cases abscesses or gangrene may develop. In severe cases death may result. See Suppuration.

Treatment.—Internally, tincture of the chlorid of iron, 10 minims every 2 or 3 hours; quinin, 2 grains 4 times a day; and stimulants. Locally, carbolized petrolatum; 25 percent ichthyol ointment; or an ointment of phenol 1 part, ichthyol 10 parts, lanolin 20 parts, or moist compresses of a dram to the ounce aqueous solution of hyposulphite of sodium, 1 percent phenol, 1 to 1000 potassium permanganate, or 1 to 1000 mercury bichlorid. When the extremities are involved, extension may sometimes be checked by the use of tincture of iodin or the stick of nitrate of silver applied to the spreading periphery.

In the recurrent form the nose and mouth should receive careful treatment, detergent washes, such as Dobell's solution, being employed.

The patient should be isolated, with a special nurse in attendance. Surgeons and obstetricians should not attend erysipelas cases. The inflamed part should always be kept warm and raised, air being excluded from the surface. Warm fomentations are the best. Subcutaneous injections of a solution of phenol, and nitrate of silver in solution, say from 20 to 30 grains to the ounce of water, applied directly over the affected parts, are highly recommended.

Constitutional treatment should be eliminative and supporting. Pilocarpin hypodermically, has been advocated for its effect on the skin.

Judd advocates a single application of 95 percent solution of carbolic acid to blanch the tissue, followed by an application of pure alcohol till the area becomes pink again, only a small section of the diseased tissue being treated at a time, followed by dressings of bichlorid or salt solution, but not of carbolic acid.

In the *cellulocutaneous* forms of the disease (*phlegmonous erysipelas*), as soon as tension of the integument appears, incisions must be made deep enough to allow the escape of the serum from the cellular tissue beneath and to relieve the tension. Some surgeons recommend that the incisions be free, so as to extend the whole length of the affected parts; others prefer a greater number of limited incisions; preference is given to the latter method. The long incisions are attended by copious hemorrhage and great risk of life, while the hemorrhage from the limited incisions can generally be controlled by elevation of the part and pressure. The part should be frequently dressed and irrigated.

Serum Therapy.—Injections of antistreptococcic serum seem to ameliorate the symptoms.

Diphtheria antitoxin is reported to have been used with success.

Vaccine Therapy.—Specific vaccine has proved of value in shortening the attack.

ERYSIPELOID.—An infection caused by the bites of crabs, punctures with fish fins and contact with putrid fish or other decomposing animal matter. Jopson thus describes a case in which the finger was affected: "It appears as a swelling, with elevated, sharply defined edges, which soon affects the entire circumference of the finger; and is commonly described as of a dark red color, with purplish or even livid edges. The finger is tense and only moderately painful, but itching and burning are prominent symptoms. It has a characteristic tendency to spread toward the palm, the primarily affected area fading from red to yellow, and thence to normal. There are no constitutional disturbances. It commonly lasts from ten days to three weeks." Jopson paints the affected parts with tincture of iodin.

ERYTHEMA INTERTRIGO (Chafing).—A form of traumatic erythema, occurring chiefly in those regions where skin surfaces are in apposition, such as the genitals, flexures of joints, neck, etc. It is common in children and in stout individuals. Moist diapers and the contact of intestinal discharges are often causative. The condition may remain as an erythema, or may develop into a dermatitis or an eczema. It is then characterized by redness, excoriation, and a mucoid discharge. There is usually a feeling of heat and soreness.

Treatment.—When the condition remains as a true erythema, dusting-powders suffice. The following is a useful combination:

℞. Magnesium carbonate,
Venetian talcum,
Zinc oxid, } each, ʒ ij.

If an eczema or a dermatitis supervene, the condition should be treated according to the principles laid down in the treatment of those affections.

ERYTHEMA MULTIFORME.—An inflammatory disease, characterized by variously sized and shaped patches or erythema, papules, vesicles, and blebs, running an acute course, and accompanied, as a rule, by constitutional disturbance.

Symptoms.—The disease is usually preceded or accompanied by febrile disturbance, malaise, rheumatoid pains, etc. The eruption, which comes out more or less suddenly, may consist of macules, maculopapules, vesicles, and blebs, one type of lesion, as a rule, predominating. After remaining stationary for some days the eruption gradually disappears. Any part of the body may be involved, although the disease exhibits a marked predilection for the backs of the hands and feet, and not infrequently for the face and neck. Itching and burning, when present, are usually mild. The lesions are at first bright or dusky red, later becoming purplish or bluish.

When the patch is circular, with peripheral spreading and central clearing up, it is called **erythema circinatum,** or **erythema annulare.** Concentric rings of variegated colors are termed **erythema iris,** and when the rings are made up of vesicles, **herpes iris.** The fusion of circular patches often produces gyrate or festooned configurations, **erythema gyratum et figuratum. Erythema papulosum,** characterized by discrete or aggregated, reddish or violaceous maculopapules or papules, is the commonest expression of the disease. **Erythema vesiculosum** and **erythema bullosum** are characterized respectively by vesicles and blebs.

The eruption comes out in crops, and lasts from 1 to 4 weeks. In some cases there is a distinct tendency to recurrence.

Etiology.—The disease occurs most frequently in youth and adolescence. Meteorologic conditions, particularly humidity, are looked upon as causative. Most cases are observed in spring and autumn. Duhring looks upon erythema multiforme as a general disease of infectious or nervous origin, and considers the skin manifestations merely conspicuous symptoms. Upon this point there is considerable divergence of opinion.

Pathology.—There is dilatation of the papillary and subpapillary blood-vessels, with serous and sometimes moderate cellular exudation into the tissues. The affection is an angioneurosis.

Diagnosis.—The distinguishing features of this disease are the distribution, peculiar coloration, and multiformity of the lesions, the acute course, the spontaneous involution of the eruption, and the associated general symptoms.

Prognosis is favorable. The tendency of some cases to recur should be remembered.

Treatment.—Quinin is recommended in idiopathic cases. Symptomatic eruptions must be treated according to the individual indications. The salines are to be employed when constipation exists.

Locally, soothing lotions, such as the following may be used:

℞.	Carbolic acid,	♏ xxx
	Boric acid,	ʒ j
	Glycerin,	ʒ ij
	Water,	ʒ vj.

ERYTHEMA NODOSUM (**Dermatitis contusiformis**).—An acute inflammatory disease of the skin, characterized by the formation of roundish or oval node-like swellings.

Symptoms.—The disease is usually ushered in with fever, articular pains, malaise, and coated tongue. Soon roundish or oval node-like swellings, varying in size from a hazelnut to an egg, develop over the region of the tibia. In some cases the forearms, trunk, and face are involved. The nodes are rosy-red in color, tense and shining like erysipelas, and exquisitely tender to the touch. At first hard, they later soften, but never suppurate. Their duration is from a week to 10 days, during which time they undergo all the color gradations observed in common contusions. In number they vary from about 5 to 20. Erythema nodosum is frequently associated with other forms of erythema multiforme.

Etiology.—The affection is one of childhood and adolescence. It is distinctly rare after the age of 20. It occurs twice as frequently in girls as in boys. Rheumatism, gastrointestinal disorders, and general nutritive disturbances are not infrequently associated with it. The disease is probably closely allied to, and perhaps a form of, erythema multiforme.

Pathology.—The nodes show serous exudation throughout the entire cutis and even the subcutaneous tissue. There are dilatation of the lymph-spaces and some cell-infiltration. Blood-stains from hemorrhages are present.

Diagnosis.—The distribution, tenderness, symmetry, course, and color changes of the lesions enable one to differentiate the affection from bruise, abscess, gumma, and erythema induratum.

Prognosis.—Favorable, recovery ensuing in from 1 to 3 weeks.

Treatment.—Regulation of the bowels by salines. Internally, quinin or salicylate of sodium. Locally, hot lead-water and laudanum, rest, and elevation of the limbs.

ERYTHEMA SIMPLEX (**Stomach Rash**).—A congestive disorder of the skin, characterized by nonelevated, variously sized and shaped patches of redness.

Redness is the essential characteristic of the disease. It may be a bright or a dull red, but always disappears upon pressure. Infiltration and elevation are absent. Mild burning and itching are usually present.

Erythema may be due to external or local causes and to internal causes. When not arising from local causes, it is due to toxemia. Local causes are heat, cold, traumatism, poisons, etc.

Erythema caloricum is due to exposure to extremely high or low temperatures.

Erythema solare (sunburn) is due to exposure to the solar rays.

Erythema traumaticum is due to injury.

Erythema venenatum is due to exposure to poisonous plants.

The internal, or *toxemic*, erythemata are exemplified in the stomach rashes of children, in intestinal autointoxication, after the use of the various antitoxins, drugs, etc.

Treatment.—If the erythema is due to a toxemia it is evident that treatment must be directed toward this condition.

A saline purge will immediately relieve an erythema due to the absorption of ptomains from the intestinal tract.

Stomach rashes in children will nearly always succumb to fractional doses of calomel.

The local treatment consists of the use of dusting-powders and cooling lotions. The following may be employed:

℞. Carbolic acid,		♏ xxx
Boric acid,		ʒ j
Glycerin,		ʒ ij
Water,	q. s.	ʒ vj.

ERYTHRASMA.—A rare disease of the skin, always attacking the axillæ or inguinal regions, or the nates. It forms reddish or brownish, sharply defined, slightly raised, desquamating patches, that cause no itching or inconvenience. It is due to the microorganism, microsporon minutissimum, and is readily curable.

ERYTHREMIA.—A rare disease characterized by an increase in the number of red blood corpuscles, enlargement of the spleen and cyanosis.

Synonyms.—Vaquez's disease; Osler's disease.

Etiology.—The cause is unknown; probably it is due to hyperactivity of the erythroblastic tissue of the bone marrow.

Symptoms.—There is an enormous increase in the number of red blood corpuscles, as many as 10 or 12 millions to the cubic millimeter being observed; the hemoglobin is increased, and the leukocytes moderately increased. The spleen is much enlarged; and cyanosis, particularly of the hands and face, is frequently observed. Other symptoms are headache, vertigo, constipation, albuminuria and hemorrhages.

Diagnosis.—This is made by the presence of the polycythemia, enlarged spleen, and cyanosis, and the absence of congenital heart disease.

Prognosis is unfavorable.

Treatment is symptomatic, and uncertain; splenectomy is not advised.

ERYTHROCYTOSIS MEGALOSPLENICA.—A condition or syndrome characterized by polycythemia, cyanosis, splenic enlargement, generally albuminuria, hyperviscosity and rapid coagulation of the blood, and often hepatic enlargement.

ERYTHROL TETRANITRATE.—Tetranitrol. A vasodilator and antispasmodic similar in action to nitroglycerin, but slower and more prolonged. It is claimed to be especially valuable in preventing attacks of angina pectoris. Dose, 1/2 to 2 grains.

ERYTHROMELALGIA (Red Neuralgia; Terminal Neuritis).—A variety of chronic dermatalgia characterized by burning and then aching pain of a part, usually of one or more extremities, intensified by warmth and by the dependent position, and accompanied by flushing and local fever.

ERYTHROXYLON (Coca; Cuca).—The leaves of *E. coca*, a shrub indigenous to the Andes. (Not to be confounded with *cocoa*.) It contains an alkaloid, Cocain (*q. v.*), to which its properties are mainly due. It is an aromatic tonic and cerebral stimulant, its use developing a remarkable power of enduring hunger and fatigue. Large doses cause hallucinations. Its effects are similar to those of coffee, but are more intense. It is used by the Indians of South America for sustenance during long journeys. The leaves, smoked, are beneficial in hay-fever. **Fluidextractum C.**, dose 10 to 60 minims. **Vinum C.**, dose 1 to 8 drams. Elixirs, wines, pastes, etc., of coca are numerous.

ESCHAROTICS.—See Caustics.

ESERIN.—A poisonous alkaloid derived from Physostigma (*q. v.*). It occurs as colorless, slightly pink crystals. It is sparingly soluble in water, but readily so in alcohol and in dilute acids. Dose, 1/100 to 1/50 of a grain. Eserin is used locally in many affections of the eye, such as glaucoma, failure of accommodation, ciliary paralysis, and suppurative keratitis without iritis. It is recommended in abdominal distention and tympanites in typhoid fever and after operations, but its action is uncertain. The sulphate is generally employed.

Eserin causes contraction of the pupil and spasm of the ciliary muscle by its property of stimulating unstriped muscular fibers. It temporarily diminishes the mydriasis resulting from pathologic or experimental paralysis of the third nerve, and increases the miosis due to paralysis of the sympathetic. Its effects are more temporary than those of the stronger mydriatics, and when the latter are overcome by its use, they subsequently reassert themselves. In *complete* ciliary paralysis by atropin, and in the mydriasis induced by hyoscin, eserin has no effect. Eserin begins to contract the pupil and to cause accommodative spasm in about 5 minutes, and reaches its maximum effect in from 20 to 45 minutes. Its effect on the accommodation lasts only a few hours; in the pupil rather longer—sometimes several days. In strong solutions it causes pain in the eye and head, ciliary congestion, twitching of the orbicularis muscle, and occasionally spasm of the external muscles; if constitutional effects have been induced, giddiness and faintness are added to these symptoms. The sulphate is the form most in use. Its solution becomes red after standing for a time and loses some of its efficacy. The salicylate is said to be more permanent. It is usually prescribed in solutions of from 1/10 of a grain to 1 grain to the ounce. For continued use even weaker solutions are sometimes preferred, but when a rapid and decided effect is sought, 2 to 4 grains may be needed. The susceptibility to its unpleasant effects varies greatly in different individuals.

Pflüger states that eserin increases the intraocular tension of a normal eye; but that it diminishes tension in the early stages of glaucoma is universally admitted. It is not to be compared in this respect to iridectomy or sclerotomy, and has little

effect in advanced stages of the disease when the paralyzed muscular fibers of the iris fail to respond to it; but will sometimes check the commencement of an acute attack, and should always be used when, for any reason, an operation must be avoided or postponed. When it fails to contract the pupil, it may do harm by increasing the flow of blood to the iris and inducing irritating spasm of the ciliary muscles. Some authors have advised against its use in the hemorrhagic form of glaucoma. It is often used after cataract extraction, particularly without iridectomy, to withdraw the iris from the wound, and for the same purpose is indicated in peripheral perforation of the cornea from ulceration or puncture.

ESOPHAGOTOMY.—Esophagotomy has been successfully performed for the removal of foreign bodies lodged in the esophagus and for morbid growths attached to this organ, to establish a passage for food below a malignant growth obstructing the tube, and for the relief of stricture of the esophagus.

The operation is indicated especially for the removal of impacted foreign bodies that cannot be removed with esophageal forceps, hook, snare, or bristle probang; and in about 80 percent of suitable cases it will prove successful; whereas, without such interference most of these cases would result fatally by sepsis or ulceration of adjoining parts.

Among the foreign bodies that often become lodged in the esophagus are tooth-plates, coins, tin whistles, fish bones, buttons, and pins, the tooth-plate being most frequent. They usually lodge where the lumen of the esophagus is smallest, at about the level of the cricoid cartilage, but they may become fixed at any point along the canal. The diagnosis of foreign bodies in this organ, though frequently easy, is often only made with great difficulty and after a long and harmful delay. The foreign body can sometimes be reached by the examining finger, especially in children. If not discovered in this way, a long curved probe or, better, an esophageal bougie, may be employed to locate it. The laryngoscope should be employed in the examination when possible, for it may furnish a view of the object, and thus avoid severer measures. Esophagoscopes have been devised, but have not come into general use; indeed, they have not yielded results of much value. Kerstein's modified autoscope promises to be especially useful in young children when laryngoscopy is impracticable. The X-ray apparatus has on several occasions been serviceable in locating the foreign body.

The symptoms indicating the need of operation depend chiefly upon the size and shape of the foreign body. A large object may cause speedy death from its pressure upon the larynx or from spasm of the glottis. An angular and irregular object may usually be felt externally, and bodies of any considerable size may produce dysphagia or complete obstruction. Tenderness in the side of the neck, soreness behind the sternum, dyspnea, cough, and a constant discharge of mucus and saliva are common symptoms. Later, if the obstruction continue, infection is likely to take place, leading to ulceration, with loosening and expulsion of the foreign body, or more frequently, to extensive inflammation of the surrounding tissues. Abscesses thus formed may extend along the deep fascia to the pleura or pericardium, or ulceration of the adjacent blood-vessels may lead to speedy death. The foreign body may work its way by ulcerative process into the trachea, from which it may be expelled by cough or through which it may reach the glottis and cause clonic spasm and death. In many cases, especially of fish bones and pins, the sensation of the presence of the foreign body remains a long time after its dislodgement. When a positive diagnosis has been made and simpler means have failed to dislodge the object, esophagotomy should be performed; for although foreign bodies have been successfully removed by this operation as long as two years after their impaction, the danger attending their prolonged retention is very great.

Anatomy.—The esophagus is in relation in front with the trachea, the thoracic duct, the thyroid gland, and the recurrent laryngeal nerve, the latter running in a groove between the esophagus and trachea. Behind, it rests on the vertebral column and the longus colli muscle. On each side —especially on the left, as it inclines to that side— it is in close relation with the sheath of the great vessels and part of the lateral lobes of the thyroid gland.

Operation.—Unless there is some special contraindication—as, for instance, the projection of a foreign body plainly upon the right side—the incision is to be made on the left side of the neck, along the anterior border of the sternomastoid muscle, from a point opposite the thyroid cartilage to within an inch of the sternoclavicular articulation. The larynx and trachea are thus upon the inner side of the incision, and the great vessels on the outer. The superficial structures are divided, the deep fascia is slit up on a director, and the sternomastoid is retracted, so as to expose to view the sheath of the great vessels, which should be protected by blunt retractors. With blunt-pointed instruments the dissection is carried between this sheath and the trachea, the thyroid gland being crowded aside and great care being taken to avoid injuring the arteries and veins and the recurrent laryngeal nerve, running in its groove between the esophagus and trachea.

The upper two inches of the esophagus is thus exposed. If the omohyoid muscle cannot be retracted, it may be divided. If on retracting the trachea from the carotid sheath a good view of the esophagus is not obtained, the sternohyoid and sternothyroid muscles may be divided. The foreign body may make the esophagus prominent, but if not, a sound, an olive-tipped bougie, or the esophageal forceps may be passed through the mouth, and made to project in the wound. A longitudinal incision is now to be made over the point thus indicated, keeping as much to the side as possible, so as to avoid the position of the recurrent laryngeal nerve. If the exact position of the foreign body cannot be determined at once, small, curved needles, armed with silk, may be passed through the edges of the esophageal wound. An assistant can hold the wound open by drawing on

these threads, and thus expose the esophagus to free inspection and instrumentation. The location and size of the foreign body having been ascertained, the incision may be enlarged to the required size, and the offending body extracted with suitable forceps.

It is now necessary to decide whether to close the wound or allow it to heal by granulation. If the impaction is recent, the tissues not being bruised or inflamed, the esophageal wound may be closed with catgut, the sutures being placed in the muscular coats only. The external wound may be closed in the usual way. When conditions obtain that are likely to prevent union by primary intention, it is best to leave the whole wound open, save for a few stitches in the integument. Suitable drainage should be established and a large antiseptic dressing applied.

Some operators feed the patient through a stomach-tube for the first few days; but greater success has attended those cases in which the only food given consisted of nutrient enemata. These should be relied upon for at least 72 hours. After this, liquids may be taken by the mouth. The wound is usually completely closed in from 2 to 4 weeks. A fistulous opening sometimes persists for a long time, but in most cases it finally closes without further operation.

Esophagotomy for the cure of membranous stricture of the tube has been successfully performed by Dr. Christian Fenger. An oblique membranous diaphragm having a small perforation was found and excised. The mucosa of the lower part was stitched to that of the upper part, and the wound in the esophagus closed by a double row of sutures over a flexible tube passed through the right nostril. The external wound was drained.

Esophagotomy in cases of malignant growths may be justifiable for the purpose of prolonging life, but it yields no more brilliant results than do operations for malignant tumors elsewhere, and for nourishing the patient gastrotomy is preferable. See Neck (Injuries).

ESOPHAGUS, DIVERTICULA.—Diverticula occasionally are present in the neck and communicate with the esophagus or pharynx. When these are large, food passes into them and serious symptoms, even death, may result. The condition is often unrecognized by the physician. In serious cases operation is demanded. Sometimes good results are obtained by having the patient swallow a whip cord and, using this as a guide, passing bougies in a manner analogous to the passage of Gouley's tunnelled sounds over a whalebone filiform in urethral stricture (Mixter).

Operation.—The first steps are those of an esophagotomy. The trachea is retracted toward the right, the sternomastoid and the sheath containing the carotid, internal jugular, and vagus to the left. An esophageal bougie is passed if possible, through the mouth into the diverticulum, in order that the diverticulum and its relations to surrounding structures may be appreciated. Then the bougie is removed. The diverticulum is separated from its surroundings by blunt dissection. Where the diverticulum joins the esophagus its neck may be as thick as a man's thumb. At this junction it is divided layer by layer. The wound of the mucous membrane is sutured with catgut. The wound of the outer tunics of the neck of the diverticulum is closed by an invaginating suture like Lembert's intestinal stitch. The external wound is partially closed, free drainage being provided by means of iodoform gauze. The after-treatment is that of esophagotomy. When the diverticulum is comparatively small, the skin-incision need not be longer than that for esophagotomy. It is, however, better to make an incision longer than necessary than to be cramped, while operating, through lack of room.

ESOPHAGUS, INJURIES.—The esophagus may be wounded from the outside in cases of cut-throat, or from the inside by corrosive fluids or sharp-pointed foreign bodies. In rare instances rupture has taken place during vomiting, but probably only when the walls have been weakened beforehand by inflammation or fatty degeneration.

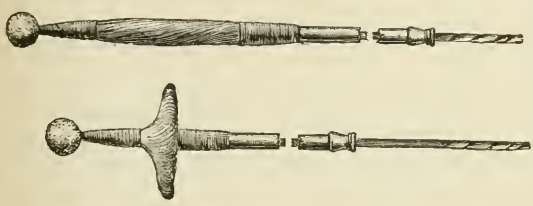
Swallowing corrosive fluids is nearly always done with suicidal intent, the liquid (usually a mineral acid or a very strong alkali) being thrown quite to the back of the pharynx, so that the lips, mouth, and tongue are often not touched. The immediate effect is profound collapse, with intense burning pain, followed by vomiting of mucus, blood, and sloughing shreds of epithelium, mixed with the contents of the stomach. If the result is not immediately fatal from perforation or collapse, the severity of the symptoms gradually subsides; there is less blood and more mucus and pus in the fluid that is brought up; the pain becomes less severe; the swelling and thickening around the esophagus diminish, and the febrile symptoms abate. Swallowing, however, causes very great pain, and if more than the epithelial surface has been destroyed, it rapidly becomes more and more difficult, until at length a traumatic stricture is established. The wall of the esophagus contracts spasmodically on the irritant before it is vomited back, and thus it may happen that the whole of the tube, from the cricoid almost down to the cardiac orifice, will be more or less eaten away. In cases of long standing the walls become enormously thickened from inflammatory deposit and fused with the structures around. The interior is rough and irregular, marked by sloughs and cicatrices in all directions, and here and there the cavity may be completely obliterated. Great emaciation follows.

Foreign Bodies in the Pharynx and Esophagus.—False teeth, pieces of unmasticated food, coins, fish bones, pins, and the like, are not uncommonly impacted in the esophagus, generally where it is narrowest—at the level of the cricoid cartilage—but sometimes immediately behind the arch of the aorta or the left bronchus.

The symptoms depend chiefly upon the size and shape of the foreign body. If it is large and smooth instant death may occur from pressure upon the aperture of the larynx, or from the spasm of the glottis; if pointed and irregular, there may be dysphagia or complete obstruction. Tenderness

in the side of the neck, soreness behind the sternum, dyspnea, and a constant discharge of saliva and mucus are often present. Later, if the case remains untreated, inflammation sets in. Sometimes this leads to spontaneous expulsion, as the foreign body becomes loosened; more frequently it makes matters worse by extending into the tissue around. Abscesses may form under the deep cervical fascia and spread into the pleura or pericardium. The walls of the carotid, and even of the aorta itself, may give way. The foreign body may ulcerate through into the trachea and be coughed up, or it may be driven into the pericardium and even into the substance of the heart. When the foreign body is a large one, there is seldom any difficulty in the diagnosis. The finger can explore the whole of the upper part of the pharynx, from the level of the soft palate down to the back of the arytenoid cartilages, and in children even lower, and the mucous membrane may be thoroughly inspected by means of a laryngoscopic mirror; but when the foreign body is situated below this, and is of small size—a fish bone, for example—its presence is often only a matter of inference. In many cases the sensation and soreness persist only after the offending substance has been dislodged.

Treatment.—A foreign body must, if possible, be extracted through the mouth; if this cannot be done, it may be pushed on into the stomach, removed through a side opening, or left to itself,



Horsehair Probang, Expanded and Unexpanded.

according to its nature and situation. Sometimes it is ejected during the retching and vomiting that accompany exploration of the fauces, but emetics should never be given for the purpose. The esophagus has been ruptured by violent vomiting. Long-handled, curved forceps, such as are used for extracting foreign bodies from the larynx, are the most useful, especially if such are small and rough. Pins and fish bones may be caught by an expanding or umbrella probang, but care must be taken not to drive them further in; they may easily be forced into the carotid or pericardium. If smooth and firm and low down, the obstructing body may sometimes be pushed onward, especially as, after a few hours, it becomes coated over with mucus; and in the case of meat it has been proposed to soften the surface by means of dilute acids. Irregular structures, such as false teeth, may be seized by what is known as a coin-catcher—a blunt, flat hook attached to a probang by a thin strip of steel, so that it may glide past an obstacle, and then catch against it as it is withdrawn—and considerable force may be used. If this fails, and if the foreign body is impacted in an accessible part of the esophagus, it must be removed by Esophagotomy (*q. v.*).

For other **wounds of the esophagus** see Neck (injuries).

ESOPHAGUS, STRICTURE.—Organic stricture may be congenital or acquired. The former is exceedingly rare; the latter, which is common, may be simple or malignant. Simple stricture nearly always arises from the swallowing of corrosive fluids. The mucous membrane sloughs, and cicatricial contraction follows. Sometimes almost the whole length is obliterated in this way, but the effect is always greatest at the commencement. In very rare instances it may arise from some form of specific inflammation, such as tubercle or syphilis. Malignant stricture is always the result of squamous epithelioma, and is usually annular, the muscular coat above being considerably hypertrophied.

Symptoms and Diagnosis.—Pain and difficulty in swallowing are the prominent symptoms. The diagnosis can only be made certain by the passage of a bougie; but as dysphagia occurs in other affections in which a proceeding of this kind is not unattended by danger, an attempt must always be made to exclude them first.

Muscular spasm or **paralysis** may simulate true stricture. There may even be a history of some foreign body swallowed; but it is never the kind that causes traumatic stricture. Nor is there really any likelihood of mistaking spasmodic contraction for malignant disease, for while the latter rarely occurs except in men, and never under the age of forty, the former is almost confined to young women, and is always marked by the peculiar incongruity of its symptoms. In diphtheritic paralysis, which is very rare, the food usually passes slowly down for some time before it stops, and solids are swallowed more easily than liquids.

Compression of the Esophagus.—Dysphagia arising from this condition is exceedingly common, and although the cause is usually sufficiently evident, this is not always the case. Aneurysms of the aorta; tumors of all kinds growing from the vertebræ, lymphatic glands, cellular tissue, or other structures near the esophagus; enlarged or accessory thyroids; gummata (especially retropharyngeal); abscesses, connected with the vertebræ or not, and other conditions, may give rise to it. Aneurysms have been ruptured by the passage of a bougie, and without an excessive amount of force having been used.

In a few cases **dysphagia** has been traced to the presence of a pharyngocele dragging the orifice of the esophagus out of its true axis.

Practically, unless there is a very clear history of a gumma or of tuberculous disease, a stricture that develops after the age of 40 without injury is malignant.

If the presence of an external tumor pressing upon the esophagus is negatived, a bougie must be passed, not only to verify the existence of a stricture, but to ascertain its locality, and, perhaps, its diameter. The patient should be seated on a straight-backed chair and the head supported by an assistant—forward rather than upward, in order

to straighten the cervical spine; if it is thrown back, the bougie strikes against the bodies of the vertebræ. A medium-sized gum-elastic instrument (equal to No. 24 or No. 27 catheter on the French scale) should be chosen to begin with, warmed by dipping in hot water, and well lubricated with glycerin. The point should be bent a little downward. The operator then, standing in front of the patient, runs the forefinger of the left hand over the tongue, and guides the bougie, which is held in the right, over the base to the back of the throat. If protected in this way, it cannot pass up into the nasopharynx or enter the larynx. A certain amount of spasm nearly always follows contact with the mucous membrane, and when it comes near the cricoid, it is not infrequently gripped tightly, and then forcibly ejected by retching, or suddenly pulled out by the patient. To some extent this can be prevented by a cocain spray, or by brushing the surface of the mucous membrane with a 2 percent solution, but it can nearly always be overcome by patience. No force must be used under any circumstances. If the end is definitely arrested, but not gripped, the bougie must be withdrawn and a smaller one selected; in some cases only a catgut will pass. Measured on a bougie, the cricoid cartilage is approximately 7 inches from the teeth, the left bronchus 11, and the opening in the diaphragm 15 (Moullin).

Other methods of examining the esophagus are of very little value. Auscultation (the stethoscope being placed by the side of the spine while the patient drinks some water) may be tried, but it rarely gives any indication that can be interpreted. The condition of the lungs, especially the amount of bronchial irritation caused by the passage of a bougie, and the state of the cervical glands, whether enlarged or not, are very important factors in the prognosis.

The treatment of stricture of the esophagus depends upon the cause, whether it is traumatic or malignant. In the former case the walls are usually very much thickened (although it may be a long time before the sloughing in the interior ceases), the patient is often young, and there is no danger but that of starvation; but, if the patient lives sufficiently long, ulceration always gains the upper hand and causes perforation, and even if starvation and pneumonia are successfully prevented, the result must inevitably prove fatal within a few months from the malignant cachexia.

Traumatic Stricture.—In any case in which the interior of the esophagus has been seriously injured, contraction must be prevented by the use of bougies. At first they must be passed every day; then, if the tendency to contract is not very marked, at gradually increasing intervals; but, as it may be necessary to make use of them for the rest of his life, the patient should learn as soon as possible how to pass them himself. The food must, of course, be always suitably prepared.

In old cases in which the stricture has been allowed to contract, the difficulty is very much greater. Gradual dilatation is the most successful method, using slightly conic instruments. It may be necessary to begin with catgut, if the constriction is very narrow, leaving it in place for 24 hours, or making use of it as a guide on which a fine rubber tube can be slipped down; the patient can always swallow liquids by the side of it. Internal Esophagotomy (*q. v.*) (division of the stricture from within) is a very dangerous operation, and, as the stricture must be a permeable one to allow of its being done, can very seldom be advised. In exceptional instances an artificial opening has been made in the neck below the stricture (esophagostomy), and the stomach has been opened and the stricture dilated through the cardiac orifice. Practically, if dilatation fails, **gastrostomy** (see Stomach (Surgery) must be performed. The results, compared with those of the same operation for malignant disease, show a far higher percentage of success, but it is not probable that all the unsuccessful cases have been published.

Malignant Stricture.—Excision of the growth has been practised with success, an artificial opening into the esophagus being left at the root of the neck; but cases in which such a proceeding is possible are infrequent. As a rule, all that can be done is to make an artificial opening below the stricture, either in the esophagus or stomach, or to maintain the patency of the canal by means of tubes or bougies.

ESSENCES.—See Spirits.

ESSENTIAL OILS.—The essential or volatile oils (*attars*) are found extensively distributed throughout the vegetable kingdom. They occur in almost all parts of the plants except the cotyledons of the seeds. They impart the peculiar and characteristic odors to the plants, furnish the perfumes, spices, and aromatics, and many of them possess valuable medicinal properties. Chemically, essential oils are subdivided into the following classes:

(1) *Hydrocarbon oils* (or *terpenes*), consist of C and H, most of them having the formula $C_{10}H_{16}$ and are therefore isomeric with rectified oil of turpentine, which is the type of this class. (2) *Oxygenated oils*, contain C, H and O, are highly aromatic and usually consist of a terpene mixed with an oxygenated principle (an acid, an aldehyde, etc.). The oils of cinnamon and peppermint are examples of this class. (3) *Sulphuretted oils* contain sulphur in addition to their other elementary constituents, and are pungent and disagreeable in odor and taste; as the oils of garlic and mustard. In the latter case the oil is formed by the reaction of the constituent principles in the presence of water and does not preëxist in the plant. (4) *Nitrogenous oils*, contain N, as the compound cyanogen, CN, in the form of hydrocyanic acid, which is formed only after maceration with water. Examples are the oils of bitter almond, peach-kernels, etc.

ESTHIOMENE.—Lupus exedens; lupus of the vulva. A very rare and chronic disease, commencing during the menstrual period. It is a form of ulceration accompanied by fibrous overgrowths of the surrounding and adjacent tissues. It produces hard, cicatricial tissue on healing. There is a process of imperceptible disintegration of the tissues, but no sloughing. Death may result from hemorrhage or perforation into the peritoneal cavity or bladder.

ETHER.—A thin, colorless, volatile, and highly inflammable liquid; in composition a diethylic oxid

$(C_2H_5)_2O$, known also as ethylic ether. It is obtained by the action of sulphuric acid on alcohol, and is of strong characteristic odor. It is freely soluble in alcohol, water and chloroform. Official preparations contain about 4 percent of alcohol. It is used mainly as a solvent for fats and oils, and as an anesthetic. Internally it is anodyne, antispasmodic, diaphoretic, and narcotic. Inhaled it is an anesthetic and a cardiac stimulant; in toxic doses, it paralyzes the respiratory centers and depresses the circulation. Used habitually it produces effects similar to those of chronic alcoholism.

Therapeutics.—Its anesthetic use is discussed under ANESTHESIA and ANESTHETICS (General) (*q. v.*).

When used internally, ether is best given in capsules or in ice-cold water. If cold water is not used, the evaporation as it passes the fauces will cause such irritation as to prevent deglutition. It may be given in 20-drop doses with cod-liver oil, taken at the time discomfort usually appears. It is of service in hiccup, colic and flatulence, especially that of children, and is best given in the form of compound spirit of ether (**Hoffmann's anodyne**). It produces local anesthesia by evaporation, and is used in paracentesis or thoracentesis, in opening abscesses, etc. The local effect is also used to ease the pains of neuralgia. The contraction caused by the local application of ether is utilized in reducing hernia.

The sweet spirit of niter, or spirit of nitrous ether, is an alcoholic solution of ethyl nitrite containing 4 percent of crude ether. It should not be kept long, as it turns acid with age. It is an ingredient of the compound mixture of glycyrrhiza. The dose for an adult is from 20 drops to 1 dram, and for a child of 1 year, 5 to 10 drops. As inferior preparations are usually sold in shops, a ready means of detection is given in the addition of a grain or two of antipyrin to 1/2 of an ounce or less of the spirit. If ethyl nitrite is present, a purple color will appear, immediately followed by a green precipitate, which is not at all poisonous.

Sweet spirit of niter is very extensively used by the laity. It is a sedative to the circulation and to the nervous system, and, according to the mode of administration, it is a diaphoretic or diuretic. The diuretic action is best obtained by using the drug in cold water, and by keeping the patient lightly covered and cool. The diaphoretic action is best obtained by giving warm drinks, such as hot lemonade, with the niter, and keeping the patient well wrapped. It is very useful as a diaphoretic in the treatment of acute colds in adults and in children. In incontinence of urine in children it is of service when followed by belladonna or combined with potassium citrate. It is beneficial in the nervous excitement of fevers and in states of irritation in infancy, when it is a distinct antispasmodic. It is a valuable vasodilator.

In incontinence of urine the following is useful:

℞.	Potassium citrate,	ʒ j to ij
	Spirit of nitrous ether,	ʒ ss
	Water, enough to make	ʒ iv.

Give a dessertspoonful every 5 hours until urine becomes clear.

Preparations.—**E., Commercial,** contains 94 percent of ether. It is unfit for use except as a solvent. **Oleum Æthereum,** ethereal oil, contains equal parts of ether and heavy oil of wine. **E., Spt. of,** ether 32.5 and alcohol 67.5. **E., Comp. Spt. of,** Hoffmann's anodyne. Ether 32.5, alcohol 65, ethereal oil 2.5 percent. Dose, 5 minims to 2 drams. **E., Spirit of Nitrous,** *sweet spirit of niter,* a solution of ethyl nitrite in alcohol. Dose, 10 minims to 2 drams.

ETHMOIDAL SINUS, DISEASE OF.—See NOSE (Accessory Sinuses).

ETHYL ACETATE.—Acetic ether. Combined with other carminatives, it is used as an antispasmodic and stimulant. Dose, 10 to 30 minims.

ETHYL BROMID.—Ethyl bromid had a short period of popularity as an anesthetic, but fell into disrepute after a few cases of death under its influence, which were probably not due to the agent used. Its action is less prolonged than that of ether, but it has many advantages, being noninflammable, acting rapidly in small quantity, and being comparatively free from ill effects. It may be used as a primary inhalation before the use of ether, a method of inducing anesthesia which has given good results in many cases, being free from bronchial irritation, requiring less ether to maintain the effect than when ether is given alone, having less intoxication and muscular excitement, less tendency to vomiting, and a more rapid return to consciousness. It is considered an excellent anesthetic in obstetrics and gynecology; its inhalation has proved useful in hysteria, epilepsy, chorea and other spasmodic disorders; and it has been employed subcutaneously in place of ether in the treatment of spasmodic affections such as whooping-cough and chorea.

ETHYL CARBAMATE.—See URETHANE.

ETHYL CHLORID.—Monochlor-ethane, kelene. A colorless, highly volatile fluid, of strong ethereal odor. It is usually kept in glass tubes drawn to a point, which is broken off and the chlorid expelled as a spray by the heat of the hand. The evaporation from the spray produces intense cold, the part becoming first red, and finally white, when complete anesthesia is present. It is a safe local anesthetic for minor operations, and used as a preliminary inhalation to ether or chloroform prevents the stage of excitement of the latter.

ETHYL IODID.—Hydriodic ether. It is used to relieve the dyspnea of bronchitic asthma and edematous laryngitis. The dose is 5 to 20 minims, to be inhaled 3 or 4 times daily. It is of service in chronic bronchitis, complicated with emphysema, and in catarrhal affections of the bronchi; it is an alterative.

EUCAIN.—A local anesthetic, the salt of which is Beta-eucain hydrochlorid; it is soluble in water and not decomposed when boiled. The solution does not precipitate, and phenol or salicylic acid need not be added to preserve it. It is painted on mucous membranes or injected into the area to be operated upon. Its area of anesthesia is more extensive than that of cocain, it lasts longer, and the heart is not influenced by it; 30 grains may be injected without risk. Solutions of 15 percent

strength are permanent, and do not become flocculent. Solutions of from 2 to 5 percent, instilled into the eye, will anesthetize in from 1 to 3 minutes. Eucain causes no ischemia, and anesthesia in the eye lasts from 8 to 12 minutes. A 2 percent solution is usually employed, but 2 drams of a 5 percent solution have given no symptoms of poisoning. Anesthesia is usually complete in from 3 to 5 minutes, and the duration has varied from 20 to 60 minutes. Hemorrhage is more abundant when eucain is employed than when cocain is used, and the injection is more painful than that of cocain. Eucain should not be used in the urethra more than once daily. Eucain has been used with the best results in the nose and throat. **Beta-eucain lactate** has the same action and is more soluble. See also Intraspinal Anesthesia.

EUCALYPTOL.—$C_{10}H_{18}O$. An antiseptic camphor prepared from the essential oil derived from the distillation of the leaves of *Eucalyptus globulus* and other species of the genus. The dose is from 3 to 10 minims in capsule. Eucalyptol is used for the same purposes as the oil of eucalyptus, and is the refined product of the latter. In malarial fever, when quinin cannot be borne, in bronchitis and in subacute forms of gonorrhea, in emulsion or in capsule, it is serviceable.

℞. Eucalyptol,
Oil of sweet orange, } each 5 j.

Place in 20 capsules. Give 1 three times daily, after meals.

The drug is largely used by rhinologists in lotions and in nasal applications. It is insoluble in water, but soluble in alcohol and ether, and is used in solutions of the fatty oils.

EUCALYPTUS.—The leaves (lanceolate, after 3 years' growth) of *E. globulus*, or blue-gum, native to Australia, but now cultivated in California. It contains a volatile oil that yields *eucalyptol*, a camphor, by distillation. It is an aromatic bitter, promoting digestion. It is highly antiseptic and antimalarial, and is valuable in atonic dyspepsia and in intermittent fevers. **E., Fluidextract.** Dose, 10 minims to 1 dram. **E., Ol.**, the volatile oil. Dose, 5 to 20 minims, in capsules or emulsion.

EUCHININ (Euquinin).—An antimalarial, antispasmodic and antineuralgic, used as a substitute for quinin; it is produced by the action of ethyl-chlorocarbonate on quinin. It is said to cause no gastric disturbance, to produce cinchonism less often and less intensely than quinin sulphate, though it is equally efficient. Dose, 5 to 20 grains. Recent observers claim better effects from small doses (1 to 3 grains) than from the large doses recommended by von Noorden. See Quinin.

EUDOXIN.—Bismuth tetraiodophenol phthalein. It is an insoluble, odorless, tasteless powder, reddish brown in color, containing 52.9 percent of iodin and 14.5 percent of bismuth. It has been used in intestinal inflammations. Dose, 3 to 8 grains, t. i. d.

EUGALLOL.—An active substitute for pyrogallol. It is said to be useful in lupus and psoriasis. If irritation result, the treatment should be discontinued for a few days. Dose, one application daily, the painted part being then covered with powdered zinc oxid.

EUGENOL.—See Cloves.

EUMYDRIN.—Methylatropin nitrate. A mydriatic intermediate between atropin and homatropin in its effects; and an antihydrotic. It is recommended in night sweats, enuresis and whooping-cough. Dose, 1/60 to 1/24 grain; as mydriatic, a solution 1/10 stronger than the usual atropin solution.

EUONYMUS.—Wahoo. The bark of *E. atropurpurea* is an astringent tonic and purgative, resembling rhubarb, jalap, aloes, etc., but rather milder. It is beneficially employed in dropsy and hepatic affections. **E., Ext.** Dose, 1 to 5 grains. **E., Fluidextract.** Dose, 5 to 15 minims. **Euonymin** is tonic, laxative, and expectorant. Dose, 1/2 to 5 grains.

EUPATORIUM.—The leaves and flowering-tops of *E. perfoliatum*, thoroughwort, or boneset. It is a bitter tonic, diaphoretic, aperient, and emetic, of value in remittent and typhoid fevers, and believed, also, to be a teniafuge. **E., Fluidextract.** Dose, 10 minims to 1 dram. *E. purpureum*, trumpet-weed, another American species has similar qualities, but is more markedly diuretic.

EUPHORIN.—Phenylurethane, derived from anilin. A white, crystalline powder, nearly insoluble in water, soluble in weak alcohol. It is an antipyretic in doses of from 2 to 8 grains. It may be used as an antiseptic dusting powder for ulcers and skin diseases.

EUPHTHALMIN.—The hydrochlorid of the mandelic acid derivative of Eucaine-B, is a brief and efficient mydriatic, but not an anesthetic. Two drops of a 5 percent solution cause maximal dilatation of the pupil in 35 minutes, without any raise of tension or appreciable effect on accommodation, the patient being able to read as usual. The effect passes off in 2 to 4 hours. It is the most satisfactory mydriatic for ophthalmoscopy, being safe in glaucomatous cases, and of rapid and short action.

EUPYRIN.—A compound of para-phenetidin with vanillin ethyl-carbonate. The toxic action of phenetidin is said to be counteracted in eupyrin by the vanillin. It is claimed to be a stimulant antipyretic. Dose, 20 grains once or twice daily.

EUQUININ.—See Euchinin.

EURESOL.—Resorcin monacetate. Its action is similar to that of resorcinol, but milder and more lasting because of the gradual liberation of the phenol. Euresol is recommended in acne, sycosis, seborrhea, and particularly in the treatment of chilblains. It is applied in 5 to 20 percent ointments and in acetone solution.

EUROPHEN.—A preparation of iodin recommended as a substitute for iodoform. It occurs as a fine, amorphous, yellow powder, with an odor like that of saffron. It contains about 27 percent of iodin. It is insoluble in water and in glycerin, but soluble in alcohol, ether, chloroform, and fatty oils. Heat and starch readily decompose it and light does so slowly. It is 5 times more bulky than iodoform. It is a valuable antiseptic, antisyphilitic, and antituberculotic. It is used freely as a powder or combined with lanolin as a base to make an ointment of 5 to 10 percent strength. It must not be combined with metallic oxids or mercurials or with zinc starch paste. In skin-

diseases a 5 to 10 percent ointment is employed. A 3 to 10 percent solution in olive oil is employed hypodermically.

EUSTACHIAN CATHETER.—See EAR (Examination).

EUSTACHIAN TUBE.—See EAR (Diseases).

EVIDENCE, EXPERT.—See EXPERT TESTIMONY.

EVISCERATION.—1. The removal of the abdominal viscera. See ABDOMEN, INTESTINES, etc. 2. The removal of the viscera of a fetus. See EMBRYOTOMY. 3. Removal of the contents of the eyeball. See EYEBALL (Removal).

EXALGIN.—Methylacetanilid. A crystalline compound allied to acetanilid. It is a valuable analgesic. It is readily soluble in dilute alcohol, less so in warm water, and with difficulty in cold water. Dose, 1 to 5 grains, in wine or other dilute alcoholic mixture. Exalgin, 16 grains, alcohol 1/2 of a dram, and water, 1 ounce, form a permanent solution. Exalgin should never be employed as an antipyretic. In severe neuralgia, headache, migraine, chorea and in locomotor ataxia it is very efficient.

℞. Exalgin, gr. xxiv
Brandy, ʒ iij.
Dissolve in a solution and add:
Syrup of orange, } each, ʒ jss.
Water, }

Give a teaspoonful to a dessertspoonful every hour until 4 or 5 doses have been taken.

EXANTHEMS.—The eruptive fevers. They are separately considered under their individual headings.

THE DIFFERENTIAL DIAGNOSIS OF THE EXANTHEMS.

NAME.	PERIOD OF INCUBATION.	STAGE OF INVASION.	TIME OF APPEARANCE OF ERUPTION.	CHARACTER OF ERUPTION.	DURATION OF ERUPTION.	LOCATION.	DESQUAMATION.	DURATION OF DISEASE.	CONVALESCENCE.
Cerebrospinal Meningitis.	Unknown.	Sudden.	2nd to 4th day.	Herpes labialis, purpuric spots, dusky erythema.	.....	Herpes on lips; purpuric spots over entire body.	.....	Variable; many sequels.	Lysis.
Erysipelas....	Few hours to 3 or 4 days.	1 to 3 days.	Within 24 hours.	Efflorescence; bright red: polished; with well-defined, raised margin.	4 to 8 days.	Face.....	Branny or in large flakes.	1 to 3 weeks.	Crisis.
Measles.....	10 to 12 days.	4 days.	4th day.	Papules; small, dark-red, with crescentic borders. Complete in 24 hours.	4 to 5 days.	Face; then downward over body.	Branny; 8 to 11 days.	2 weeks.	Crisis.
Rötheln.....	8 to 17 days.	24 to 48 hours.	Within 48 hours.	Macules; rose-colored; rounded discrete.	3 days.	Face and scalp; then downward over body.	Slightly branny.	4 to 7 weeks.	Crisis.
Scarlatina....	1 to 21 days.	1 to 2 days.	Within 24 hours.	Diffuse; scarlet; punctate.	7 to 10 days.	Neck, chest, face; then over body.	Scales or large flakes. About one week.	2 to 3 weeks.	Lysis.
Typhoid Fever.	5 to 35 days.	6 to 8 days.	7th day.	In crops. Rose-colored, lenticular spots.	Each crop 3 to 5 days. Last 10 to 20 days or throughout course of the fever.	Abdomen, chest, and back.	Slightly branny or none.	3 to 4 weeks.	Lysis.
Typhus Fever.	4 to 12 days.	5 days.	Usually 5th day: may be on 3d or not until 7th day.	Measly spots petechiæ: streaks: color, mulberry-red.	Few days, or may last throughout the course of the disease.	Sides of chest and abdomen; arms; back.	Slightly branny.	2 to 4 weeks.	Crisis.
Varicella.....	4 to 14 days.	1 to 2 days.	Within 12 to 24 hours.	In crops. Vesicles.	5 to 8 days.	Back, chest, arms.	Crusts; 5 to 8 days.	2 weeks.	Lysis.
Variola.....	8 to 14 days.	3 days.	4th day.	Umbilicated pustules.	21 to 25 days.	Face, and over body.	Crusts; 12 to 22 days.	4 to 5 weeks.	Lysis.

EXCISION OF BONES.—In the excision of diseased bones care must be taken that the wound is so situated that no injury will be done to arteries, nerves, muscles, or tendons. In choosing interstices between muscles and tendons only those should be selected that correspond to the borders of nerve distribution. If the preservation of the function of a muscle is desired, its motor nerve must be preserved.

The Upper Extremity

Excision of the Clavicle.—An incision is made along the whole course of the bone, which, being subcutaneous, can be easily reached. In this incision the platysma and supraclavicular nerves are divided. The periosteum should be separated from the bone. The clavicle may then be sawed through in the middle, as this facilitates the removal of each half separately. The parts to be detached from the bone are: *above*, the clavicular attachment of the sternomastoid muscle and the trapezius; *below*, the clavicular portion of the pectoralis major and deltoid; *behind*, the subclavius muscle and the costoclavicular ligament.

Excision of the Scapula.—An incision is to be made from the point at which the acromion must be severed, along the spine of the scapula to its posterior margin, then downward to the angle of the scapula, preserving as much of the acromion as possible, as important muscles—the trapezius and deltoid— are attached to it. If no part of the acromion can be saved, the incision is to be carried into the joint and the triangular flaps, formed by the incisions previously named, dissected back.

The posterior margin of the deltoid should be raised and separated from the spine at the acromion as far as the acromioclavicular articulation, or to the point at which the acromion is divided, and the acromion cut with a chisel. If the articular surface of the scapula can be saved, the muscles should be cut one by one, first raising them on the finger or on an elevator, and then sawing off the articular part of the scapula. If the articular surface cannot be saved, the muscles that are attached to the head of the humerus—viz., the supraspinatus, infraspinatus, and teres minor, from the greater tuberosity, the subscapularis from the lesser tuberosity, as also the latissimus dorsi and teres major—are to be dissected off, preserving the axillary nerves and the posterior circumflex artery at the lower margin of the teres minor, and, further backward the dorsalis scapulæ, which must be ligated. Beginning at the acromion, the trapezius is to be divided on the finger and its separation continued backward along the spine of the scapula, drawing the scapula downward and separating the muscles attached to its upper margin—viz., the omohyoid (here the terminal branch of the transverse scapular artery must be tied), and the levator scapulæ at the posterior superior angle of the bone, where some branches of the dorsalis scapulæ artery may require ligation. The posterior margin of the scapula should next be dealt with, separating the attachment of the serratus magnus. The scapula is now turned over, the rhomboids are divided, and the dorsalis scapulæ artery ligated as it passes along the edge of the bone.

The Ulna.—The ulna lies so near the skin throughout its entire length that its excision requires no special description.

The Radius.—The part of the radius most easily exposed is the middle third of the shaft along its posterior surface between the long and short extensors and the extensors of the fingers. There are no vessels of any importance at this part, and the nerves may be disregarded, as the muscles receive their nerve supply higher up. The head of the radius may be felt posteriorly just below the external condyle of the humerus, and is readily exposed by an incision along the course of the bone.

Metacarpal Bones and Phalanges.—For the metacarpal bones dorsal incisions are required, care being taken to preserve the extensor tendons and the radial and ulnar nerves. For the phalanges bilateral incisions should be employed, otherwise cicatricial contraction may cause deformity.

The Lower Extremity

The Shaft of the Femur.—Along the outer aspect of the bone an incision may be made from the base of the great trochanter to the outer condyle of the femur without fear of dividing vessels, nerves, or muscles of any consequence. If the incision is made above the base of the great trochanter, the terminal branch of the external circumflex artery, as it passes under the vastus externus muscle, will be divided. If the incision is carried beyond the condyle of the femur, another artery will be endangered—viz., the external superior artery of the knee, as it runs transversely around the bone between the posterior margin of the vastus externus and the biceps.

The Patella.—A longitudinal incision over the patella exposes the bone. The periosteum and fascia of the quadriceps are separated by a periosteal elevator, and the bone enucleated from the anterior wall of the capsule. This operation is indicated when the patella alone is diseased, and its early performance will prevent a general inflammation of the knee-joint.

The Tibia is so near the skin that no special directions for its excision are necessary.

The Fibula.—Two structures must be avoided in excision of the fibula—viz., the peroneal nerve, which winds around the neck at the upper extremity of the bone, and the peroneal artery, which passes behind the lower half of the fibula. Avoiding these, the whole bone can be excised by an incision behind the peroneal muscles in their entire length.

EXCISION OF JOINTS.—When joints are hopelessly diseased, or so extensively injured as to threaten the life of the individual and render repair impossible, cutting out the portion of diseased or injured bone is resorted to instead of amputation. It is now well established that in many joints excision is better and safer than amputation; less violence is done to the body; fewer great arteries, nerves, and veins are divided, and the patient retains a limb that, although imperfect, is in most cases highly useful.

Excision is usually attended with the best success in the elbow, and here it may be done at a later period of life than would be advisable elsewhere. In the shoulder, elbow, and wrist, fibrous ankylosis is aimed at in order to secure a movable joint; in the hip and knee, firm bony union is sought in the most useful position of the limb, which is that of extension.

Contraindications.—Excision should *not* be undertaken—(1) when the disease is acute; (2) when there is much destruction of the bones or riddling of the soft parts with sinuses; (3) when there is much atrophy of the bones and muscles; (4) when the bones are in a state of osteomyelitis; (5) when the patient is either young or old, as in the former instance, the epiphyses are liable to be removed and the growth arrested in consequence, and in the latter, the powers of repair are usually insufficient to ensure sound healing and a subsequently useful limb; (6) when there is lardaceous disease or signs of phthisis, or other organic mischief; and (7) when the patient's powers of repair are exhausted by long-continued suppuration. Under most of the above circumstances amputation is generally indicated.

Excision of the Shoulder-joint.—Surgeons differ as to which is the best incision to make in commencing this operation; many authorities recommend an anterior, in front of the deltoid; Nélaton used the transverse, and other surgeons, the deltoid, flap. Bryant advocates a vertical incision from the acromion process, through the thickness of the deltoid down to its insertion. A vertical incision should be made down to the bone, rotating the head of the humerus successively outward and then inward; a transverse cut is next made across the tuberosities, to divide the insertions of the scapular muscles; the capsule is divided, turning the head out of the wound, and resecting through the tuberosities. Should the glenoid cavity be diseased, the dead bone must be removed. When the vertical incision is employed, and opening must be made posteriorly through the soft parts, at a point corresponding to the upper end of the humerus, for the purpose of drainage; it must be kept open by means of a drainage-tube. After the operation the arm should be abducted and placed on a pillow, and the edges of the wound carefully brought together and dressed antiseptically. From 3 to 4 months are required to secure a useful arm.

Excision of the Elbow-joint.—The patient is placed on his back, and the arm, with the hand in a prone posture, held by two assistants, one of whom holds the arm and the other the forearm. A straight vertical incision 4 inches long through the skin and subcutaneous tissues is then made, a little to the ulnar side of the hinder surface of the joint; its center about the level of the olecranon and to the outer side of the groove in which the ulnar nerve lies. Deeper cuts are then made around the upper border and sides of the olecranon, laying bare the condyles of the humerus, separating the origins of the muscles of the forearm, and cutting into the joint transversely, severing the triceps from the olecranon. The ulnar nerve is drawn inward, off the inner condyle, by a double blunt hook, and protected from the saw, the lateral ligament severed, the elbow forcibly bent, so as to turn out the ends of the bones. The olecranon may now be cut off with the saw or forceps, when the other diseased portions of bone will be visible. The end of the humerus, as well as the head of the radius, may now be removed. Enough bone must be removed to prevent ankylosis. As much of the brachialis anticus must be removed from the coronoid process as may be necessary; the triceps tendon must be left as long as possible. When the bleeding has ceased, the wound is to be brought together by sutures, dressed antiseptically, and the arm, in a half-bent posture, laid upon a well padded angular splint and secured by bandages.

When the reparative stage has fairly set in, the arm is to be moved from time to time, so as to form a *false joint*. There are many varieties in the plan and shape of the incisions; the most practical is to make the incisions connect and fall into the tract of any sinuses that may exist. In short and muscular men the **H** incision is the best, especially if there is much enlargement of the joint.

Excision of the Wrist-joint.—The incision and modes of procedure in this operation vary in each case according to the situation and extent of the disease; no precise rules can therefore be laid down. The form of the incision must be guided by the presence of the sinuses on the surface; by following these a sufficient opening may usually be made between the extensor tendons and the bones. One of the most usual modes of operating consists of longitudinal incisions on both sides of the wrist-joint, or incisions on the dorsal and internal lateral aspects, directed so as to go between the tendons without dividing them. An incision to the ulnar side of and parallel to the tendon of the extensor secundi internodii pollicis, and another incision vertical on the inner side of the joint, between it and the flexor carpi ulnaris, will allow sufficient room to remove the diseased carpal and bases of the metacarpal bones.

Excision of the Hip-joint.—To perform this operation a long, straight incision is made down the outer side of the limb, beginning below and behind the anterior superior spine of the ilium, and passing over the great trochanter. The attachment of the muscles having been severed from the trochanter, the bone is turned out of the wound by raising and adducting it at the knee; the neck and head of the bone, if necessary, are to be dissected out of the acetabulum.

Another method of performing this operation is to make a semicircular incision, beginning just above the edge of the tensor vaginæ femoris, and curving downward and outward, so as to cross the bone an inch below the trochanter, whence it should turn a little upward. This flap, including skin, fascia lata, tensor vaginæ femoris, and part of the gluteus maximus should be turned up, the muscles attached to the injured parts divided, and the remaining steps of the operation completed in the manner described.

Excision of the hip-joint should be performed with antiseptic precautions. If foul sinuses exist, they may be scraped with a sharp spoon and

cleaned well with a sponge dipped in a solution of sulphate of zinc. Antiseptic dressings may then be applied and the limb fixed in a long splint or in plaster.

Excision of the Knee-joint.—A semicircular incision is to be made, with convexity downward, commencing at the side of one condyle of the femur and passing immediately above the tubercle of the tibia to a corresponding point on the opposite condyle. This incision divides the patellar ligament, and the patella is turned up in the flap; the crucial ligaments should then be cut across, and any remaining lateral attachments divided. The limb must now be forcibly flexed and the knife carefully applied to the posterior part of the head of the tibia; a blunt-pointed resection knife is best for this purpose. The articular surfaces are to be sawed off. The lower end of the thigh bone should first be removed; the division must be made accurately at right angles to the shaft of the femur, in the anteroposterior direction. A thin slice is next taken off the tibia; the section must be accurately at right angles to the shaft of the tibia. Care must be taken not to remove more of the bones than is absolutely necessary, especially in young subjects. If the patella is much diseased, it should be removed; if it is only slightly carious, it may be scraped or gouged out; if healthy, it should be left to consolidate and strengthen the joint. But the articular surface should be destroyed to favor firm union with the femur. To keep the bones in position they should be drilled obliquely at the anterior part, and secured by two strong sutures of catgut. If the wound is septic, wire sutures are the best. Before the wound is closed all hemorrhage must be thoroughly arrested. Ligatures must be applied to the articular arteries, if necessary. The patellar tendon should be stitched in place with catgut and the wound drained for 1 or 2 days by tubes or numerous strands of silkworm-gut. The limb must be kept at perfect rest for the first few weeks; a narrow, properly padded splint, extending from the hip to the heel, will meet all indications. It should be fixed in position by a flannel bandage above and below the knee, over which a firm plaster-of-Paris bandage must be applied. An interrupted plaster splint with connecting side irons allows free access to the joint for dressing and prevents soiling of the splint. The first dressings should be changed after 24 hours. After that the dry, antiseptic wool dressings should be used, which can be left untouched for 2 or 3 weeks.

Excision of the Ankle-joint.—The foot is placed on its inner side, and an incision made along the posterior face of the fibula, beginning 3 inches above its lower extremity; after reaching the end of the malleolus its direction changes, and it terminates about 1/2 of an inch short of the metatarsal bone of the little toe. The flap is raised and reflected forward, exposing the surface of the fibula, taking care not to injure the tendons of the long and short peroneal muscles, which lie against the posterior and outer surface of the bone. The fibula is now to be cut through with strong bone-pliers, and its lower extremity dissected out. If the disease is very limited and easily accessible, the one incision here recommended will suffice; if the disease is more extended, the foot must be placed on its outer surface, and a second incision must be made along the inner angle of the tibia and terminating at the internal cuneiform bone. The flap is dissected back, keeping close to the bone, so that the tendons of the tibialis posticus and of the flexor longus digitorum, and the posterior tibia artery, veins, and nerves may be raised without injury. These parts should be held aside, the internal malleolus cut away with the bone-pliers, and the internal lateral ligament divided. The bone is cleared in front and behind with the periosteal elevator, and the foot strongly everted, when the tibia and upper surface of the astragalus will be exposed at the internal wound. The bone should now be divided from behind forward by a narrow-bladed saw passed through the internal wound, behind the tibia, and made to appear at the external opening. The upper surface of the astragalus may now be sawed off. The wound must be thoroughly washed out with bichlorid solution, a drainage-tube passed through from one side of the joint to the other, the sides of the incision closed by interrupted sutures, and the whole dressed antiseptically. The foot and leg must be covered with a bandage and plaster rollers applied, care being taken to give the foot a proper angle with the leg, the foot being held by the hand of an assistant until the plaster has hardened. Traps are to be cut on the sides of the splint opposite the wounds.

EXCORIATION.—The superficial destruction of a portion of skin or mucous membrane. The surface of the skin is usually denuded only so far as the stratum mucosum. Healing takes place without a scar. Excoriation occurs chiefly in pruritic diseases. Acetanilid and boric acid in equal parts may be dusted over the surface. The nitrate and carbonate of bismuth also make good dusting-powders. Camphor added to these powders will allay heat and itching. Calamin, (zinc carbonate), and zinc oxid are useful. Lime-water will allay the irritation resulting from the presence of urine. Soap may be used when acid secretions are causative, followed by oily applications. Boric acid in ointment, glycerin with tragacanth, and the glycerite of tannin are serviceable.

EXCRETA.—See Feces.

EXENCEPHALUS.—1. A species of single autositic monsters, characterized by a malformed brain, situated, at least in part, outside the cranial cavity, the bony walls of which are themselves imperfect. The specimens of this nature are divided into two main classes—those with and those without a spinal fissure. 2. A variety of autositic monsters of the foregoing species in which there is an arrested development of the cranial bones, with protrusion of the brain, associated with an extensive spina bifida.

EXENTERATION.—1. Removal of the intestines or thoracic viscera in Embryotomy (*q. v.*). 2. In ophthalmology the operation of evisceration of the contents of the eyeball, leaving the globe as a stump in the orbit, or the removal of the contents of the orbital cavity. See Eyeball (Removal).

EXERCISE.—Broadly, the setting in motion of the body, or the functional activity of the organs, whether muscular, nervous, nutritive, secretory, or reproductive. Popularly, the term is applied only to the muscles and to the parts called into play through the same—especially the circulatory and respiratory systems. Exercise is essential to the preservation of health; the want of it is frequently associated with the causes of disease; it is often a rational and successful means of treatment; and it is often abused. General muscular exercise increases the number of respirations and the quantity of air inspired. When walking at the rate of 2 miles an hour, the amount of inspired air is doubled; at 4 miles trebled. General muscular exercise also increases the force and frequency of the heart's action. The excretion of water from the skin is increased, and the loss of chlorids and fatty acids is considerable. The amount of water and chlorids in the urinary excretions is decreased, and the eventual result is a small increase in the amount of nitrogenous loss by exercise. Regular constant exercise increases the density and the bulk of muscle; there is actual storage of nitrogenous tissue; while excessive exertion leads to muscular exhaustion, diminished irritability, and, finally, to degeneration. Exercise increases the appetite, especially for fats and meats; digestion becomes more rapid and the hepatic circulation is better; the total weight of feces is decreased, the amount of water ingested increased, and nutrition is markedly improved.

Deficient exercise lessens oxidation, diminishes the efficiency of the circulation, and lowers metabolism. The muscular system wastes, while fat and water increase; the muscles become smaller, more flabby, paler, and the heart shares in the changes, so that subsequent exertion favors dilatation. Deficient exercise lowers pulmonary nutrition and favors the onset of tuberculosis; appetite is lessened, digestive power enfeebled, and chronic constipation favored.

Exercise is excessive when it produces a distinct sense of fatigue. A laborer's daily work amounts to 900 foot-tons. A 9-mile walk equals 150 foot-tons. Excessive exercise produces laborious respiration, with occasional sighing; if it is persevered in, hemoptysis may result. Palpitation or intermittence of the heart may occur after exercise too long continued. Overexertion, often repeated, produces cardiac hypertrophy, valvular disease, atheroma of vessels, and even rupture of the heart.

A pulse of 120 to 140 in rapidity from exercise is excessive in amount or velocity, disturbing rhythm; and exercise causing it should be abandoned. The more rapidly work is done, the more exhausting it is. Both tea and alcohol are to be avoided when the sense of fatigue is pronounced.

Exercise in the treatment of chronic heat-disease has been reduced to a system. Fatty hearts, from general obesity, and enlarged hearts, from gout and chronic mitral disease, especially when dropsy, renal disturbance, bronchial congestion, or catarrh are present, are the conditions to be improved. Specified distances, under certain elevations, are made use of. These are daily increased as the restoration of compensation is secured. In climbing the arteries are fuller, although the walls are more relaxed. Exercise is of the utmost service in chronic bronchitis phthisis in a quiescent state, atonic dyspepsia, dyspepsia with plethora, hepatic tenderness, constipation, and cachectic conditions, especially in scrofula, the "tubercular diathesis," rickets, and anemia.

In local paralyses or pareses from disease, injury, or disuse exercise is indicated (1) when the patient retains voluntary power over the muscles and can bring them into action, and (2) when the muscles may be involuntarily moved by electric stimulation.

It is most important that in manhood no violent exercise should be undertaken that throws a strain upon the thoracic organs until their powers have been brought into play by careful preliminary training. See HEART-DISEASE (Organic), LOCOMOTOR ATAXIA, SCHOTT TREATMENT.

EXHAUSTION.—A phenomenon that consists in a failure to respond to stimulation, and that occurs in all irritable tissues. Excessive, continuous, or quickly repeated stimulation will bring about exhaustion of muscle and nerve. Previous insufficient exercise of function, exposure to the extremes of temperature, and an insufficient supply of oxygen, an excessive supply of carbon dioxide exposure to certain toxic agents, and alteration in the quantity of blood supply favor exhaustion. Overwork, physical or mental, will cause exhaustion, especially when unremitting and monotonous. In a healthy man, however, great permanent harm from physical work seldom results; but excessive mental labor, especially if continuous, will permanently damage the nervous tissues. Exhaustion quickly results when, in addition to hard, voluntary mental labor, some constant stimulus unceasingly works upon the brain, as in a person harassed by poverty or affected by the sudden death of a relative or by a severe money loss. Anemia, faulty nutrition, prolonged pyrexia, inadequate diet, persistent morbid discharges, or venereal excesses favor general exhaustion. A previous condition of excessive slothfulness, exposure to extremes of temperature, retention of morbid products, etc., also predispose. Severe injury or psychic causes—such as fright—occasionally induce general exhaustion.

Local exhaustion is the result of excessive local stimulation, and is particularly liable to occur in those suffering from general exhaustion. Loss of power in the rectum results from the excessive use of purgatives. Failure of the uterus in protracted labor and failure of the voluntary muscles in "writer's cramp" are instances of exhaustion from overstimulation.

The chief indications for the treatment of general exhaustion are to lighten the labor and obtain rest. Narcotics, such as chloral, opium, sulphonal, and potassium bromid, are sometimes advisable. Phosphorus is given for physical and mental exhaustion and in depression from overwork. Grain doses of calcium phosphate, calcium carbonate, and ferric phosphate may be given. Potassium bromid allays bad dreams, insomnia, and irritability. One drop of laudanum with 2 or 3 drops

of tincture of nux vomica, 3 or 4 times daily, is of value in exhaustion with headaches, flushing, and dyspepsia. Musk benefits all forms of nerve exhaustion. Cimicifuga is advised for headache from overstudy or excessive fatigue. Coca lessens the sense of fatigue, and is suitable for convalescents. Cocain has been used in exhaustion from sunstroke from loss of blood, and in diarrhea. A cold wet sheet may be used as restorative. Seabathing is valuable. Change of occupation is better than absolute rest. Fresh air and good diet are most necessary. Stimulants are to be used with caution. The brain-worker should seek recreation in outdoor exercise, by music or painting, or by practising some handicraft. See COLLAPSE, SHOCK, NEURASTHENIA.

EXOPHTHALMIC GOITER (Basedow's Disease; Graves' Disease).—A disease characterized by tachycardia with palpitation, goiter, exophthalmos and tremor, palpitation usually being the initial symptom. The pulse ranges from 90 to 120 or higher. Occasionally the exophthalmos is so extreme as to produce spontaneous dislocation of one or both eyes.

There are present *Graefe's lid-sign*—namely, inability of the upper lid to follow perfectly the downward movement of the eye—and, usually, *Stellwag's sign:* viz., apparent widening of the palpebral aperture, due to retraction of the upper lid. The disease is usually encountered in women; its course is chronic, and the ultimate outcome is recovery. Death, however, occasionally results.

The etiology is obscure, but the disease occurs frequently in those of the neurotic habit. The theories propounded for the explanation of exophthalmic goiter may be placed in 3 divisions: (1) The *cardiovascular theories*, which locate the seat of the disease in the heart itself, in the vessels, and in the blood; (2) the *mechanic theories*, which connect the symptoms with compression of vessels or nerves in the neck by a primarily hypertrophied thyroid; (3) the *nervous theories*, which attribute the disease to disturbance in the vagus nerve, in the sympathetic nerve itself, or in the central nervous system proper.

Treatment.—Rest and protection from excitement are essential conditions of a successful treatment. After this the treatment is mainly directed to the symptoms. The remedies most used are the bromids and digitalis: digitalis to slow and steady the pulse, the bromids for two reasons—(1) as nervous sedatives and (2) for their reputed action in producing anemia of the nerve-centers. Quinin hydrobromid has been used in doses of five grains, thrice daily.

In some cases, when there is no cardiac lesion and the pulse is good and strong, aconite with the bromids is of service. Ergot, for its power of contracting the caliber of blood-vessels, is also a rational remedy. There is a difference of opinion as to the propriety of administering iron. Tyson believes the decision should be based on the condition of the patient and on the presence or absence of anemia. Galvanism of the sympathetic is said by German writers to be of service. Theoretically, it should be. A constant current of from 5 to 8 cells is used; the negative pole is placed on the fifth cervical vertebra, the positive pole along the sternum. Special efficiency has been claimed for the tincture of nux vomica. Thyroid extract (see THYROID TREATMENT) has not proved very useful.

Section of the cervical sympathetic is advocated by some. Ligation of the carotid has been practised in pulsating exophthalmos.

Reports from the clinics of Kocher, Halsted and the Mayos show improvement in cases of goiter treated surgically, and they are uniform in the stated changes occurring in the thyroid, especially as to the apparent cell activity essential to excessive secretion. There has been a great reduction in the mortality of operations for hyperthyroidism. In cases hardly severe enough for thyroidectomy ligation of the vessels will often effect a cure in a few weeks. Ligation is also indicated in acute, severe exophthalmic goiter and in the chronic, very sick cases with secondary affections of the heart, liver, spleen, kidneys. The operation is of particular value in cases with marked pulsation and thrill in the superior thyroid arteries. Ligation is also a valuable step to reduce excessive secretion before thyroidectomy.

Five hundred and eighty patients suffering from hyperthyroidism or exophthalmic goiter have been operated on at St. Mary's Hospital. Of these, 225 were ligations of the superior thyroid arteries and veins. A number of these ligations have been too recent to base observations on except as to the immediate risk of operation, which is about 2 percent in deaths occurring within a few days. Ten of these patients were operated on too late, dying in from eight to ten months later of their disease. In these deaths is included a case of pernicious anemia. The Mayos now have full records of 138 cases which were ligated sufficiently long ago to make the report of value.

There were 12 cases of ligations of the remaining superior thyroid artery and vein following thyroidectomy of the larger lobe and isthmus, the primary operation being followed by relapse after one or several years with growth of the remaining lobe. Twenty-eight cases of thyroidectomy followed the ligation of both superior thyroid vessels. Although all of them were very severe cases at the time of ligation, there was no mortality from the second operation.

In cases of ligation without thyroidectomy the results were as follows: Slight improvement, 9; great improvement, 44; very marked improvement, 11; absolutely well, 4; cases of questionable exophthalmic goiter, no improvement, 9.

In one hundred and ten cases in which partial thyroidectomy was performed there were nine deaths. Of the rest 50 percent made an early recovery, 25 percent improved as regards the main symptoms during several months, and 25 percent, while greatly improved, had occasional temporary relapses of the tachycardia and tremor. Mayo's rules for operation in exophthalmic goiter are as follows: If the condition is fair, operate; if the pulse is 130 to 160, or if it suddenly fluctuates in tension and rapidity, if there is anemia with

swelling of the feet, the patients are placed upon belladonna treatment for some days. The more severe types are also given X-ray exposures, from two to six weeks.

EXOPHTHALMOS.—Protrusion of the eye from the orbit; it may be due to increase in the bulk of the eye by disease, orbital cellulitis, an orbital tumor, a foreign body or hemorrhage in the orbit, myopia, or exophthalmic goiter. It may be present in a slight degree after tenotomy. If one eyeball alone bulges forward, there is likely to be a local cause, such as abscess, injury, aneurysm, or other tumor, and it should be treated accordingly. Protrusion of both eye-balls is probably the result of some circulatory disturbance, such as **exophthalmic goiter** (**Basedow's** or **Graves' disease**); injury of the internal carotid within the cavernous sinus (**pulsating exophthalmos**); or of some condition causing thrombosis of the ophthalmic vein. In such cases local treatment is of no avail. See Exophthalmic Goiter.

EXOSTOSIS.—See Bones (Diseases); Nails (Diseases).

EXPECTATION, TABLES.—See Life Assurance Examination.

EXPECTORANTS.—Remedies that modify the secretion of the bronchopulmonary mucous membrane and promote its expulsion.

Nauseating Expectorants.—In large doses these act mechanically by expelling the mucus in the act of vomiting; in small doses, by increasing osmosis from the inflamed mucous membrane. The members of this subdivision generally increase secretion and tend to lower blood-pressure. The principal are:

Antimony, tartar emetic, ipecacuanha, emetin, pilocarpus (jaborandi), apomorphin, quebracho, alkalies, potassium iodid, lobelia, lobelin.

Stimulant Expectorants.—These are largely eliminated by the bronchial mucous membrane, which they stimulate, altering the secretion and facilitating expectoration. These remedies generally diminish secretion and increase blood-pressure. They are:

Ammonium chlorid, ammonium carbonate, benzoin and benzoic acid, balsams of Peru and tolu, wood-tar and tar, acids, squill, garlic, onion, turpentine, sulphur, nux vomica, strychnin, senega, saponin, licorice, saccharine substances.

EXPECTORATION.—See Sputum.

EXPERT TESTIMONY.—Under the present judicial system, in matters involving scientific or technical knowledge for their decision, information must be given to the 12 men who constitute the jury, as well as to the judge himself, by persons whose special education has given them the knowledge required. Such a person is known as an expert witness; when medical subjects are involved, a medical expert witness.

It is not uncommon for the laity to abuse medical experts, and, indeed, the whole medical profession, on account of the medical testimony given in the courts. There is undoubtedly good reason for complaint, but this complaint should rest against the legalized judicial system and the scheme or plan of expert testimony that it involves; not against the medical profession, which neither in its solidarity nor its individuality has borne a prominent part in the legislation upon which the procedures in courts are based. The medical profession, as a profession, has no control over its membership; the whole tendency of medical education and the stimulating force of professional *esprit de corps* are toward the elevation of the character of the individual, so that the average personnel of the profession is superior to the average of the educated classes of the community. Nevertheless, the medical profession does, and probably must always, contain within its ranks many men of feeble intellectual powers and not a few who are lacking in moral character.

According to the present custom, the lawyer who wishes to use medical testimony for his purpose goes from doctor to doctor, getting opinion after opinion, until he finds what he is after or relinquishes the quest. By the acceptance of the fee for the opinion, the mouth of the physician concerned is sealed, so that it is not known that the lawyer has approached, it may be, a dozen doctors, and received a dozen adverse opinions, before he has found one opinion that is suited to his purpose.

It is evident that in this way the legal profession is able to avail itself of whatever of crankism, incompetency, or dishonesty is to be found in the medical profession. Under these circumstances the question arises to every self-respecting member of the medical profession, "Shall I or shall I not allow myself to be called into court?" It is evident that the expert is an absolute necessity to the doing of justice. Thus, how can a conviction of poisoning be reached until death from poisoning has been established by the expert. As, therefore, the expert is an absolute necessity, and as the refusal of the honest and capable would leave the field even more open that it is at present to the dishonest and incapable, it would seem that members of the profession are not justified in refusing to testify on matters concerning subjects within their immediate knowledge.

When approached by the lawyer, the physician should receive as far as possible a definite statement as to the facts involved, and should give upon these facts the best opinion that he is capable of, receiving for this work a suitable fee. In order that no misunderstanding should arise, both the allegation as to facts and the opinion given should be in writing.

In giving direct testimony upon the stand the bearing of the medical witness should be quiet, dignified, as far as possible free from any evidence of nervousness, and the statements made should be in plain, nontechnical language, direct, without equivocation. There should be no apparent voluntary offering of opinion, but simple replies to direct questions. Garrulousness and attempts at oratory or at the methods and manner of the lecture-room are out of place.

As **cross-examinations** are now conducted they are often very trying to the physician, and more usually adapted to obscure than to bring out the truth. In a large proportion of cases their obvious intent is to throw discredit upon the witness, so that the latter is usually at once forced

into the position of personal defense. It is, however, most essential for the witness to avoid the exhibition of partizanship or of personal irritation. As technical language is more accurate than non-technical, but at the same time less readily understood by the cross-examiner and jury, a witness upon his defense should avoid the use of such language. He should use as few words as possible, and give no more information than is required by the question asked. At the same time the answers should be straightforward, direct, and promptly given, so that there shall be no appearance of insincerity or uncertainty. All questions that are allowed by the court should be answered, but whenever there is reason for doubting the propriety of a question, the expert should pause for a moment before answering, so as to give opportunity to the counsel by whom he has been employed to make objection to the question. When the questions are personally very offensive, the expert has the right to appeal to the court, though such appeal is very rarely advantageous; but the court has been known to intervene.

The various pitfalls arranged by legal skill are too numerous to be discussed in detail, but some of the most common may be pointed out. Words or sentences having two meanings, one technical and the other popular, or ambiguities of other form, are often used; the expert has the right to insist that the question be clear. Assertions are made that the expert has said something that he has not said; the expert has the right to appeal to the stenographic record. There is a strong tendency to repeat words that have just been used or to accept a statement that is hurriedly put, even though it is not accurate or correct; the expert should guard against this. Impugning the sincerity or the honesty of the expert witness should be met with a quiet, good-humored denial; at such point it is the duty of the court to interfere, and this duty is sometimes fulfilled. Categoric questions, requiring an answer "yes" or "no," should usually be answered without reserve. Sometimes the answer may be given "yes and no;" in all cases in which explanation is necessary, the expert witness should insist upon his right to make such explanation.

In many cases, especially in those involving questions of sanity, there is room for such honest differences of opinion that there will be discordance in the statements of experts. Leaving aside these cases, vital differences in expert testimony are much less frequent than is generally believed. Failure of justice has been more often by disregard of concordant statements than through the disagreements of experts. Not rarely contradictions arise through members of the profession giving opinions concerning matters upon which they are not thoroughly informed. The intellectually honest expert will confine his testimony to what is strictly within his own province.

The question whether the court has the power to compel a person having special knowledge to give expert testimony without any pecuniary compensation save that of the ordinary witness as to facts is sometimes raised, and has received various answers at the hands of the courts. Practically, in civilized communities the question has very little importance; the injustice of the procedure is so apparent that the judge who attempts to enforce it demonstrates thereby his unfitness for judgeship. Furthermore, few lawyers would be willing to trust the interests of their clients to expert opinions given under such circumstances. He must be a remarkably good or a very dull-witted man whose service as an unwilling, unpaid expert would be valuable.

The basis upon which the expert testimony is given of course varies with the case. In many suits a personal examination of the subject is made by the expert, and the results, with the deductions therefrom, given in the court-room. In making and reporting such examinations it is usual for the expert to distinguish between subjective and objective symptoms: that is, between those symptoms the knowledge of which by the doctor depends upon the statement of the patient, and those symptoms that are directly perceived by the doctor. Pain is an example of the subjective symptoms; the shortening of a limb or an exaggeration of the knee-jerks is an objective symptom. Objective symptoms usually have much more weight in the consideration of the court than have subjective manifestations, but very many objective symptoms are capable of being feigned, so that it is essential to distinguish carefully, even in regard to objective symptoms, between the real and the feigned.

The examinations made by the expert should always be very thorough, with exposure of the person as free as is at all necessary, and usually more prolonged than is necessary. Thus, the doctor may be perfectly able to reach a positive conclusion in a certain case in 5 minutes, but his opinion formed in that short time would very probably be impugned by opposing counsel, and perhaps disregarded by the injury.

Very frequently the expert opinion is not based upon personal observation, but upon statements made in the court-room. In such cases there are several methods of procedure adopted by different courts. One is for the expert to have heard all the testimony given or to have studied the stenographic report of the testimony. Under these circumstances the statements of the witness must be based upon the testimony of one side of the case. When, as is usual, there is more or less conflict of testimony, if the expert bases his testimony upon the whole case, he must take upon himself the function of the jury, because he must assume as the basis of his opinion that one set of alleged facts is true, the other false.

The question to the expert by the counsel should always, in the case under consideration, be formed somewhat as follows: "Assuming that the testimony for the defense [or prosecution] is correct, what is your opinion," and so on. As ruled by some courts, under any circumstances—and certainly whenever there are antagonistic assertions and denials of alleged facts—the opinion of the expert should be based upon a supposititious case, or upon the so-called hypothetic question. Us-

ually, it is necessary to have at least two hypothetic questions, in one of which is embodied the case of the prosecution, in the other the case of the defense; one question being in accord with one set of alleged facts, the other with the other set of alleged facts. Which of the contradictory statements as to facts is proved by the testimony to be true it is the province of the jury, not of the expert, to determine; and the application to the case in hand of the opinion of the expert should stand or fall as the jury finds the hypothetic question he has answered is or is not in accord with what it believes to be the facts of the case. The opinion of the expert should always be correct, but may or may not be applicable to the case in hand, as viewed by the jury.

The expert should never prepare the hypothetic question, although, if necessary, after the question has been framed by the counsel the expert may point out defects, so that irrelevant matters may be omitted and the question thereby gain in brevity and simplicity; or relevant matters that may have been omitted may be inserted, so as to make the question more positive and definite. If the expert takes an active part in the preparation of the question, it will almost certainly be discovered by the opposing counsel, who will then, perhaps successfully, discredit the whole proceeding by asserting to the jury that this partizan expert came and made out a question for himself to answer in order to help his side of the case.

Whenever the testimony of an expert is as to the facts of a case, all possible direct proof of corroboration of these alleged facts should be produced in court. Thus, in a case of fracture or dislocation, skiagraphs should confirm the statements of the witness; and the chemist should always produce in court the poison that he has obtained from the body. In poisoning cases the chemist must see that the parts that have been given to him for investigation have been so kept that it is not possible for them to be tampered with, and should, by his own testing, have positive knowledge of the chemic purity of his reagents. He should make clear, definite notes in writing at every step of his various procedures, and when on the stand, should be prepared to show these notes, if requested to do so by the opposing counsel.

EXPLOSIVE COMPOUNDS.—See INCOMPATIBILITY.

EXTRACTS.—Solid or semisolid preparations obtained by evaporating solutions of vegetable principles. There are 28 official extracts, as follows: Extractum Aloes; Ext. Belladonnæ Foliorum; Ext. Cannabis Indicæ; Ext. Cimicifugæ; Ext. Colchici Cormi; Ext. Colocynthidis; Ext. Colocynthidis Compositum; Ext. Digitalis; Ext. Ergotæ; Ext. Euonymi; Ext. Gentianæ; Ext. Glycyrrhizæ; Ext. Glycyrrhizæ Purum; Ext. Hæmatoxyli; Ext. Hyoscyami; Ext. Krameriæ; Ext. Leptandræ; Ext. Malti; Ext. Nucis Vomicæ; Ext. Opii; Ext. Physostigmatis; Ext. Quassiæ; Ext. Rhamni Purshianæ; Ext. Rhei; Ext. Scopolæ; Ext. Stramonii; Ext. Sumbul; Ext. Taraxaci.

EXTRAUTERINE PREGNANCY.—The development of the ovum outside of the uterine cavity.

Its **frequency** is very difficult to determine, one for every 500 cases of normal pregnancy being about the proportion.

Etiology.—The cause of extrauterine pregnancy may be stated as any condition that interferes with the passage of the ovum from the ovary to the uterine cavity. Such are salpingitis, twisting or contortion of the tube, polypi growing from the tubal mucosa, and congenital malformations of the tube.

Varieties.—Primary extrauterine pregnancy is probably always tubal in character. Depending upon the part of the tube in which the ovum develops, it is called *ampullar*, or tubal proper; *infundibular*, or tuboovarian, and *interstitial*, or tubouterine. Primary *ovarian* and *abdominal* pregnancies have been described, but their existence is doubtful. Secondary abdominal pregnancies are not infrequent, and are due to rupture of the tube with extrusion of the ovum into the abdominal cavity.

Terminations.—Four terminations of extrauterine pregnancy have been described:

1. Rupture of the tube with extrusion of the ovum into the peritoneal cavity or between the layers of the broad ligament. This is by far the most frequent termination. It occurs usually between the eighth and twelfth weeks. If of the intraperitoneal variety, unlimited hemorrhage and death will usually result; if of the extraperitoneal variety, a hematoma will form between the layers of the board ligament, which will be absorbed, or which will form an abscess or cyst, or which will finally rupture through the broad ligament, causing unlimited intraperitoneal hemorrhage.

2. Death of the ovum without rupture of the tube. This is usually followed by atrophy and disappearance of the entire gestation sac. Hematosalpinx or other form of salpingitis may result.

3. Extrusion of the ovum into the uterine cavity or through the fimbriated extremity into the peritoneal cavity (*tubal abortion*) may occur. The former takes place, rarely, in the interstitial variety of extrauterine pregnancy, and is usually looked upon as an ordinary abortion. The latter occurs not infrequently in the ampullar and infundibular varieties. The hemorrhage is most frequently slight and is absorbed; if great, death may result.

4. The ovum may proceed to full term without rupture of the tube. This is an exceedingly rare occurrence. More frequently gradual rupture will take place without destruction of the ovum, which may then proceed to full term as a secondary abdominal pregnancy.

After any of these terminations, unless maternal death speedily occurs, mummification, formation of adipocere, or lithopedion formation may take place in the fetus.

Symptoms.—The symptoms of extrauterine pregnancy are of two classes: those *before rupture*, and those *after rupture*.

Before Rupture.—For the first few weeks the symptoms of extrauterine pregnancy are exactly similar to those of normal pregnancy. There are cessation of menstruation and, perhaps, nausea

and changes in the breasts. Later, there will develop *pain*, which is the most characteristic symptom of this condition. It is extremely sharp and cramp-like, occurs periodically, and is usually reflected down one thigh. After having missed one or two menstrual periods, the patient will have *return of menstruation*. The bleeding is usually profuse and attended by some pain. In the discharge will be found flesh-like masses (decidua). In other words, the common symptoms of an ordinary abortion are present.

Vesical irritability and *constipation* are commonly present, since the gestation sac is likely to cause pressure on the bladder and rectum. Slight *rise of temperature* may occasionally be noticed. If the ovum continues to develop, *abdominal enlargement*, *fetal heart-sounds*, and *fetal movements* will be present.

The physical signs are important. The cervix will be softened, the uterus enlarged and somewhat displaced—usually forward or to one side. The enlargement will not be so great as in a normal pregnancy, and will be most noticeable in the long axis of the uterus. Behind or to one side of the uterus will be felt a small cystic tumor, slightly adherent and exquisitely sensitive.

After Rupture.—Rupture is almost invariably attended by *intense pain*. So great is this pain that *syncope* is a common accompaniment. The subsequent symptoms will depend upon the character of the rupture. If intraperitoneal and extensive, hemorrhage will be unlimited and death will result, usually in a few hours, attended by symptoms of profound shock; rapid, weak pulse; blanched, cold skin; sighing respirations, and fall of temperature. If the rupture is extraperitoneal —between the layers of the broad ligament—a limited hemorrhage will occur, and the symptoms of shock and bleeding will be slight. Pressure of the resulting hematoma on the bladder or rectum may cause vesical irritability or constipation.

The physical signs are not so clearly marked as before rupture. If of the intraperitoneal variety, fluid will be felt in the pelvic and abdominal cavities. This is best determined sometimes after rupture, when clotting has occurred. If of the extraperitoneal variety, the broad ligament will be felt distended and bulging into the vagina, and the uterus will not be pushed to one side.

Diagnosis.—Although the diagnosis of extrauterine pregnancy is difficult, it should be determined, in the majority of instances, by a careful study of the patient's menstrual history and of the physical signs, and particularly by characteristic pain. After rupture the history of early pregnancy, intense pain, syncope, and collapse will inevitably determine the diagnosis. Among the conditions that most closely simulate extrauterine pregnancy are: abortion complicated by a tumor near the uterus; pyosalpinx with an indistinct history of pregnancy; normal pregnancy with a rapidly growing fibroid on one side of the uterus; and pregnancy in a bicornuate uterus. In all of these conditions celiotomy is indicated, so that the differential diagnosis is not of vital importance.

Prognosis.—If treated by operation, the mortality should be less than 5 percent. When operative treatment is not instituted, fully 66 2/3 percent will die, and of the remaining 33 1/3 percent, a large proportion will remain invalids from some pelvic complication.

Treatment.—If the case is diagnosed before rupture, immediate operation is indicated. This consists in the removal of the tube and ovary of the affected side, and differs in nowise from an ordinary salpingooophorectomy.

Seen just after rupture, immediate operation is again indicated; the bleeding should be controlled by a double ligature, securing the ovarian artery, and the blood-clot, fetus, and gestation sac removed. Some surgeons advise waiting for reaction, but this is unwise, as reaction will not take place until the hemorrhage has been arrested.

If a developing extrauterine pregnancy is first seen after the fourth month, the difficulties of removal are much increased. Uncontrollable hemorrhage is likely to occur when the placenta is removed. To avoid this it is best to open the sac, remove the fetus, ligate the cord, and suture the sac-wall to the lower angle of the abdominal incision. The cord is allowed to protrude through the opening and the sac is packed with sterile gauze. This is removed at the end of from 4 to 6 days, and the placenta may then be taken away without much risk of hemorrhage. Some operators allow the placenta to come away spontaneously.

EYE, EXAMINATION.—Notice if the **eyelids** are swollen, hypertrophied, or faulty in form, shape, position, or movements. Normally, the lids follow the movements of the eyeball. In exophthalmic goiter this harmony does not exist. This symptom was first noticed by von Graefe, and has been named after him. It has since been shown by Gowers and others that this sign is present in some central cerebral lesions.

The cilia should be inspected, and their form, size, and position carefully noted, as many unpleasant conditions may arise from misplaced cilia.

The position of the **lacrimal puncta** should be noted, and whether or not they are patulous. In the normal state the **lacrimal sac** is empty, while if it is distended with mucus or pus, pressure with the finger will usually cause escape of the contents, either from the nose or from the punctum. Further examination is effected by lacrimal probes.

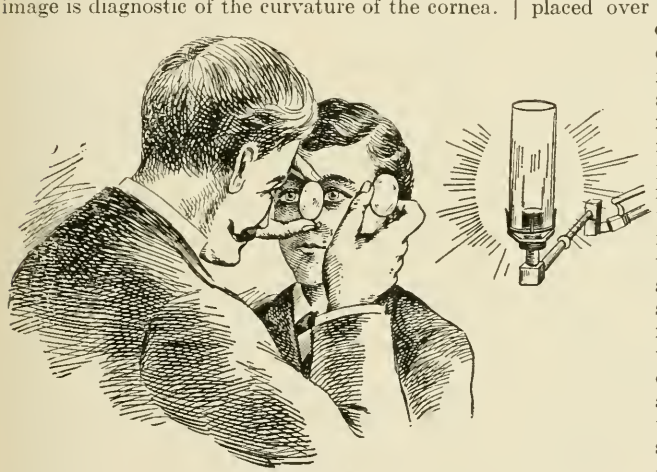
The conjunctiva is normally so translucent as to allow the bluish-white sclera to show through; it contains only a few minute blood-vessels. In old age there may be a deposition of fat in the subconjunctival tissue, giving a yellowish tinge to the membrane, and its translucency is additionally affected by an increase in the size and number of blood-vessels. In inflammatory conditions of the conjunctiva it should be thoroughly examined for the presence of a foreign body or an inverted cilium. The surface of the bulbar conjunctiva is first inspected, and then the lower sulcus, which is easily brought into view by simple tension downward with one finger. Eversion of the upper lid is readily effected without the use of a probe or

other instrument by telling the patient to look down, seizing the edge of the lid and cilia with the thumb and forefinger of the right hand, and drawing the lid first forward and downward away from the globe, and then upward over the point of the thumb or forefinger of the left hand, which is held stationary on the lid and acts as a fulcrum.

Conjunctival injection is recognized by its brick-red color; by the great irregularity, tortuosity, and intimate anastomosis of the blood-vessels; by the mobility of the vessels on the sclerotic; by the fact that pressure applied through the lid to the globe produces a distinctly anemic spot; by the injection being more intense on the lids and in the culdesac and diminishing toward the cornea; by the accompanying mucous or muco-purulent secretion.

Ciliary injection is distinguished by its pink appearance; by the vessels running in a straight parallel course, radiating from the cornea; by the immobility of the vessels when the conjunctiva is moved; by the fact that gentle pressure on the margin of the lower lids produces an anemic spot, which gradually becomes pink when the pressure is removed; by the congestion being most intense nearest the cornea, and fading away toward the equator of the globe.

The cornea is perfectly transparent and glistening in health, and returns diminished erect images of all objects held before it. The shape of the image is diagnostic of the curvature of the cornea.



Oblique Illumination.

The iris and the pupil are readily seen through the cornea. A foreign body, abrasion, opacity, ulcer, scar, or vascular formation is usually readily detected by simple inspection in a bright light, or with the opthalmoscope and a high convex lens; but it is always best to use what is called **focal** or **oblique illumination.** This method is effected by placing the patient in the line of the source of illumination—to the right side if the left eye is to be examined—and focusing the rays of light obliquely on the cornea with a convex lens held in that hand of the surgeon nearest the light. The illuminated point is viewed either directly or through a magnifying lens held at the focal distance from the patient's eye. Diffuse keratitis, corneal abscess, leukoma, and other similar corneal affections should be examined by oblique illumination.

The exact extent of the corneal abrasion of an ulcer may be ascertained by the application of a drop of a solution **of fluorescin** in the lower culdesac and rubbed over the eyeball. A few drops of boric acid solution are then instilled to wash away the superfluous stain, and the denuded area is stained a bright yellowish-green color. If the epithelium is changed and roughened, but not denuded, as in keratitis and glaucoma, then the defective spot does not stain.

The aqueous humor is so transparent in health as to be invisible, but may be rendered turbid by inflammatory and hemorrhagic deposits, or may contain pus, which gravitates to the bottom of the anterior chamber, forming the condition known as **hypopyon.**

The iris is ordinarily bright, and presents a polished surface. The pigmentation and fibrillation are distinctly visible, and the pupil is perfectly round, and surrounded by a ring of dark pigment. The size of the **pupil** in its usual state varies with each individual. A general average is 4 mm. The pupil should be equal, and should at all times respond to light. The patient should be placed before a window or light, the surgeon standing before him, and one eye perfectly occluded either with a hand or bandage; then one hand should be placed over the exposed eye and quickly withdrawn. Under the shadow the pupil dilates, and when the hand is removed, it quickly contracts. This is a direct reflex by means of the optic nerve. To study the **consensual reflex,** the patient is placed near a point of light in a room and the rays focused gradually on the cornea of the proximal eye, the eye furthest removed from the light still being in the shade. In health a simultaneous and sympathetic contraction of the shaded pupil is also seen. The pupil normally contracts in the act of convergence, and the patient should be directed to look at some distant object and then at an object near the tip of the nose, and the variations in the size of the pupil noticed. There are certain conditions, such as locomotor ataxia, in which the eye contracts as usual in accommodation but has lost its contractility to light. This condition is commonly known as the **Argyll Robertson pupil,** and is a significant diagnostic sign. If the eyes do not react at all to light and accommodation, there is probably disease of both optic nerves. Permanent dilatation (mydriasis) and contraction (miosis) are discussed under Pupil (*q. v.*). Further inspection of the iris should determine whether it is steady or tremulous, and whether it is in its normal vertical position, or is convex and displaced forward toward the cornea, or concave and depressed toward the vitreous, thus forming a shallow and deep **anterior chamber.** Instead of being circular, the pupil may be oval, with its greatest diameter

horizontal, as is often seen in glaucoma. Adhesions of the iris to the anterior capsule of the lens or to the posterior surface of the cornea, called **synechiæ**, also distort the pupil. Focal illumination and examination with a high convex lens by the ophthalmoscope render iritic adhesions more conspicuous.

Measurement of the Tension of the Eyeball.—The surgeon stands in front of the patient, who is directed to look downward. All but the index-fingers of the surgeon's hands rest over the eyebrow of the patient, and the tips of the index-fingers alternately and slightly indent the eyeball through the closed lid. The educated sense of pressure (*tactus eruditus*) measures the elasticity and resistance. It is well to immediately compare one eye with the other, as there is often quite a noticeable difference between the two. As a standard, the student has the tension of his own eye as a guide, from which any abnormal tension can be calculated. In glaucoma the eyeball is often hard, and there is none of the normal sense of elasticity left. In certain extensive destructions of the choroid and liquefaction of the vitreous the eyeball is soft and mushy. The eyes of the young are generally softer than those of the old. The degree of tension is expressed by the capital letter T., preceded by a plus sign (+) if there is increase; or preceded by a minus sign (−) if there is decrease. The amount of deviation from normal is expressed by numerals; thus, +T. 1, expresses distinct hardening; +T. 2, decided hardening; and +T. 3, extreme hardening, resisting all efforts to produce dimpling. See also OPHTHALMOSCOPY, RETINOSCOPY, REFRACTION, FIELD OF VISION, COLOR-BLINDNESS, etc.

EYEBALL, INJURIES.—**Punctured and incised wounds** about the sclerocorneal margin are especially dangerous on account of involvement of the ciliary body; chronic cyclitis and even sympathetic inflammation of the other eye resulting. Wounds of the sclera are accompanied by prolapse of the choroid and retina and loss of vitreous. Detachment of the retina is a serious sequel. Injury to the lens or its capsule results in traumatic cataract. Corneal opacity is liable to follow a corneal wound, and the opacity will be greater if the iris prolapses.

One of the chief sources of danger in penetrating wounds of the eyeball is the liability to infection, which is augmented by the impossibility of disinfection, on account of the depth and narrowness of the traumatic canal.

Treatment consists in thorough disinfection of the eyeball and appendages with a 1:5000 mercuric chlorid solution, closure of the wound with a conjunctival suture, sprinkling with finely powdered iodoform or one of its substitutes, and an antiseptic bandage. Prolapse of the iris should be combated by restitution, abscission, atropin, or eserin. If the lens is injured, atropin and iced compresses are indicated and the ordinary treatment of traumatic cataract instituted. Injury of the lens through the pupil offers the best prognosis. In case the retina is completely prolapsed and much vitreous is lost, causing blindness, immediate enucleation may be necessary.

Contused wounds of the eyeball are the result of blows from the fists or from a blunt instrument. "Black eye" usually results. There may occur hemorrhage into the anterior chamber, and sometimes when this clears up vision is lost by a coincident retinal hemorrhage. The iris may be torn from its attachment (iridodialysis) or the lens may be dislocated. In severe cases the globe is ruptured at the weakest point in the sclera, opposite the point of impact, about 2 to 5 mm. from the cornea. In such cases the vitreous escapes and the iris may be prolapsed in the rent. The ciliary body and the retina are very susceptible to serious injury. A curious result of rupture of the eyeball is seen in those cases in which, by an accidental blow, a cataractous lens has been removed and vision thereby restored. The prognosis of ruptured eyeball is always serious, and many injured eyes become atrophied.

Treatment consists in careful disinfection, the application of ice, eserin or atropin, a bandage, and rest in bed. A bruised iris must be carefully excised. The various complications should be treated as they arise. If there is an extensive rupture of the sclera, conjunctival and scleral sutures may be necessary to prevent complete prolapse of the vitreous. Nothing can be done for the iridodialysis except iridectomy. A dislocated lens must sooner or later be removed. Hemorrhage into the anterior chamber and subconjunctival hemorrhages will usually absorb without treatment.

Foreign Bodies in the Eyeball.—After injury to the eyeball it is always important to determine whether or not a foreign body remains within the eye. If it can be seen by the naked eye, focal illumination, or the ophthalmoscope, the diagnosis is easy. In other cases in which the media become quickly opaque, or the body lies concealed in the sclerocorneal covering, or is near the ciliary body, it may escape detection. In these cases the patient's general and local condition and the nature of the injury must be carefully considered. If there is no point of exit, and there is absolute history of entrance of a foreign body, it must be assumed that it is in the eye. The surest way of locating a foreign body is by the Roentgen rays.

Prognosis depends on the location of the foreign body, its chemic nature, and whether or not it was aseptic. Aseptic and chemically unirritating substances, however, have produced alarming inflammations in the ciliary region. Infection from a foreign body in the eye may result in panophthalmitis and speedy destruction of the globe. However, there have been cases in which small aseptic foreign bodies have remained for years in different parts of the interior of the eye, even in the sensitive ciliary body. According to reliable statistics, the loss of the eye from foreign bodies in the anterior chamber is virtually nil; in the lens, 30 percent; and in the vitreous, 71 percent.

It must be remembered that a foreign body remaining absolutely quiet within the eye is at all times dangerous, both to the affected eye and to its fellow.

Treatment.—Foreign bodies should always be

removed from the anterior chamber. A lens with a foreign body in it will sooner or later have to be extracted. If the foreign body is in the vitreous, the treatment depends on its nature. In such case, if the foreign body is of iron and can be located, it should be removed through a scleral incision by the electromagnet. Aseptic substances, such as copper, wood, stone, or glass, may be permitted to lie quiescent and be treated expectantly. At the first sign of inflammation they should be removed by a pair of fine forceps through a scleral incision. If the symptoms are indicative of much ciliary involvement, enucleation should be performed or active sympathetic inflammation may soon set up and destroy the uninjured eye. Of all operations, removal of a foreign body from the eye should be performed under the strictest antiseptic precautions.

A good rule in those cases of foreign body in the eye seen soon after the accident is to secure the patient's assent to the application of the magnet, under anesthesia; and in case of failure of extraction, to submit to immediate enucleation. However, if there is evidence of intense ciliary inflammation in the injured eye or signs of sympathetic inflammation in its fellow, it is not safe to lose time in attempting extraction; the injured eye should be removed at once. See SYMPATHETIC OPHTHALMIA.

Parasites in the eye are usually the cysticercus, the larva of the tape-worm, which may also be found in any part of the body. Liebreich gives a good ophthalmoscopic image of a living cysticercus in the vitreous. Thread-worms have been found in an opaque lens and in the virteous. It is possible that remnants of the persistent hyaloid artery have been mistaken for worms in the vitreous.

EYEBALL, REMOVAL.—Evisceration of the eyeball is performed as follows: The cornea is removed by making incision with a Graefe knife, so as to include one-half of the corneoscleral margin, and completing the circumcision with scissors. The contents of the globe are then evacuated by means of a special scoop, care being taken to remove the choroid unbroken, by carefully peeling it from the sclerotic backward until it is only attached at the lamina cribrosa. The interior of the eyeball is washed out, and after all hemorrhage has ceased, the edges of the sclerotic are stitched together and the conjunctiva united over it.

In **Mule's operation** the opening is enlarged vertically to admit of the introduction of a hollow glass or silver or aluminium sphere. The margins of the sclerotic are now united vertically by interrupted silk sutures; the conjunctiva is then sutured at right angles to the scleral closure. Two points of importance are strict antisepsis and the checking of all bleeding in the cavity before the glass ball is inserted. The advantages claimed for this operation are that it leaves muscular attachments adhering to the stump and offers a movable ball on which to insert an artificial shell; that it keeps the orbit filled out; and that it lessens the danger of meningeal infection, sometimes following enucleation. The cosmetic improvement is by far the greatest point in its favor. The operation is of particular value in staphyloma of the cornea and in disfiguring leukoma. The disadvantages are the uncertainty of result, possible infection, and sympathetic involvement, though the occurrence of the latter is rare.

Some operators practise **insertion of the glass sphere in the capsule of Tenon** instead of the scleral cavity. The operation is similar to an enucleation except that the recti muscles are secured with sutures before dividing them. The glass sphere is placed in the cavity previously occupied by the eyeball, and the sutures holding the four recti are tied tightly together over it; care must be exercised to secure adaptation of the sutures, so that the tendons assume the same position they occupied in the living eye. This operation eliminates all the dangers and disadvantages of evisceration or Mule's operation, and leaves as useful a stump.

Total combined keratectomy is the name given to an operation that Panas has most successfully used for several years in all cases in which enucleation is ordinarily indicated. A half-curved Reverdin needle is introduced through the sclerocorneal junction, passed back of the iris and lens, coming out at a point opposite. The needle is then armed with a thread and allowed to remain in place. The cornea is detached as in evisceration. The iris is removed by forcibly tearing with a pair of forceps. The speculum is gently raised away from the globe by an assistant. The lens is next removed with a scoop, care being taken not to lose any vitreous. The Reverdin needle, armed with its thread, is now withdrawn, and the suture made is tied. Two sutures, one on each side of the middle one, are made and tied. The projecting angles of the wound are trimmed with scissors, and the wound is dressed antiseptically.

Enucleation.—The patient is placed on an operating table and, preferably, anesthetized with ether or chloroform, although sometimes local anesthesia with cocain alone is used. After thorough disinfection of the eyeball and neighboring parts a speculum is introduced, the arms of which are widely separated. A fold of conjunctiva is seized by a fixation forceps in the left hand, opened with a pair of enucleation scissors curved on the flat, and cut close entirely around the circumference of the cornea. The separated conjunctiva and capsule of Tenon are pushed back with the closed scissors. The tendon of the internal or external rectus muscle is seized by the fixation forceps close to the insertion and divided back of the forceps. One blade of the scissors is passed under the tendon of the superior rectus, which, with the tissues surrounding it, is divided close to the globe. The inferior rectus is then severed with one cut; the globe is then rotated forward and toward the nose, the scissors passed backward, and the optic nerve and the adjoining tissue divided. The globe is then seized with the fingers and forced from the socket, and the remaining tendons and attached tissues separated from it. Instead of crowding wet antiseptic sponges into the orbit to check the hemorrhage, it is better simply to irrigate the cavity with sterile cold water, and thus avoid crushing and lacerating the remaining muscles. These muscular remnants are then puckered to a point with a "purse-string"

suture, and afford a more or less movable stump. When the bleeding has subsided, the cavity is washed out with a sublimate solution and an absorbent sponge or wad of cotton is placed over the orbit, leaving free drainage, and a bandage applied without exerting undue pressure. The old custom of immediately applying a pressure-bandage after enucleation to check hemorrhage is not advisable. It is better to delay permanent bandaging until the hemorrhage has subsided. The dressing may be changed in 24 hours, and the parts cleansed with a sublimate solution and a new dressing applied. After the fourth day the bandage may be discarded, and the patient given a mild antiseptic wash to use in the eye 2 or 3 times daily until the wound has completely healed.

An **artificial eye** may be worn after a lapse of 2 or 3 weeks, if all inflammation has subsided. Early insertion of the artificial eye is advisable to prevent absorption of the orbital fat. It must be remembered that the orbit is very tolerant of foreign bodies; however, to thoroughly accustom the orbit, the artificial eye should not be worn over a few hours at a time for the first few days. To insert an artificial eye, it is lubricated and the broad outer end slipped under the upper lid, which is slightly raised. The lower lid is then drawn downward, the patient directed to look down, and the eye is gently manipulated into place. Irritation of the stump by an artificial eye has led to sympathetic inflammation of the other eye, and must be guarded against. An artificial eye should be taken out at night and placed in water.

Exenteration of the orbital contents, usually for malignant growth, is performed by splitting the external canthus and separating the entire periosteum, with all its contents, from the bony wall, except at the apex of the orbit. Enucleation scissors are introduced, and the stump is cut off close to the bone. Profuse hemorrhage is best checked by actual cautery. If the neighboring skin or the lids are involved, the incision must be made into healthy tissue, and the diseased parts removed with the orbital contents.

EYE-DISEASES, DIAGNOSIS.—It is well to become thoroughly familiar with the table on the following page, as it embodies the most important points in the diagnosis of inflammatory conditions of the eye.

See too, Choroiditis, Conjunctivitis, Cornea, Glaucoma, Iritis, Optic Nerve, Tuberculosis, (Ocular), etc.

EYE-DISEASES, LOCAL TREATMENT.—Local applications to the eye are detergent, soothing, astringent, stimulating, caustic, antiseptic, mydriatic, or miotic; and are made by means of solutions, ointments, oils, or powders.

Collyria are ordinarily applied by means of the pipet with small rubber bulb, but, if this is not at hand, a simple glass tube or quill will answer the purpose nearly as well. While the patient's head is thrown backward, the lower lid is gently drawn down and the solution dropped into the lower culdesac of the conjunctiva. It should be remembered that the strength of the application cannot be regulated by the amount of fluid used, as not more than 1 or 2 drops will be retained in the conjunctival sac. Usually, an excess does no harm; but when the mydriatics are used, not more than 2 or 3 drops at most should be applied. As an additional precaution against the constitutional effects of the drug, it has been recommended to press the end of the finger over the lacrimal canals for a few minutes, to prevent the passage of the fluid into the nose and throat. When it is desired to act upon the lacrimal passages, they should first be emptied by pressure upon the sac, and the solution should then be applied freely to the inner canthus. When it is desired to flush the conjunctival sac for cleansing and antiseptic purposes, as before, during, and after an operation, and in purulent cases, a larger tube with an ounce rubber bulb is a very convenient instrument. The sponge is now rarely used. The old "eye cup," whose edges fit within the margins of the orbit, is an easy and pleasant means of making free applications of soothing washes, but is not always cleanly, and is not recommended. The eye douche, for directing a spray against the closed lids, may be made by attaching a nozzle, perforated with small holes, to a rubber tube connected with a cup, or the fountain syringe, to be held above the head; but it is now generally superseded by the atomizer.

Oils are applied with the pipet or by means of a pledget of absorbent cotton. **Ointments,** when intended for the margins of the lids only, should be used in very small quantity, to avoid irritating the conjunctiva. A little is taken on the end of the forefinger and the edges of the lids are simply anointed, so that there shall be a delicate film of the ointment between them when they are closed. When it is intended to act upon the cornea, a piece of the ointment the size of a pin's head may be placed directly upon it, or may be applied to the conjunctival surface of the upper lid. **Powders** were formerly "insufflated," or blown from a glass tube or a quill upon the eyeball, but are now always "dusted" from a camel's-hair brush. The handle of the brush is held between the forefinger and thumb, while the brush is struck sharply with the little finger of the same hand. Drugs may also be applied to the eye in the form of soluble solids. Medicated **gelatin discs** for this purpose have long been made. The chief advantage claimed for these discs is that, by means of their slow solution, the drug is maintained continuously in contact with the conjunctiva, instead of being in great part carried off by the overflow of tears, as is the case with aqueous solutions. The discs contain atropin, cocain, eserin, pilocarpin, etc.

EYEGLASSES.—See Spectacles.

EYELIDS, DEFORMITIES. Narrowed Fissure.—The normal palpebral fissure in the adult is 26 to 28 mm. long, and about 1 cm. wide. Narrowing of the fissure is either called **ankyloblepharon** or **blepharophimosis.** The first condition is an actual union of the external angle of the lids, and may be congenital or due to a cicatrix following a burn or an ulceration. Blepharophimosis indicates that a fold of skin covers the external angle, and results from a contraction of the skin of the lid after a chronic conjunctivitis.

DIFFERENTIAL DIAGNOSIS OF INFLAMMATIONS OF THE EYE

Symptoms.	Acute Conjunctivitis.	Acute Iritis.	Keratitis.	Acute Glaucoma.
Color of the Injection.	Red, but less marked near the cornea.	Red; most marked near the cornea; bright zone of ciliary redness.	Rose-pink; conspicuous near the cornea.	Dark red.
Vessels.....	Superficial, tortuous, and irregular in distribution; freely movable.	Vessels run deeply and straight toward the corneal margin (ciliary region); not movable with conjunctiva.	Vessels run straight, and break into fine network in the immediate vicinity of the cornea.	Vessels widely distributed and dilated.
Conjunctiva....	Thickened; vessels on the everted lid concealed in the general redness; easily thrown into folds.	Not much thickened; distribution of vessels on everted lid easily seen; not easily thrown into folds.	No thickening in simple keratitis.	No thickening.
Secretion.....	Hypersecretion of mucus seen in flakes; lashes matted; lids glued together in the morning.	No considerable hypersecretion of mucus.	Free lacrimation, but no hypersecretion of mucus.	No hypersecretion.
Pain.....	Not severe; smarting and burning; sense of sand in the eye; no tenderness.	Neuralgic and paroxysmal; worse at night; eyeball tender.	Moderate, but constant; sticking, lancinating; no tenderness of the eyeball.	Same character as in iritis, but more severe; not markedly worse at night.
Photophobia....	None, unless the cornea is affected.	Slight.....	Severe and conspicuous.	Slight.
Iris.....	Normal.....	Thickened, dull looking, and, if light, discolored.	Normal.....	Slightly discolored.
Pupil.....	Normal.....	Small, sluggish, or fixed; irregular, not round.	Normal.....	Dilated, sluggish, and greenish in color.
Cornea	Clear, if not secondarily affected.	Clear, unless corneal complications.	Clouded or opaque, obscuring the view of the pupil and iris.	Haziness; or in extreme cases steamy, like ground glass.
Tension.....	Normal.....	Normal, or in ciliary involvement possibly slightly increased.	Normal.....	Increased. (The important diagnostic feature.)
Anterior Chamber.	Normal.....	Normal.....	Normal.....	Shallow; iris and lens pushed close to the cornea.
Corneal Sensitiveness.	Normal.....	Normal.....	Increased.....	Diminished (if touched with a wisp of cotton).
Vision.....	Little change.....	Dimmed, but not suddenly, and never complete blindness.	More or less impairment by corneal turbidity or opacity.	Suddenly and greatly diminished at the onset of the attack.
Field of Vision.	Normal.....	Normal.....	Possibly limited by opacities.	Contracted.
Atropin and Eserin.	No effect on condition.....	Atropin soothes; eserin aggravates pain.	Little immediate effect; both beneficial ultimately.	Atropin greatly aggravates the pain; eserin mitigates all symptoms.

Treatment of ankyloblepharon consists in an operation called **canthoplasty.** The adhesions are dissected up and the external canthus split, leaving a denuded V-shaped wound, the conjunctival edges of which are drawn together by sutures. Blepharophimosis may be corrected by cutting away the redundant skin and stitching the edges of the wound together.

Trichiasis is a condition in which the cilia are misplaced or misdirected and rub against the cornea, causing more or less corneal irritation. The condition may apply to all the cilia, or only a few may be misdirected. The common cause of trichiasis is trachoma, although blepharitis or any inflammation about the cilia may produce it. Cicatricial contraction after injury and operation is a cause. The treatment consists in curing the causative condition, and by epilation, electrolysis, illaqueation, excision, and plastic operation.

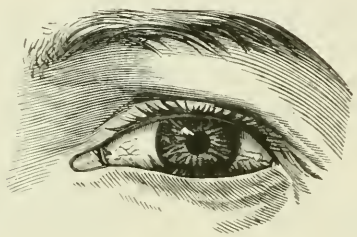
Distichiasis is a condition in which there is a double row of cilia, one directed inward and one

directed normally outward. The result of this condition is corneal irritation. The treatment is similar to that of trichiasis.

Entropion is inversion of the edge of the eyelid. It results from cicatrization following trachoma, blepharitis, wounds, burns, etc. Blepharospasm and pressure from bandaging are causes. It should be distinguished from simple trichiasis, in which the cilia alone are displaced. In entropion the edge of the lid is wholly or partly inverted, as well as the cilia.

Treatment.—If spasmodic entropion is due to a faulty bandage, such cause must be removed. One end of a piece of adhesive plaster fastened below the lashes and the other end to the cheek secures relief. The best operative measure for spasmodic entropion is the classic excision of a horizontal fold of skin parallel to the edge of the lid, with suture of the wound. Many other operations have been proposed. Canthoplasty may be performed especially in senile entropion.

In **von Graefe's operation** two vertical incisions are made through the skin of the upper lid, the

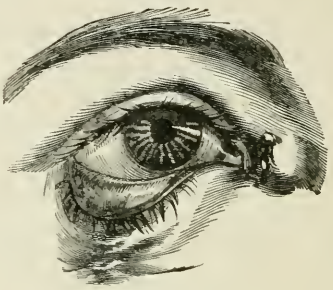


Entropion.

latter being split into an anterior and a posterior leaf; the cutaneous margins are then entered higher up along the vertical incisions. A horizontal incision is made through the skin of the upper lid, and a triangular piece of skin, with its base downward, is removed; a triangular portion of the tarsus, base upward, is also removed, and the wound sutured. This operation is recommended in senile entropion, when excision of a horizontal piece of skin or the application of subcutaneous sutures is not sufficient.

Hotz's operation for the same condition consists in excising the skin and muscle down to the tarsus, some 4 to 6 mm. from the lid-edge, laying bare the tarsus, and drawing the two skin-margins together and holding them until union is effected, thus giving a solid fulcrum for the everting force of the cicatrix and skin, which Hotz thinks is lacking in other methods.

Ectropion is eversion of the lid. It is not attended with the severe symptoms of entropion. Epiphora, with the consequent eczema that follows it, is the most prominent symptom. In severe cases the whole lid may be everted, leaving the conjunctiva unprotected, a condition popularly called *blear eye*. This deformity results from relaxation of tissues in old age, or from paralysis of the orbicularis, cicatricial changes due to injuries, burns, etc., and follows chronic conjunctivitis, blepharitis, or other inflammatory conditions about the lids. The scars of lupus and syphilis are occasional causes. Both lids may be affected.



Ectropion.

Treatment.—**For eversion of the puncta,** slitting the lacrimal canal and clearing the nasal duct may give relief. Any discernible cause should be treated. Mild antiseptic lotions should be used on the denuded surfaces. The patient should be instructed to wipe the eye from below upward, thus tending to reduce the eversion by a sort of massage.

Operations for ectropion are designed to raise the under lid or to stretch it out horizontally. The usual plastic operation is excision of a V-shaped piece of skin below the lid margin. The edges of the denuded triangular area are brought into position by sutures. **Snellen's sutures** are threads inserted on the conjunctival side of the lids from above downward, and brought out on the skin at about the level of the edge of the orbit, the ends being knotted over pieces of tubing or a ball of cotton. In cicatricial ectropion the first step is to sever the adhesion between the lid and the bone, and to cover the remaining scar by a transplanted flap or by skin-grafting.

In moderate degrees of ectropion or entropion a row of *galvano-cautery punctures* near the free edge of the lid has been used with success.

EYE-MUSCLES, ANOMALIES.

Functional Anomalies

Muscular Balance.—When the visual axes of the two eyes exactly meet at the object to which they are directed, the eyes are said to be balanced, or in equilibrium. This muscular balance is maintained by the constant and equally distributed innervation of the ocular muscles, and is directly dependent upon the relative anatomic formation and physiologic strength of the muscles. Any disturbance of these factors produces muscular imbalance. However, muscular imbalance does not imply inability to perform perfect binocular fixation, for in some cases the visual axes are rightly directly by increased innervation, and it is this necessary extra expenditure of nervous energy that causes the asthenopic symptoms so frequent in minor disturbances of muscular equilibrium.

Stevens, of New York, has suggested a descriptive nomenclature for the functional anomalies of ocular muscles that has been universally accepted in this country. For the different varieties of disturbance of muscular equilibrium, or latent squint, he suggests the use of the following terms:

Orthophoria, perfect binocular equilibrium.

Heterophoria, imperfect binocular equilibrium.

The varieties of heterophoria are:

Hyperphoria, a tendency of one eye to deviate upward.

Esophoria, a tendency of the eyes to deviate inward.

Exophoria, a tendency to deviate outward.

Hyperesophoria, a tendency of one eye to deviate upward and inward, or of its fellow to deviate downward and inward.

Hyperexophoria, a tendency of one eye to deviate upward and outward, or of its fellow to deviate downward and outward.

Tests for the strength of ocular muscles are based upon their ability to overcome prisms while both eyes are fixed on a small light about 6 meters' distance. In these tests the object is to measure the associated powers of the muscles concerned in abduction, adduction, and sursumduction rather than the strength of the individual muscles, which may never have individual action. To test adductions, the prisms are placed bases out; to measure abductions, bases in; to measure the elevators (supraduction), bases down; to measure the depressors (infraduction), bases up.

It is the measurement of the strength of the abductors and adductors that is of most practical importance in ordinary practice, and in all cases in which there is reason to suspect any muscular insufficiency in the causation of asthenopic symptoms not only should the tests for muscular equilibrium be applied, but also the power of adduction and abduction should be measured. The usual strength is adduction 20°; abduction, 6°.

Tests for Heterophoria.—The cover-test, although unreliable and not available in low degrees, sometimes enables the physician to detect the tendency toward deviation. For rough diagnosis the patient is placed in front of the physician, with his eyes about the level of the bridge of the physician's nose, at which he is told to look steadily. A card is placed over one of the eyes, and a moment afterward withdrawn; if there is a tendency to deviate out, a slight movement inward is noticed immediately after the withdrawal of the card. In the same manner a tendency inward will be detected by quick movement outward after the withdrawal of the card. Both eyes can be tested in this manner. The chief tests are with prisms and the Maddox rod.

Treatment of Functional Anomalies.—The most important treatment is the correction of the ametropia with proper glasses. A strong correction is ordered in esophoria, a weak correction in exophoria. Defective adduction is brought up by tonics and ocular gymnastics with prisms. High degrees of heterophoria are treated either with correcting prisms, prism exercise, tenotomy, or advancement.

Strabismus

Synonyms.—Heterotropia, or manifest squint.

Varieties.—The difference between strabismus and insufficiency is only one of degree. In strabismus the muscular insufficiency is uncorrected, the squint is manifest, and diplopia is produced. However, strabismus may be only **periodic**, as when the patient is fatigued or the systemic condition weak; or it may be present only when the patient looks at distant objects or accommodates for near work.

Concomitant strabismus is a variety in which there is equal movement of the eyes, but the eye still deviates on account of some defect in one of the ocular muscles.

Paralytic strabismus is due to paralysis of an ocular muscle, and when the eyes are turned toward the paralyzed muscle, one eye is deficient in movement. This form will be fully discussed in the section on Ocular Paralysis. See EYE-MUSCLES (Paralysis).

Spastic squint is a term applied by some authors to cases in which deviation is caused by spasmodic contraction of one muscle. It is very rarely, if ever, present, and must result from some peculiar central irritation.

Alternating strabismus is fixation with either eye, the other eye deviating. At times one eye squints and at others the other eye is at fault. It occurs when the vision is nearly equal in the two eyes, or when one eye is used for near work and the other for distance.

Monolateral or **constant strabismus** is the name given to those cases in which the squint is always in the same eye.

Internal strabismus, or **convergent squint**, is deviation inward of one or both eyes, and is usually due to the increased convergence of an ametropic eye. The converging eye is usually highly hyperopic. Homonymous diplopia is produced.

External strabismus, or **divergent squint**, is a deviation outward of the visual axis of one or both eyes, and in most cases is due to insufficiency of adduction rather than to overaction of the abductors in an ametropic eye. The diverging eye is usually highly myopic. Crossed diplopia is produced.

Disadvantages.—When there is uncorrected deviation of one eye, diplopia results. To overcome this anomaly of vision, the use of one eye is interdicted and the image suppressed, and if this amblyopia is untreated for any length of time, it gradually increases until the affected eye may become practically blind. Before the eye falls into disuse and the amblyopia exanopsia developed becomes discommoding, asthenopic symptoms are caused by the struggle for perfect binocular fixation.

Diagnosis.—Ordinarily, strabismus is apparent on simple inspection. However, we cannot depend on the symmetric situation of the cornea, as it sometimes happens that the visual axis is to one side of the center, and an eye is thought to squint

that is really properly directed for perfect binocular vision. The cover-test is reliable for the simple diagnosis of strabismus. The patient is told to fix his vision on an object, and the fixing eye is then covered, and immediately the other eye will turn into position and fix, while the other deviates.

The movement of the sound eye when covered is called secondary deviation. In concomitant strabismus the sound eye makes a movement in its deviation equal to that made by the squinting eye in its effort to fix. In paralytic strabismus the paralysis in the affected eye prevents full movement, and the secondary deviation is always greater than the primary squint. The *primary* and *secondary deviations* may be measured by marking on the lids the boundaries of the corneas before the test, and the boundary of the cornea of the affected eye when attempting to fix, and the boundary of the cornea of the sound eye diverging under cover. The markings on the lid of the squinting eye show the primary deviation, while those on the lid of the other eye show the secondary deviation.

Paralytic Squint.	Concomitant Squint.
1. Contraction of the field of vision.	1. Displacement of the field of vision, but no contraction.
2. Secondary deviation greater than the primary.	2. Secondary deviation equal to the primary.
3. Disturbance with double images.	3. No disturbance with double images.

It often happens that there is horizontal as well as lateral squint, and to properly study the exact character and degree of deviation, an attempt should be made to compel recognition of the double images that are received; unfortunately, after some time the image in the squinting eye becomes suppressed, and it is very difficult to get the patient to recognize two images; but by placing a deeply colored glass before the fixing eye, its image is so modified that the false image, which is ordinarily suppressed, may be recognized by the squinting eye.

Treatment.—As strabismus is often due to ametropia, or, more commonly, to anisometropia, the first object should be to correct the refractive error in both eyes and to strive to bring the squinting eye into function by the blinder-exercise, in the manner employed in the treatment of anisometropia. The muscular insufficiency should be treated by systematic exercise: at first by the finger-exercise, and afterward with prisms. Periodic squint is particularly amenable to this treatment. In young children in whom there is a tendency to strabismus, the constant use of a weak solution of atropin in the sound eye will bring the other eye into function and correct the squint, or it may be necessary completely to paralyze the accommodative effort for some time by using the mydriatic in both eyes.

When, however, binocular vision cannot be obtained by the foregoing procedures, an operation must be resorted to. For internal strabismus, tenotomy of the internal recti is indicated. For external strabismus, tenotomy alone of the external recti or in conjunction with advancement of one or both tendons of the internal recti may be necessary. In regard to the relative indications of tenotomy and advancement, it should be remembered that in concomitant squint with relaxed tendons advancement, and with tense tendons tenotomy, should be performed. However, it is sometimes necessary to advance an apparently tense tendon and to regulate a tenotomy by subsequent advancement. The great difficulty with tenotomy is that, despite the most careful and assiduous static and dynamic testing and operative dexterity, the exact effect of the operation, after cicatrization and contraction is completed, is not certain. Advancement seems to offer more definite results.

Paralysis

Varieties.—Suspension of the function of a muscle or of a set of muscles constitutes true *paralysis;* impairment of the function alone is called *paresis.* One muscle alone may be paralyzed, or a set of muscles may be affected, or there may be total paralysis of all ocular movement.

Total ophthalmoplegia is paralysis of all the ocular muscles, due to some destructive cerebral lesion.

External ophthalmoplegia indicates paralysis of the external muscles of the eye—the four recti and the two oblique. It is an occasional symptom of locomotor ataxia.

Internal ophthalmoplegia, or paralysis of the ciliary and pupillary muscles, is very rare, but partial internal ophthalmoplegia often follows an attack of diphtheria. This partial paralysis of the internal muscles is generally known as paralysis of accommodation.

Paralytic strabismus may also be divided and classified according to the nerve involved.

Paralysis of the third or oculomotor nerve causes paralysis of the muscles of the lid (ptosis), and paralysis of the superior, inferior, and internal recti and of the inferior oblique. The manifestations of such paralysis are inability to move the eye from its central position inward and upward, and hence divergent or vertical squint with crossed and more or less vertical diplopia. There are also mydriasis and loss of accommodation.

Paralysis of the sixth or abducens nerve produces convergent squint and homonymous diplopia, due to a loss of power in the external rectus, which is supplied by this nerve.

Paralysis of the fourth nerve is manifested by loss of power in the superior oblique muscles, causing imperfect movement of the eye down and out, and hence diplopia and slight convergent squint.

According to A. Graefe, the proportionate frequency is as follows:

32 percent, isolated paralysis of a rectus externus.
16 percent, isolated paralysis of an oblique superior.
8 percent, isolated paralysis of one of the four remaining muscles.
44 percent, combined paralysis of all these four remaining muscles in one or both eyes.

The objective symptoms are limitation of movement of the affected eye on the side and in the direction of a paralyzed muscle. This limitation can generally be perceived when the patient holds his head still and attempts to follow the movements of the physician in various directions. If the paralysis is slight, it may not be recognized objectively. Another significant objective sign is the tendency of the head to be obliquely inclined, in a characteristic position for each form of paralysis. The deficiency in the affected muscle is partly corrected and the diplopia controlled by keeping the head turned toward the side of the affected muscle.

Subjective Symptoms.—Diplopia, occurring when the patient looks at an object situated within the sphere of action of the paralyzed muscle. The two images of an object seen in the median line are more widely separated when the object is moved in the direction of the action of the paralyzed muscle. The image seen by the sound eye is the true image, and that seen by the affected eye the false image. A study of the relative position of the two images enables one to determine the special muscles or set of muscles paralyzed.

Vertigo, nausea, headache, and incorrect estimation of position in space are disagreeable symptoms of an ocular paralysis. As the patient forms incorrect location of objects, his gait is often uncertain.

Special diagnosis of the ocular palsies depends upon the relative position of the images in diplopia. To determine the eye and muscle affected, it is necessary to remember that the loss of motility and diplopia increase upon the side of the paralyzed muscle. The image of the affected eye is always found on the side opposite that to which the cornea is turned. A ready method is to tell the patient to look straight at a pencil, and to follow the movements given it until two images of the pencil are seen. Then one eye is covered, and according to which image disappears, it is known whether there is crossed or homonymous diplopia, and the relative position of the two images will give an idea of the muscles paralyzed.

Causes.—The lesion directly causing the paralysis may be a primary affection of the nerves themselves, or may be situated in the cerebral centers from which the nerves originate. Syphilis and tubercular meningitis are probably the most common causes. Of the infectious diseases, diphtheria is most active in causing ocular paralyses, which, however, in these cases, are more manifest in the internal muscles of accommodation. Influenza, rheumatism, typhoid fever, and diabetes have also been mentioned as causes. Poisons, like nicotin, alcohol, lead, the ptomains, carbonic oxid gas, and exposure to cold have all been reported as causes. Orbital tumors and abscesses, exophthalmic goiter, aneurysm, cerebral hemorrhage, and fractures at the base of the brain may cause paralysis by pressure.

Prognosis.—The duration of the paralysis is more or less chronic. In the most favorable cases several months are required for a cure. The prognosis is favorable when a paralysis is a sequel to diphtheria, some mild injury, or transient intoxication. Ocular paralysis associated with locomotor ataxia in the early stages is likely to disappear as the disease progresses. The prognosis is uncertain when the true nature of the causative disease cannot be made out. In cases of long duration muscular atrophy may occur. The prognosis is unfavorable when the paralysis is discovered to be the result of some grave spinal or cerebral lesion.

Treatment.—Treatment should be directed to the removal of the cause and the relief of the symptoms. Syphilis yields to mercurials and iodids and diaphoresis. Meningitis must be treated in the usual manner. Diabetes demands dietary and hygienic treatment. Paralyses of rheumatic origin require the salicylates, colchicum, and other ordinary rheumatic therapeutics. Diphtheritic palsies generally disappear with healthy bodily nutrition and the best tonic treatment. The influence of mercuric chlorid should never be overlooked. Both the galvanic and faradic currents are sometimes of value. For the relief of the diplopia it is well to occlude the unsound eye from vision, either by a bandage or by an opaque disc. The simple patch is the least cumbersome occlusive bandage. In all cases it is well to remember that a long period of diplopia and its consequent distressing symptoms will elapse before a cure can be effected. If the paralysis continues in spite of all treatment, it may be well to try to remedy the patient's discomfort by prisms, but these are rarely of value. In cases beyond the possibility of cure, in which strabismus has developed, tenotomy or advancement may be performed to relieve the disfigurement. In cases of secondary contracture an attempt should be made to oppose the development of the contracture by stretching the antagonist of the paralyzed muscle, by seizing the overlying tissues with fixation forceps, and strongly rotating the eye several times toward the side of the paralyzed muscle.

Nystagmus is involuntary oscillation of the eyeball due to spasmodic jerking movements of the eye, not interfering with the voluntary movements, but accompanying them. It is the result of defective coordination. The involuntary movements may be horizontal or vertical, oblique, or rotations about the visual axis. Internal squint is a frequent accompaniment, and there may be simultaneous shaking of the head.

The commonest form of nystagmus is that coming from some deficiency of vision in both eyes, beginning in childhood, particularly in amblyopia, the result of the destructive changes after ophthalmia neonatorum and in retinitis pigmentosa. It also exists in microphthalmos, albinism, and some varieties of congenital cataract. Miners who constantly strain their eyes in the darkness sometimes develop the disease. Nystagmus from cerebral disease is only of symptomatic significance. It is especially important in the diagnosis of multiple sclerosis.

Treatment beyond rest and the relief of the distressing symptoms is of little value. It must always be remembered that there is a possibility of improving the visual acuity and modifying the

PARALYSIS OF THE OCULAR MUSCLES

The black figure represents the image of the left eye throughout. The light figure, that of the right eye. (*Modified after Landolt.*)

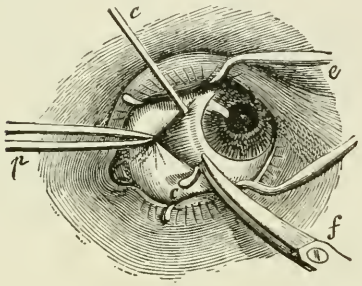
The muscle paralyzed.	Limitation of motion.	Direction of the affected eye.	The Images.	Position of the Images.		Direction of the sound eye during fixation of the paralyzed eye.	Position of the face.	Remarks.
				Paralysis of the Left.	Paralysis of the Right.			
Rectus externus.	Outward.	Inward. No inclination of vertical meridian.	Homonymous. The images are upon the same plane and parallel; their distance apart is increased by the patient directing his gaze to the side of the affected eye. The dividing line between single and double vision is, in the upper part, somewhat inclined toward the affected eye; in the lower, toward the sound one.			Inward	Turned upon its vertical axis toward the affected eye.	Pathologic convergence becomes clearer in looking downward, divergence in looking upward.
Rectus internus.	Inward.	Outward.	Crossed. On the same plane and parallel. Their distance apart increases when the patient looks to the side of the sound eye and upward. In looking upward and to the sound side, the image of the paralyzed eye is a little lower than the other, and its upper part is inclined inward. In looking downward and to the sound side, the image of the paralyzed eye is higher and its upper part inclined outward. The line between single and double vision is inclined to the vertical.			Outward.	Turned upon its vertical axis toward the affected eye.	
Rectus superior.	Upward and a little inward.	Downward. In looking upward, downward and outward.	One image is above the other and slightly crossed, especially in the upper half of the visual field. The image of the affected eye is above the other, and its upper part is inclined away from the image of the sound eye. The difference of elevation increases upon looking upward and inward. The lateral distance decreases in looking either to the right or to the left. The obliquity of the images increases in looking toward the sound side. The line between single and double vision is inclined to the horizontal from above, and from the side of the sound eye downward and toward the affected eye.			Upward.	Upward.	The upper lid of the paralyzed eye is slightly elevated in looking upward. In paralysis of the rectus superior or inferior, the deviation is particularly shown in the position of abduction. In paralysis of the superior or inferior oblique, the deviation is particularly shown in the position of adduction.
Rectus inferior.	Outward.	Upward and outward.	One image is above the other and slightly crossed, especially in the lower half of the field. The image of the paralyzed eye is below, with its upper end inclined to that of the sound eye. The perpendicular distance between the images increases in looking downward and to the affected side. The lateral distance decreases in looking to either side. The line between single and double vision is inclined to the horizontal.			Downward and outward.	Downward and slightly to the affected side.	

PARALYSIS OF THE OCULAR MUSCLES

The muscle paralyzed.	Limitation of motion.	Direction of the affected eye.	The Images.	Position of the Images.		Direction of the sound eye during fixation of the paralyzed eye.	Position of the face.	Remarks.
				Paralysis of the Left.	Paralysis of the Right.			
Obliquus superior.	Downward and outward. In complete paralysis of this muscle, rotation downward is lessened.	Upward and inward. Vertical meridian is inclined outward, especially in looking downward and outward.	The images are one above the other and homonymous, especially in the lower half of the field. The image of the paralyzed eye is below, its upper end inclined toward the image of the sound eye. Their perpendicular distance apart increases by looking downward and toward the sound side. The lateral distance is decreased by looking to either side. The obliquity increases toward the side of the affected eye. The image of the affected eye appears to be nearer than the other. The line between single and double vision is inclined toward the horizontal from above, and the sound side downward and toward the paralyzed eye.			Downward and inward.	Downward and to the sound side. To avoid this position of the head, the patient holds the object above and to the sound side.	In paralysis of either obliquus, the act of looking upward or downward is always accompanied by a convergence caused by the exclusive action of the recti muscles. Divergence is observed in paralysis of the recti. The inclination of the images is reversed. In paralysis either obliquus the vertical deviation toward the nose, and obliquity toward the temple, is increased; the reverse takes place in paralysis of the recti.
Obliquus inferior.	Upward and outward.	Downward and inward.	The images are one above the other and homonymous, especially in the upper half of the field. The image of the paralyzed eye is above, and its upper end turned away from that of the sound eye. The perpendicular distance increases in looking upward and inward. The lateral distance increases in looking upward and outward. The obliquity of the two images increases upon the side of the paralyzed eye. The line of division between single and double vision is inclined to the horizontal, and the end corresponding to that of the affected eye is above the other.			Upward and inward.	Outward and slightly inclined toward the sound side.	The maxima-elevation and intermediate positions result from the combined actions of the superior and external recti.
Recti, obliqui, levator palpebræ superior, ciliary, and iris circular.	Inward, upward, downward; and intermediate positions.	Outward.	Crossed. The image of the paralyzed eye is a little above that of the sound; its upper end is inclined to that of the sound eye, and it seems to the patient that it is nearer him than the other one is. The perpendicular distance is increased by looking upward, and likewise the obliquity. This is decreased by looking downward and to the affected side. The lateral distance is increased by looking to the sound side.			Outward.	Inclined to the sound side and slightly raised.	The affected eye is somewhat prominent. Ptosis of the upper lid, mydriasis, ophthalmoplegia interna.

disease by correcting lenses. The prognosis of nystagmus is never encouraging, even under the most favorable circumstances.

EYE-MUSCLES, OPERATIONS. Tenotomy.—The eye should be thoroughly cleansed and rendered aseptic. The section of the tendon is best performed under cocain or other local anesthetic, as in general anesthesia the result cannot be seen during the operation. The lids are held apart by an eye speculum. The eye is turned in a direction away from the muscle to be divided and held by fixation forceps. A fold of conjunctiva lying over the muscle is grasped with the fixation forceps and a short vertical incision is made about 4 mm. from the corneal margin through the conjunctiva and the capsule of Tenon. The conjunctiva is freed from the underlying tissue by means of a pain of blunt scissors or other blunt instrument; when the muscle is exposed, a strabismus hook is



Section of the Tendinous Insertion.
c. c. Tenotomy hook. *e.* Speculum. *f.* Tenotomy scissors. *p.* Fixation forceps.

passed underneath the tendon and the tendon is raised from the globe and divided close to the sclera with a pair of blunt scissors. If complete tenotomy is desired, any fibers remaining undivided may be caught by a strabismus hook and cut through with the scissors. As a rule, no conjunctival stitch is necessary, although it may be used in cases of tenotomy of the interni. After the operation the eye is cleansed and a light dressing applied for a few hours. A mild antiseptic lotion should be ordered. The divided tendon becomes reattached at a point beyond its former insertion.

Advancement.—In this operation the insertion of a muscle is advanced toward the corneal margin by means of a suture. It is performed on weak and relaxed muscles, and in connection with tenotomy of the opposing strong muscle. The process of separating the tendon is the same as in tenotomy, and the tendon is lifted away from the globe by a strabismus hook. A needle threaded with silk of sufficient strength is then introduced in the tendon near the upper margin, from behind forward, and a sufficient number of millimeters back of the insertion to produce the requisite advancement. Another suture is similarly introduced at the lower border of the tendon. The tendon is then divided near the sclera with the blunt-pointed scissors, and the needle of the upper suture is carried beneath the conjunctiva to a point near the upper corneal margin, where it is then brought through leaving the ends of the thread hanging free. In like manner the needle of the lower suture is brought out near the lower corneal margin. The ends of the two sutures are then tied together, the threads being drawn tight enough to slightly overadvance the tendon beyond the point of necessity. This latter precaution is taken to counteract the diminution of advancement with healing. If desired, the tendon may be divided last, after the sutures are brought out through the conjunctiva. The surgeon must be careful not only to pierce the conjunctiva, but also the capsule of Tenon, as sutures would tear through the conjunctiva alone. Some surgeons excise a small portion of the conjunctiva and the capsule of Tenon between the insertion of the tendon and the cornea. The sutures should be removed on the third or fourth day. A mild antiseptic solution may be used as a lotion. Various other operations of advancement have been suggested. Landolt's **capsular advancement** is a deservedly popular operation.

EYE-MUSCLES, TESTS.—See Eye-muscles (Anomalies).

EYE-STRAIN.—See Asthenopia.

F

FACE IN DIAGNOSIS.—By frequent recurrence the physiognomic changes produced by certain passions and emotions fix themselves permanently upon the face, so that what was in the beginning a passing impression upon the features, becomes a fixed change. Joy expands the face, while sorrow wrinkles the brow and deepens the facial lines. Conditions are transmitted through generations, so that slowly but surely certain types are established. In this way is seen the sympathetic face or the repulsive face; the attractive, pleasant face, and the hard, repellent face.

Facies of Bright's Disease. Wrinkled lids.—(*Greene.*)

The upper or frontal portion of the face (which corresponds to the convolutions of the cerebrum) is a medium of expression for the intellect; the middle portion for the emotions; the lower portion for the instincts; the relative development of these portions of the face indicates a corresponding development of the faculties that they represent.

Some faces are very significant of certain morbid conditions. A person with long, silky hair, large eyes with a bluish tinge of the conjunctiva, long eyelashes, prominent cheek bones, with the skin over them a bright red, lips retracted, is a type of consumptive.

Facies of Syphilis.

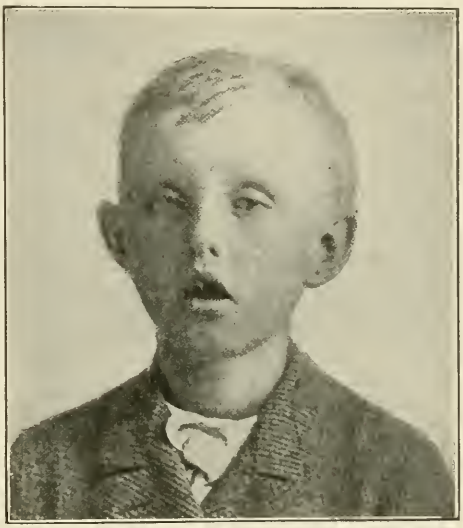
Gray areas of past alopecia. Saddle-nose. Patient and his father both showed perforated palate.—(*Greene.*)

Diseases of the abdominal organs bring about a characteristic appearance of the face. The features are somber and drawn, the skin is livid, its lines deeply marked, the eyes are sunken. The face of an infant is quite indicative of its condition of health, and significant of its malady. See Infantile Symptoms.

The various disease countenances are called the facies. Of these there are:

The Facies of Adenoids; of Bright's Disease; and of Syphilis. See Illustrations.

Cardiac Facies, an anxious expression occasionally seen in the early stages of chronic valvular disease. **F. Hepatica,** a peculiar earthy appearance of the face, often observed in organic disease of the liver. **F. Hippocratica,** the Hippocratic countenance, indicative of the rapid approach of dissolution: the nose seems pinched, the temples hollow, the eyes sunken, the ears leaden and cold, the lips relaxed, and the skin livid. **F. Ovariana,** the characteristic expression of women suffering from ovarian disease. The features are emaciated and sunken, the expression anxious, the forehead furrowed, the eyes hollow, the nostrils open and



Facies of Adenoids.—(*Greene.*)

sharply defined, the lips long and compressed, and the angles of the mouth depressed, with wrinkles encircling them. **F. Stupida,** the typhoid face.

FACE, DISEASES.—These are described under their separate headings. See Anthrax, Carbuncle, Erysipelas, Exanthems, Lupus, Syphilis, etc.

FACE, INJURIES.—Owing to the abundant blood supply, wounds of the face heal very rapidly. In burns, however, and in gunshot injuries in which there is much loss of tissue, great care is required to prevent deformity; the lower lip, for example, may be drawn down to the neck, or the lower eyelid permanently fixed in a position of ectropion. Even when they are badly bruised, the edges should always be brought accurately together and fastened by sutures; fine silver wire or silkworm-gut if the depth is not great; harelip pins if, for instance, the lip is divided through into

the mouth. It is essential to bring the scar into such a position that it will have the least effect upon the eyelids and the mouth. A double set of sutures is sometimes advantageous, one through the mucous and the other through the cutaneous surface; and the latter may be subcuticular, *i. e.*, carried through the corium from side to side, without appearing upon the surface. In this case fine catgut must, of course, be used. Bleeding generally ceases spontaneously, or as soon as the surfaces are brought into apposition; but the facial artery may require twisting or tying. Sutures should be removed as early as possible, and the edges of the wound supported by pressure, so as to avoid scarring. Many instances are on record of large portions of the nose having united again after complete detachment.

Fractures of the bones of the face are dealt with elsewhere. They are very frequently compound and comminuted; but extensive necrosis is unusual, and the prognosis, so far as life is concerned, is very good, unless the base of the skull (the roof of the nose, for example) is involved. Accurate apposition, however, so as to avoid deformity, is often a matter of great difficulty.

Division of the parotid duct is liable to be followed by salivary fistula, the opening of the cutaneous surface persisting, and the whole or greater part of the secretion pouring onto the skin, and giving rise to great discomfort and annoyance. To avoid this, the wound, if it does not already extend into the mouth, should be completed, and a catgut suture passed through the mucous membrane of the cheek and the adjacent wall of the duct on each side, and knotted on the oral surface. The edges of the wound in the skin must then be brought together accurately, and rendered as secure as possible with collodion. Even if union does not take place at first, the opening has a strong tendency to close, if only the saliva can find its way to the mouth.

FACIAL PARALYSIS (Bell's Palsy).—An acute paralysis of the seventh cranial—the facial nerve, the great motor nerve of the muscles of the face—the nerve of expression. Exposure to a current of cold air against the side of the face—over the pes anserinus—is the most frequent cause. It is also due to injury or disease of the middle ear and to syphilis.

Symptoms.—The facial nerve supplies the muscles of the face, the muscles of the external ear, also the stylohyoid, posterior belly of the digastric, the platysma, one muscle of the middle ear—the stapedius—and one palate muscle—the levator palati; by means of the chorda tympani branch it controls the secretion of the parotid and submaxillary glands, and, possibly, the sense of taste. It also furnishes motor power to the azygos uvulæ, the tensor tympani, and the tensor palati muscle.

The onset is usually sudden, with tingling of the lips and tongue, and upon looking into the mirror the patient is surprised by the perfectly blank, motionless side of the face; the corner of the mouth is depressed, the eyelids open, the face drawn toward the well side, and the patient is unable to expectorate, whistle, or swallow.

Any of the muscles innervated by the nerve may participate in the paresis. The electrocontractility is feeble or lost. The reflexes are abolished.

Diagnosis.—Paralysis of the muscles of the face occurs in hemiplegia; the points of differentiation are the presence of cerebral symptoms and the normal reflex excitability. Facial palsy with otorrhea, imperfect hearing, obliquity of the uvula, and loss of taste, determine its origin within the aquæductus fallopii. It is due to peripheral neuritis if the taste is normal and the uvula is straight. If other nerves are also involved, the origin is central.

The prognosis is favorable.

Treatment.—If the result of cold and damp, diaphoresis with pilocarpin, or diuresis with potassium acetate or iodid, and blisters in front of the ear, and the use of galvanism to the affected muscles.

FACIES.—See FACE IN DIAGNOSIS.

FAINTING.—The act of swooning. It may be the result of heart-disease, hemorrhage, pain, excessive emotion, tight lacing, indigestion, hunger, exhaustion, certain drugs, and hot and vitiated air. Eyestrain is a very common cause of fainting spells and swoonings. The face and extremities become cold, pale, and clammy. Unconsciousness may last a few seconds or several hours, usually a few minutes. It is not usually fatal.

The proper treatment is to assist the heart by lowering the patient's head, loosening any garment that may constrict any portion of the body's circulation, providing free, fresh air, sometimes sprinkling cold water over the face and chest, slapping the palms of the hands, chafing the feet, the application of weak ammonia water and smelling salts. The attendant should not hold any irritant to the air-passages too close to the nostrils. The head and face may be bathed with alcoholic solutions, as camphor, bay-rum, cologne, or whisky. No attempt should be made to administer stimulants by the mouth unless the patient is able to swallow, when whisky, wine, spirits, or ether, diluted, may be given. Dilute aromatic spirit of ammonia is serviceable and practicable.

After recovery from an attack of fainting, until the action of the heart and circulation are properly restored and strengthened, the patient must be kept quiet. See COMA, SYNCOPE.

FALLOPIAN TUBES, AFFECTIONS.—Inflammation of the Fallopian tubes, or salpingitis, is very common. It may occur as an acute or a chronic condition, the latter being most frequent.

Etiology.—The most important causes of salpingitis are septic infection (See COLON BACILLUS INFECTION), and gonorrhea. Gonorrhea very rapidly extends from the vagina or cervix to the body of the uterus, and from there extension to the tubes is a comparatively short and simple process. Septic infection involving the tubes usually follows labor or miscarriage. There are other less common causes of salpingitis, such as subinvolution, laceration of the cervix, fibroid tumors, and uterine displacements.

Pathology.—In the early stages of the disease the mucous membrane of the tube is swollen and congested, and the tubal walls become thickened.

The tube attains the size of the thumb. As the disease progresses, the abdominal and then the uterine end of the tubes closes, resulting in one of the forms of cystic distention of the tube. Thus the tube may become distended with pus (*pyosalpinx*), watery fluid (*hydrosalpinx*), or blood (*hematosalpinx*).

The ovary usually suffers as a consequence of this condition, any disease from a simple ovaritis to an ovarian abscess resulting from it.

The symptoms of acute salpingitis are not very distinctive. There is pain, which is more or less severe, confined to one or both ovarian regions; there are rise of temperature and increased rapidity of pulse. Examination reveals marked tenderness and fulness in the vaginal vaults. Occasionally, the enlarged tube may be distinctly palpated. In chronic salpingitis the most marked symptom is pain. This varies in character, but is almost constantly present. It is increased by exercise or exertion of any kind, such as walking, heavy lifting, defecation, and coitus.

At the menstrual period, when the pelvic structures are swollen and congested, the pain is intense. It begins usually 3 or 4 days before the appearance of the menstrual flow, and continues throughout the whole of the period. Marked exacerbations of pain may occur, caused by the occasional leakage of pus through the abdominal ostium into the peritoneal cavity.

Menorrhagia is commonly present, the patient usually menstruating profusely for a week or more.

Absolute sterility is present if the tubes are occluded by the inflammatory process.

The physical signs of chronic salpingitis are important. Usually the uterus is displaced backward, and lying behind or beside it can be felt the enlarged and indurated tubes. The isthmus of the tube, where it leaves the uterine cornua, can be felt as a hard, fibrous cord.

The treatment of acute salpingitis consists in rest in bed, purgation, vaginal douches, and hot applications. Purgation is best secured by the administration of Rochelle salts, 1 dram every hour, repeated as often as may be necessary. Vaginal douches of a gallon or more of hot water (110° F.) relieve the congestion and pain. Turpentine stupes or hot poultices applied to the lower part of the abdomen will also relieve the pain. If, under the foregoing plan of treatment, the patient does not improve; if the pulse-rate and temperature increase; if the pain and tenderness become more severe, celiotomy must be performed, and the diseased tubes and ovaries removed.

The treatment of chronic salpingitis may be either palliative or radical. If the pain is not severe; if there is no gross disease of the tubes; if the uterus is not retroverted, and if there are no extensive tubal adhesions, palliative treatment may be tried. This consists in rest during the menstrual periods; free purgation with saline laxatives; the administration of copious vaginal douches; painting the cervical and vaginal vaults with tincture of iodin, and the use of glycerin tampons.

A thorough preliminary curettage will be advantageous in the majority of instances.

If there are present the conditions previously spoken of, or if, in mild cases of salpingitis, palliative treatment fails, **operation** is usually demanded. This consists in freeing the tubes and ovaries from adhesions, in rendering patulous the tube, in replacing the retroverted uterus, and in removing the tubes and ovaries and, possibly, the uterus. Whenever possible, it is advisable to allow one tube and ovary to remain, or at least part of it, since in this way sterility and a premature menopause are avoided.

Tuberculosis.—This is a much more frequent condition than is commonly supposed, occurring in about 12 percent of all diseases of the tube. It may occur as a miliary form of tuberculosis, being part of a general condition, or, more frequently, it may be the chronic diffuse form, or a chronic fibroid condition.

Tuberculosis of the tubes is usually a secondary condition, the original focus of infection being in some other part of the body.

The symptoms of tubal tuberculosis are not distinctive. The same conditions are present as in an ordinary salpingitis. Should the patient have pulmonary tuberculosis, or should her husband have genitourinary tuberculosis, and should she present the ordinary signs of salpingitis, tubal tuberculosis should be suspected.

The treatment of tuberculosis of the tubes is operative. The tubes and ovaries should be removed, and the uterus also, if it is affected. The operation is usually favorable, cure resulting even though the peritoneal cavity is extensively involved.

Tumors.—Adenoma, myoma, and cancer rarely occur in the Fallopian tubes. The treatment consists of complete removal.

Impregnation.—See EXTRAUTERINE PREGNANCY.

FARCY.—See GLANDERS.

FAR-SIGHTEDNESS.—See HYPEROPIA.

FASTING.—Unless the supply of material in the form of food is equivalent to the loss occurring, a progressive wasting of the body and failure of power must ensue, and it is only a question of time when the continuance of life becomes impossible. The duration of life with complete abstinence from food and drink is usually from 8 to 10 days. A stout person may live longer than a thin one Exposure to cold hastens death; moisture in the atmosphere favors prolongation of life.

In treating cases of fasting both food and drink should be limited at first, and afterward gradually increased. To allow a sufferer from fasting to fully gratify his desires is generally fatal. Stimulants and external heat are demanded.

FATIGUE FEVER.—According to Vaughan and Novy, this affection frequently occurs after forced marching, especially during periods of war. It is accompanied by loss of appetite, chilly sensations, excessive cerebral excitement, fitful or unrefreshing sleep, and slight rise of temperature—1° to 3°. It is frequently mistaken for MALARIAL or TYPHOID FEVER (*q. v.*).

The prognosis is guardedly favorable when there is no organic lesion.

Treatment.—In the great majority of cases the

prime indications are to regulate the diet, which should be chiefly vegetable, to relieve indigestion, and to stimulate the emunctories of the body—the bowels, kidneys, and skin. Lavage may do good.

Intestinal antiseptics, such as naphthalin (6 grains) or naphthol (4 grains), are indicated, and may be given 3 times daily.

For relief of Constipation (*q. v.*) the ordinary measures are indicated.

To increase elimination of uric acid and urates Haig recommends the use of potassium iodid for a week or two, and afterward the substitution of sodium salicylate.

For inactivity of the kidneys diuretics should be used:

℞.	Lithium citrate,	ʒ j
	Wine of colchicum seed,	ʒ ij
	Sweet spirit of niter,	ʒ iv
	Elixir of curaçao,	ʒ iv
	Solution potassium citrate, enough to make	ʒ iij.

Two teaspoonfuls every 4 hours.

℞.	Potassium citrate,	ʒ ij
	Sweet spirit of niter,	ʒ iv
	Simple elixir,	ʒ iv
	Water, enough to make	ʒ iij.

Two teaspoonfuls every 4 hours.

For inactivity of the skin, hot baths, followed by massage and a sufficient amount of exercise, are of benefit in most cases. If not too depressing, the baths may be taken every 2 days, preferably in the forenoon or early in the afternoon.

The Diet.—Meats and highly nitrogenous foods are to be restricted, and fruits and vegetables, if obtainable, substituted. The excessive use of coffee, tea, alcohol, or tobacco increases the persistence of the symptoms, and should be prohibited, or only a limited quantity allowed.

FATNESS.—See Obesity.

FAUCES.—See Adenoids, Pharyngitis, Stomatitis, Tonsillitis, Tonsils.

FAVUS (Tinea Favosa).—A contagious vegetable parasitic disease, due to the Achorion schönleinii, characterized by cup-shaped, sulphur-yellow crusts perforated by hair.

Symptoms.—The usual seat of the disease is the scalp. The disease begins as a diffuse or circumscribed superficial inflammation with scaling, soon followed by the appearance of pinhead-sized, yellowish crusts seated about the hair follicles. The crusts increase to the size of peas, when they acquire the characteristics of the "favus-cup," scutulum. The typical favus-cup is split-pea sized, rounded, umbilicated, penetrated by a hair, and of a sulphur-yellow color. It is usually friable, crumbling between the fingers like dry mortar. When dislodged from its bed, there is exposed to view a reddened, shining, atrophic, cup-shaped, often suppurating excavation that heals up with the production of a scar. As a consequence, more or less permanent baldness results.

The crusts may be discrete or confluent, forming thick, irregularly shaped masses of a honeycomb appearance. In well-marked cases a peculiar mouse-like or damp-straw odor is present, which is quite characteristic of the disease. The hairs are dry, lusterless, and brittle, and are likely to split longitudinally, break off, or fall out. Itching, variable in degree, occurs in most cases.

Favus occasionally attacks the nonhairy portion of the body (*tinea favosa epidermidis*). It may also affect the nails (*tinea favosa unguium, onychomycosis favosa*), causing them to become thickened, yellowish, opaque, and brittle. The course of the disease is extremely chronic, lasting years, and in some cases a lifetime. The affection is contagious, but not to the same extent as ringworm.

Etiology.—The cause of the disease is a vegetable organism known as the Achorion schönleinii. The disease usually begins in childhood. It exists chiefly among the foreign poor. It is not infrequently contracted from cats and other lower animals.

Pathology.—The fungus occurs in the hair, hair follicles, and epidermis. The favus crust is made up almost entirely of fungus. The favus mycelium consists of slender threads, which appear as flattened tubes, either clear or containing spores. The threads are broader and the joints more numerous than in ringworm. The spores are rounded, highly refractive bodies, varying in size from 1/900 to 1/400 of an inch in diameter. They differ from the spores of ringworm in their greater variability both as to size and shape. Both spores and mycelium are abundant. Secondary inflammatory changes occur in the corium.

Diagnosis.—Tinea favosa is to be differentiated from tinea tonsurans and pustular eczema. The sulphur-yellow, cup-shaped, friable crusts, the scarring, the peculiar odor, and the history will usually enable one to make the diagnosis. Absolute proof is afforded by the microscope.

To examine for fungus, a fragment of crust or a hair is moistened in liquor potassæ and examined under a microscope, without preliminary staining.

Prognosis.—Favus of the scalp is extremely rebellious, lasting often for years. In long-standing cases extensive scarring and permanent hair-loss are likely to occur. Favus of the body responds readily to treatment.

Treatment.—The treatment of favus of the scalp consists of epilation of the diseased hairs and the use of parasiticide ointments and lotions. The hair should be closely cropped and the crusts removed by softening with oils and subsequent soap-and-water cleansing. The systematic extraction of the diseased hairs with an appropriate forceps is an essential part of the treatment. The parasiticide applications should be made twice daily.

Among the more important remedies may be mentioned the following:

℞.	Mercuric chlorid,	gr. iij to iv
	Water,	ʒ j.
℞.	Precipitated sulphur,	ʒ j to ij
	Petrolatum,	ʒ j.

℞. Oleate of mercury, 10 to 20 percent.

℞. Sodium hyposulphite, ℥ j
Water, ℥ j.

℞. Chrysarobin, ℥ j
Petrolatum, ℥ j.

To be used with caution.

The treatment is long and tedious, and is likely to tax the perseverance of the patient. The microscope should be repeatedly used before a case is pronounced cured. Treatment should be continued after apparent cure, to guard against relapse. Favus of the body is seldom rebellious, and may be treated with milder remedies than scalp cases. The crusts should be softened and removed, and a mercurial or sulphur ointment rubbed in. Favus of the nails is, as a rule, obstinate to treatment. The nails should be frequently pared and scraped and parasiticide ointments rubbed in twice daily.

FEBRIFUGE.—An agent that lessens fever. The best remedy for simple fevers is aconite in small, repeated doses. If given early, it will abate the fever. Veratrum viride is used as a febrifuge, and hyoscyamus or belladonna are beneficial, especially when there are head symptoms. Gelsemium is given for remittent or bilious symptoms, and arsenic in typhomalarial conditions. Four grains of phenacetin are given as a febrifuge in the simple fevers of children; and hydrochloric acid is beneficial to the same class. Lemon-juice, as lemonade or with potassium bicarbonate, and pomegranate-juice, are mildly febrifuge. One-half to 1 grain of the bromids is excellent for the febrile disturbances of children. Cold spongings and baths are of great use.

℞. Dilute hydrochloric acid, ℥ ss
Compound spirit of ether, ℥ jss
Syrup of rose, ℥ ss
Camphor water, enough to make ℥ iv.

Give a teaspoonful to a tablespoonful, according to age, every 6 hours.

℞. Potassium acetate, ℥ ij
Spirit of nitrous ether, ℥ iv
Simple syrup, ℥ j
Solution of ammonium acetate, ℥ ij
Camphor water, enough to make ℥ viij.

Give a teaspoonful to a tablespoonful, according to age.

See Antipyretics, Fever.

FECES.—Von Jaksch restricts the term "feces" to all those substances that, being formed from the food in the process of digestion, and mixed with the residues of the secretions of the alimentary canal, are finally expelled from the body by the rectum.

The importance of examination of the feces is gradually being appreciated. The basis of all such work is the determination of the time required for food to pass from the mouth to the rectum. The patient is merely given a teaspoonful of charcoal or a 5-grain capsule of carmin; this is easily recognized in the stool. Thus, "latent constipation" may be ascertained.

Macroscopic Examination.—The stool can be brought in a glass jar, or the patient may have one at the office at will, or by the aid of a suppository. A small piece of formed stool or a small amount of liquid feces is mixed well with distilled water and examined in a large Petri dish over a black background.

Mucus.—In constipation alternating with attacks of diarrhea the fluid stools contain flecks of mucus, and small hard fecal masses which are the cause of the diarrhea. In mucous colitis the mucus is in shreds. These strings should be searched for in all doubtful cases of abdominal pain before considering operation, since mucous colitis may simulate appendicitis, renal colic, floating kidney, gall-stones or ovarian colic. Thus a number of cases may be saved from unnecessary operation. Mucous colitis differs from membranous colitis in being a purely functional neurosis. Over 95 percent of the patients are nervous women; and in these the bowel condition should be let alone, attention being directed to the vasomotor system, rest in bed being the best treatment. The strips of mucus in the inflammatory form have cell inclusions, while in the neurotic type they are transparent. The higher the origin of the mucus the smaller the pieces. A definite colitis is usually indicated by purulent or bloody mucus, frequency of evacuation depending on the point of colon involved. In rectal carcinoma there are frequent stools, some mucus and considerable blood. Bloody mucus in children should suggest intussusception. Whenever mucus is found search should be made for amebæ, the stool being warmed, as by surrounding the container with warm water, in order to get the ameboid motion.

Intestinal sand consists of granules formed chiefly of phosphates and carbonates of calcium, magnesium, iron, etc., also of organic matter, fat, cholesterin, bacteria. It appears at intervals in the liquid stools of nervous persons, probably due to a secretory neurosis. *Pseudosand*—fruit seeds, vegetable structures—is common.

Acholic stools—clay-colored—result from (1) a milk or other fatty diet; (2) obstruction of the common duct (when relieved suddenly the stools may be orange in color, due to bilirubin); (3) bacterial ferment, which has changed the bile pigment to leukourobilin. When bile is apparently absent it may be found in the stool by extracting with alcohol or ether.

Fat is present in large amount in (1) acholic stools (the fat is not split up because of biliary stasis); (2) milk or oil diet; (3) disease of the intestinal wall preventing absorption, *e. g.*, tuberculosis or cancer of the intestine or retroperitoneal lymph glands, which blocks the flow of lymph; (4) true steatorrhea appears practically only in total destruction of the pancreas, and not always then. (The fat hardens on cooling.)

In malnutrition the stools are apt to be large, bulky, fetid, greasy, showing signs of active fermentation, containing gross particles of undigested meat and vegetables—showing a deficiency of

pancreatic fluid. Such gross particles in a firm stool are suggestive of pancreatic disease.

Black stools may be due to iron or bismuth or charcoal, or to gastric or duodenal ulcer.

Gall-stones.—If gall-stone colic is suspected, the stool should be mixed with water, strained through a coarse mesh and the stone looked for. The stone may have disintegrated in the bowel. If found it should be split open and examined, or dissolved in boiling alcohol to obtain cholesterin crystals.

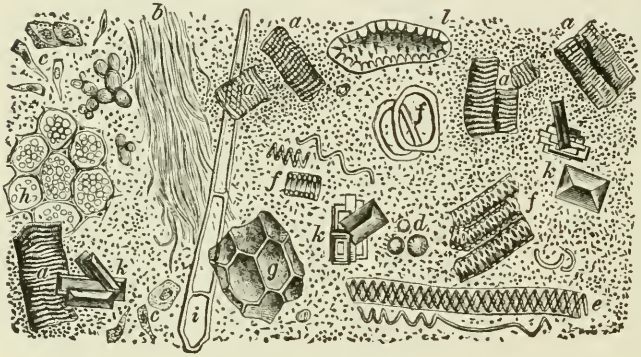
Pseudogall-stones are fat concretions or masses of vegetable or fruit tissues.

Azotorrhea, or excess of muscle fibers, denotes (1) absence of trypsinogen; or (2) its activating ferment enterokinase, *i. e.*, pancreatic destruction or intestinal destruction; or (3) abnormal motility.

Casein-curds in the stools of those on a milk diet often consist of almost pure fat.

Soaps may be present.

Intestinal worms, such as round worms, tapeworms, oxyuris, trichinæ, whipworms, uncinaria Americana and duodenalis, are frequently found and should be isolated and identified.



Normal Feces.—(*Landois.*)

a. Muscle fibers. *b.* Tendon. *c.* Epithelial cells. *d.* Leukocytes. *e-i.* Various forms of plant-cells, among which are large numbers of bacteria; between *h* and *b* are yeast-cells. *k.* Ammonium-magnesium phosphate.

Microscopic Examination.—For a correct estimate, a test diet is usually given the patient, though it has been suggested that the ordinary diet is more helpful in finding out the cause of the condition. The most popular diet is that of Schmidt and Strasburger, which consists of 2 3/4 pints of milk, 3 ounces of dried toast, 2 eggs, 1 1/2 ounces of butter, 1/4 pound tender rare steak, 6 ounces of mashed boiled white potatoes, and gruel made from 2 1/2 ounces oatmeal, 1/2 ounce of sugar. This, as translated by Steele, is given as follows: breakfast—2 eggs, 1/3 of the amount of toast and butter, 2 glasses of milk, oatmeal with milk and sugar. Dinner—Steak and potatoes, 1/3 of the amount of toast and butter, 1 1/2 glasses of milk. Supper—2 glasses of milk, remainder of toast and butter, 1 or 2 eggs, if desired.

From the aqueous mixture of the feces, particles should be selected with care, remembering that mucus and vegetable tissue tends to rise, eggs of parasites to sink with meat fragments, etc. The specimen selected is placed on a glass slide and examined. It is important to differentiate soap masses, vegetable cells, plant cells, etc., from animal cells. Unfertilized cells often resemble vegetable cells. In the search for intestinal worms and their eggs, the aqueous suspension should be centrifuged and the sediment examined, preferably after a dose of santonin or thymol.

In suspected liver-abscess or amebic dysentery careful search for amebæ should be made.

Starch granules are recognized by a drop of Lugol's solution. Charcot-Leyden crystals suggest intestinal parasites. Mucus containing pus cells is evidence of ulcer in the small intestine and colon. Blood cells from the lower bowel may be in the mucus. Fatty acid crystals are dissolved on warming and in ether. Soap may be present, if the specimen on a slide is warmed with acetic acid, crystals of fatty acid appear and droplets of neutral fat are soluble in ether. If an abnormal number of fat globules is seen there is an increase of fat in the stool—this condition is ascertained also by pressing a specimen under a cover-glass; if it is fatty, the glass will stay down when the pressure is released. In doubtful cases of malignant disease or ulcer of the stomach, a constant trace of blood in the stools is indicative of cancer; while periodic appearance of blood is suggestive of ulcer. The aloin test, though not always reliable, is preferable to the turpentine-guaiac, because it is more exclusive and is most valuable in differentiating between gastric ulcer and nervous gastralgia and in diagnosing gastric carcinoma. Tests for bilirubin indicate the location of the disturbance, if in the small bowel it will be found.

The fermentation test is helpful. An aqueous mixture of a small portion is placed in Steele's modification of Strasburger's instrument and kept at 37° C. for 24 hours. If gas is formed by fermentation it, will displace the water in the first tube, thus by the amount displaced, the amount of gas can be gauged. If more than 1/3 of the tube is filled, it is pathologic. If acid reaction is noted, there is carbohydrate fermentation; if alkaline and foul, there is albumin fermentation.

To diagnose intestinal autointoxication, cultures of the stool are made for bacteria. If intestinal ferment is suspected the bacillus bifidus should be searched for; if pernicious anemia, bacillus bifidus, and subtilis, tetani and aerogenes capsulatus; if ulcerative processes, various pathogenic and pyogenic organisms. In suspected tuberculosis search should be made for tubercle bacilli. To examine a blood stool, a fragment is mixed with 1.5 c.c. of distilled water to which is added 5 c.c. of a mixture of equal parts of alcohol and ether and after being whirled in a centrifuge 10 minutes, a smear is made from the sediment. The cholera spirillum, the Shiga bacillus, the typhoid and

tubercle bacilli are among the most important pathogenic organisms found in the feces.

The amount by weight of the bacteria in the feces is about one-third of the weight of the dry stool and represents one-half of the total nitrogen. To determine this amount Strasburger's method is the most accurate. Two c.c. of feces and 30 c.c. of 0.5 percent of hydrochloric acid are mixed in a mortar and centrifuged one minute. The supernatant liquid is poured out and the residue washed again in hydrochloric acid centrifuged and drained, the liquor being added to the first. This is repeated until the supernatant liquid is transparent. To the total liquid, which holds the bacteria, is then added an equal amount of alcohol. The mixture is placed on the water-bath at 40° for 24 hours, then partly evaporated and more alcohol added, then centrifuged for several minutes to get a deposit of bacteria. The liquid is poured off and whirled again in the centrifuge. The total bacterial sediment is washed with pure alcohol and ether in the centrifuge, dried at 100° and weighed. The dry weight of the fresh feces must have been determined in the meantime. Thus the amount of the bacteria in the dry feces can readily be ascertained.

Disinfection of Feces.—The chemicals of greatest value in the disinfection of feces are: (1) Chlorid of lime, (2) milk of lime, (3) carbolic acid, (4) mercuric chlorid.

Chlorid of lime is probably best for disinfecting the contents of privies, closets, army sinks, etc. Sternberg recommends 6 ounces to the gallon of water as a standard solution.

Milk of lime is best for disinfecting typhoid or cholera stools in the sick-room, being odorless and easily prepared by slaking lime with water, and adding 4 parts of water (Bissell). A quart of this should be added to each discharge.

Carbolic acid is frequently valuable, but on account of its odor is less used than lime. It should be used in the strength of from 3 to 5 percent.

Mercuric chlorid, under ordinary circumstances, is the best disinfectant known; yet for the disinfection of feces and sputum it is not so valuable as lime or carbolic acid, from the fact that it is quickly decomposed into an insoluble albuminate on being added to those substances to be disinfected. It may be used in strengths of from 1:500 to 1:2000. See DISINFECTION, DEODORANTS.

FEEDING.—See DIETETICS.

FEEDING, ARTIFICIAL.—See INFANT FEEDING, MILK, MODIFIED MILK.

FEEDING, FORCIBLE.—See GAVAGE.

FEEDING, RECTAL.—See ENEMA, SUPPOSITORY, etc.

FEET, EXCESSIVE OR FETID SWEATING.—See SWEAT-GLANDS (Diseases).

FEHLING'S SOLUTION.—See URINE (Examination).

FEIGNED DISEASE.—See MALINGERING.

FEL BOVIS.—The fresh bile of the domestic ox, *Bos taurus*. It is a dark green, viscid liquid, consisting mainly of sodium glycocholate and sodium taurocholate, together with cholesterin. It is a tonic, antiseptic, and purgative, useful in emulsifying the fatty portions of food. **Fel Bovis Purificatum,** ox-gall 3, alcohol 1 part. This should stand 24 hours before straining; then evaporate to the consistence of a pilular mass. Dose, 5 to 15 grains.

FELON.—See PARONYCHIA.

FEMUR.—See HIP-JOINT, THIGH.

FENNEL.—An umbelliferous plant, *Fœniculum capillaceum*. It contains a volatile oil, united with a terpene, and is a constituent of pulvic glycyrrhizæ compositus. **Oil of fennel** is a volatile, light-yellow liquid, having the odor of fennel, a warm taste, neutral reaction, and soluble in alcohol. It is an ingredient of spiritus juniperi compositus. Dose, 2 to 5 minims. **Fennel water** contains 2 parts of the oil in 1000 of distilled water. Dose, 1 to 8 drams.

Fennel is an aromatic stomachic and a mild stimulant. It is chiefly used as an agreeable carminative in flatulence and colic, and as a corrigent to senna, rhubarb, and other disagreeable medicines. An infusion is often used as an enema to expel flatus in infants.

FERMENTATION.—A general name for those processes of decomposition, during which certain carbon compounds called *ferments* act upon other carbon compounds, as on their food—splitting these latter up, setting free their elementary constituents, and thereby leading to the formation of still other carbon compounds, by the rearrangement of the freed molecules. These processes are of two kinds, viz.:

1. Those in which water is taken up (hydration), chiefly carried on by enzymes.

2. Those in which O is transferred from the H to the C association, as in lactic and alcoholic fermentation, and the putrefactive processes, which are chiefly carried on by the agency of organized ferments.

The ferments producing these fermentative changes are also carbon compounds, and are divisible into two groups, viz.:

Enzymes, or *Unorganized Ferments*, have no definite structures, as diastase, ptyalin, pepsin, etc.

Organized ferments are minute, living organisms, as the moulds, yeast-plant, bacteria, and other members of the protophytes, the lowermost class of plants, which, in the course of their life history, split up the carbon compounds in which they live, appropriating some part of their elements.

Agents which arrest or inhibit these fermentative processes either by destroying or by rendering inactive the causative ferments, are called **Antizymotics;** these are generally divided into two groups, ANTISEPTICS and DISINFECTANTS (*q. v.*).

FERROPYRIN.—An orange-red powder, containing about 64 percent of antipyrin, and 36 percent of ferric chlorid. It is used as a styptic in 20 percent aqueous solution or pure. It has given satisfaction in severe epistaxis, puerperal and other hemorrhages. Internally it has been used with benefit in anemic conditions accompanied by headache and gastralgia.

FERRUM.—See IRON.

FETATION, EXTRAUTERINE —See EXTRAUTERINE PREGNANCY.

FETOMETRY.—The measurement of the fetus, especially of its cranial diameters. The measurements usually made are as follows:

TABLE OF MEASUREMENTS

1. OF THE CHILD

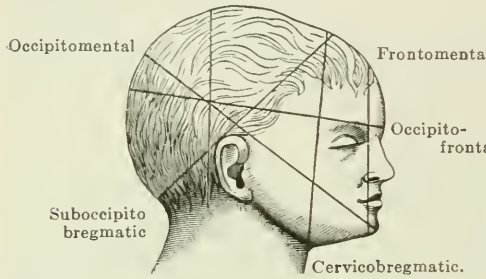
Length,	50 cm.	(20 in.?)
Bisacromial,	12 cm.	(4.8 in.)

2. HEAD

Bitemporal,	8 cm.	(3¼ in.)
Biparietal,	9½ cm.	(3¾ in.)
Occipitofrontal,	11¾ cm.	(4⅓ in.)
Occipitomental,	13⅓ cm.	(5¼ in.)
Suboccipitobregmatic,	9½ cm.	(3¾ in.)
Circumference, occipitofrontal,	34⅓ cm.	(13¾ in.)

Weight of Child, 2737 grams (7¼ pounds).

For practical purposes, it may be said that the occipitomental diameter is about 5 1/2 inches, the occipitofrontal about 4 1/2 inches, and all the others about 3 1/2 inches.



ANTEROPOSTERIOR AND VERTICAL DIAMETERS OF THE FETAL HEAD.—(*After Tarnier.*)

FETUS.—The young of viviparous animals in the uterus; the embryo in the later stages of development. The following is a table of the development of the embryo and fetus in the different months of pregnancy: *First Month.*—Indistinguishable from ovum of other mammals. It is a flattened vesicle. The embryo is nourished by a yolk-sac, which, even at the end of the first month, is larger than the cephalic extremity of the fetus. The visceral arches are distinct. The heart, first traces of liver and kidneys, eyes, rudimentary extremities, oral and anal orifices, are formed. The spinal canal closes (spina bifida results if this fails to occur at this time). Length, 1 cm. (0.4 inch). *Second Month.*—Grows to 4 cm. in length (1.57 inches), and is about the size of a pigeon's egg. The visceral clefts close, except the first, which forms the external auditory meatus, tympanum, and eustachian tube. At this time arrest of development results in harelip, umbilical hernia, or exomphalos. Eyes, nose, and ears are distinguishable. The first suggestion of hands and feet appears, and these are webbed. External genitals also now develop, but sex is not to be differentiated. *Third Month.*—Maternal blood affords nourishment; 9 cm. long (3.6 inches), and about the size of a goose-egg. Fingers and toes lose their webbed character, and nails appear as fine membranes. Points of ossification are found in most of the bones. The neck separates the head from the trunk, and sex is determined by the appearance of the uterus. Weight, 30 gm. (463 grains). *Fourth Month.*—Sixteen cm. (6 inches) in length. Lanugo is present. Intestines contain meconium. Sex is well defined. Weight, 55 gm. (848.76 grains). *Fifth Month.*—Twenty-five cm. (10 inches). Vernix caseosa appears in places. The face is senile in appearance and wrinkled. Eyelids begin to open. Quickening occurs. Heart-sounds are heard. Weight, 273 gm. (10.8 ounces). *Sixth Month.*—Thirty cm. (12 inches). Hair grows longer. Eyebrows and lashes appear. The testicles approach the inguinal rings. Weight, 715 gm. (23 ounces). *Seventh Month.*—Thirty-five cm. (14 inches). Pupillary membrane disappears. Weight, 1213 gm. (39 ounces). *Eight Month.*—Forty cm. (16 inches). Down on the face begins to disappear. The left testicle has descended. Ossification begins in the lower epiphysis of the femur. The nails do not project beyond the finger-tips. Weight, 1617 gm. (4 1/3 pounds). *Ninth Month.*—Forty-five cm. (18 inches). Subcutaneous fat increases. Diameters of the head about 1 to 1 1/2 cm. less than at term. Weight, 1990 gm. (5 1/3 pounds). *Mature Fetus.*—Fifty cm. long (20 inches); weight, 2737 gm. (7 1/3 pounds). Skin is rosy; lanugo has disappeared. The nails are perfect and project beyond the finger-tips. The eyes are opened. The center of ossification in the lower epiphysis of femur is 5 mm. in diameter, while that of the cuboid bone is just beginning to show. Diameters of head are normal.

LENGTHS AND WEIGHTS OF THE FETUS AT DIFFERENT STAGES OF ITS DEVELOPMENT

1st month,	1 cm. (0.4 in.)	
2d month,	4 cm. (1.57in.)	
3d month,	9 cm. (3.6 in.)	30 gm. (463 grs.)
4th month,	16 cm. (6 in.)	55 gm. (848.76 grs.)
5th month,	25 cm. (10 in.)	273 gm. (10.8 oz.)
6th month,	30 cm. (12 in.)	715 gm. (23 oz.)
7th month,	35 cm. (14 in.)	1213 gm. (39 oz.)
8th month,	40 cm. (16 in.)	1617 gm. (4⅓ lb.)
9th month,	45 cm. (18 in.)	1990 gm. (5⅓ lb.)
10th month,	50 cm. (20 in.)	2737 gm. (7¼ lb.)

FETUS, CIRCULATION.—Beginning at the placenta, or where the impure venous blood is transformed into pure arterial blood, the fetal circulation is as follows: From the placenta the blood passes to the under surface of the liver through the *umbilical vein*. Here it divides, the smaller portion going directly into the ascending vena cava through the *ductus venosus*, the larger portion passing through the liver and finally emptying into the ascending vena cava by means of the hepatic veins. This blood, in conjunction with the blood from the lower extremities, passes through the ascending vena cava to the right auricle, from which, guided by the eustachian valve, it passes through the *foramen ovale* into the left auricle. From here it passes into the left ventricle, and from here through the aorta, the greater portion going to the head and upper extremities. Returning by the descending vena cava, it enters the right auricle and passes from here into the right ventricle. A small portion is carried from here to the lungs through the pulmonary arteries; the remainder passes directly into the aorta through the *ductus arteriosus*. From here a small portion is carried by the aorta to the lower extremities; the remainder passes

through the *hypogastric arteries*, and finally reaches the placenta through the umbilical arteries.

The umbilical vein, ductus venosus, foramen ovale, ductus arteriosus, and hypogastric arteries are characteristic of the fetal circulation.

The fetal heart-beat is a positive sign of pregnancy. In character it is not unlike the ticking of a watch placed under a pillow. Its rate varies from 120 to 160 beats a minute. It is heard most distinctly at certain points on the abdomen, depending upon the position of the child. Thus,

THE FETAL CIRCULATION.

a. Umbilical vein. *b*. Ductus venosus. *c*. Ductus arteriosus. *d*. Hypogastric arteries. *e*. Mesenteric arteries and vein. *f*. Portal vein.

in anterior vertex presentations it is heard most distinctly about an inch below and to the right or left of the umbilicus. In posterior vertex presentations its point of greatest intensity is in the flank, right or left, about on a level with a line drawn through the umbilicus.

FETUS, DEATH.—This is not an infrequent occurrence. Quite a large proportion of children —probably 25 percent—die before reaching full term.

Causes.—The causes of fetal death are various. The most frequent and important is *syphilis*. A very large proportion of habitual fetal deaths are due to this cause. Following this come *apoplexies* of the ovum, decidua, or placenta; *acute or chronic diseases of the mother*, as pneumonia, typhoid fever, tuberculosis, nephritis, anemia, and plethora; *chronic poisoning*, as alcoholism and saturnism; *diseases of the father*, as phthisis, albuminuria, and chronic poisoning; *habit* and *heredity*.

Diagnosis.—A positive diagnosis of fetal death is extremely difficult. Among the important signs are continued absence of fetal heart-sounds and fetal movements, after they had formerly been appreciated; cessation of growth or diminution in size of the uterus; disappearance of the subjective signs of pregnancy; and the appearance of the milk secretion. If the umbilical cord can be palpated, a positive diagnosis can be made.

Results.—The most common result is spontaneous discharge of the fetus and membranes from the uterus (abortion). If, after death, the fetus is retained in the uterus, a number of changes in structure may occur. These are maceration, putrefaction, saponification, mummification, and calcification. If fetal death occurs before the third month, absorption may take place.

Treatment.—So long as a dead fetus remains inside the uterus, the mother is in grave danger of septic infection. As soon as the diagnosis is assured, the patient sould be anesthetized and the fetus and membranes removed.

FETUS, DISEASES.—A great variety of diseases may affect the fetus *in utero*. Among them may be mentioned the *infectious diseases*, as syphilis, smallpox, measles, typhoid fever, malaria, and tuberculosis; *intracranial diseases*, as tumors of the brain and hydrocephalus; *valvular heart-disease*, *rachitis*, *fractures of the long bones*, and *ankyloses* and *luxations*.

Syphilis.—This is the most frequent disease. It may originate in 3 ways: (1) From disease of the ovum; (2) from disease of the spermatozoon; from infection through the maternal blood.

The manifestations of syphilis in the fetus may be any or all of the following: (1) *The skin*—pemphigoid eruptions are frequently found on the soles of the feet and the palms of the hands. (2) *The bones*—one of the most constant manifestations is a jagged yellow line between the diaphysis and the epiphysis of the long bones. This is caused by a fatty degeneration of the embryonal bone-cells, due to a premature attempt at ossification. (3) *The liver and spleen*—both are frequently enlarged, due to an overgrowth of connective tissue. (4) *The lungs*—usually one of three conditions is found—an overgrowth of connective tissue (fibroid pneumonia), an overgrowth and fatty degeneration of the epithelial cells lining the air vesicles (white pneumonia), or gumma.

FETUS, MALFORMATIONS.—Every departure from the normal condition may be classified as: (1) Hemiteratic; (2) heterotaxic; (3) hermaphroditic; and (4) teratologic. See MONSTROSITY.

FETUS PAPYRACEAS.—The name given to the malformation resulting in a twin pregnancy, when, owing to an inequality in the circulation of the embryos, the weaker fetus dies, and, by the continually increasing pressure of the growing fetus, it is flattened more and more against the uterine walls, until the mass becomes as thin as stout parchment.

FETUS, POSITIONS AND PRESENTATIONS.—On the following page is presented a comparative table of fetal positions and presentations.

Breech Presentation.—Presentation of any part of the pelvic extremity of the child. Breech presentations occur in about 3 percent of all cases of labor.

Causes.—These are: (1) Decreased mobility of the child, as in twin births, hydramnios, and placenta prævia; (2) when the head cannot engage in the superior strait, as in hydrocephalus and contracted pelvis; (3) in abnormal growths of the fetus when the center of gravity is thrown nearer the pelvis, as in hemicephalus and tumors of the sacrum. Breech presentations are very frequent in premature births, on account of the disproportion in size of the fetus and uterine cavity.

Diagnosis.—Abdominal palpation reveals the head above, which is round, hard, and freely movable; the breech below, soft and irregular in outline. The heart-sounds are heard above the umbilicus. Vaginal examination shows a high position of the presenting part; after dilatation of the os the characteristic features of the breech may be detected—the sacrum and coccyx, the external genitalia and anus, the nates and thighs. There is usually evacuation of meconium.

Mechanism.—This comprises the following steps: (1) Dilatation of the lower uterine segment and cervix. This occurs very slowly, as the soft breech is a very ineffectual dilator. (2) Descent of the breech to the pelvic floor. (3) Forward rotation of the anterior hip. The anterior hip is the first part of the child to strike the pelvic floor. (4) Birth of the anterior hip, posterior hip, and trunk. (5) Engagement, descent, rotation, and birth of the shoulders. (6) Descent of the head. The head usually descends in an oblique diameter. (7) Forward rotation of the occiput. (8) Delivery of the head. The parts pass over the perineum in the following order: Chin, mouth, nose, eyes, and brow.

Abnormalities in Mechanism.—The most frequent and important is backward rotation of the occiput. This occurs very rarley in spontaneous births; more frequently in operative retraction. If the head remains flexed, the chin, mouth, eyes, and brow pass rapidly beneath the symphysis. If the head becomes extended, the chin catches upon the symphysis, and the small fontanel, cranial vault, and face slide over the perineum.

Prognosis.—The danger to the mother is no greater than in vertex presentations, except that there is greater risk of injury to the soft parts. The fetal mortality is about 30 percent.

Treatment.—Unless there is some indication for interference, breech presentations should be treated expectantly until the birth of the umbilicus. At this stage the cord becomes compressed between the pelvis and the child's trunk or head, and asphyxiation may occur. During this period of waiting the child's heart-beat should be listened to repeatedly, so that no danger may be overlooked. As soon as the umbilicus appears, the patient is placed in the lithotomy position across the bed; the trunk is delivered rapidly until the shoulders appear; the arms are released, and the after-coming head is extracted by one of the methods described below.

After-coming Head.—This may occur in normal breech presentations and after the performance of podalic or pelvic version. After the child is born as far as the umbilicus, the cord is compressen between the fetal head and maternal pelvis above, thus shutting off the supply of oxygen. Further delivery must be accomplished rapidly—within five minutes—if asphyxiation is to be prevented. This is effected as follows: If the arms are extended by the side of the child's head, they should be delivered first. The posterior arm may be located by the position of the trunk and shoulders, as it will be found the easiest to manipulate. If it is the right arm, the child's ankles should be grasped with the left hand—the middle finger above the internal malleoli, the index- and ring-fingers above the external malleoli—and the body raised upward and outward over the mother's right thigh. Sufficient force should be exerted to bring the right shoulder well down in the pelvis. The first two fingers of the right hand are passed along the posterior surface of the right scapula and arm, well beyond the elbow. The forearm is now pushed in front of the child's face; the fingers are hooked in the bend of the elbow, and slight traction causes it to appear at the vulva. The forearm is now easily delivered by extension. The left arm is delivered in a similar manner. Should the shoulders lie in the transverse diameter, either arm may be delivered first. The head should next be extracted by one of the following methods, tried in the order given:

The Wiegand-Martin Method.—The first three fingers of the supinated right hand are introduced into the vagina, the abdomen of the child lying upon the operator's forearm, with a leg hanging on each side. The index-finger is inserted into the child's mouth, and sufficient traction made to secure complete flexion of the head. The left hand now locates the occiput through the abdominal wall above the pubes, and its further delivery is accomplished by suprapubic pressure in the direction of the parturient axis and by elevation of the child's body toward the mother's abdomen.

The Mauriceau or Veit-Smellie Method.—The manipulations of the right hand are the same as in the preceding method. The pronated left hand is passed along the back of the child, the middle finger making pressure against the occiput, so as to aid flexion, the index- and ring-fingers hooked over the clavicles. Traction is now made in the direction of the axis of the parturient canal; first, downward and outward; finally, as the face emerges, upward and outward. Suprapubic pressure on the occiput by an assistant increases the efficiency of this method.

The Prague Method.—The child's ankles are grapsed by the pronated right hand—the middle finger above the internal malleoli, the index- and ring-fingers above the external malleoli. The pronated left hand is introduced into the vagina along

the child's back; the index-finger is hooked over one clavicle, the remaining fingers over the other. Traction is now made with both hands as directly downward as possible, until the occiput appears under the symphysis. The right hand now shifts its grasp on the ankles so that they are held as before described, except that the feet are now in contact with its dorsal surface. The feet are now raised by a circular movement toward the mother's abdomen, the left hand acting as a fulcrum around which the head moves until it is finally delivered.

TABLE OF THE POSITIONS AND PRESENTATIONS OF THE FETUS

Presentation.	Frequency.	Varieties.	Symbol.	Frequency of Varieties.	Position of Fetus.	Position of Fetal Heart-sounds.	Mortality.	
							Fetal.	Maternal.
Vertex.	95 per-cent of all cases.	Left occipito-anterior.	L.O.A.	70 percent.	Occiput to left acetabulum, forehead to right sacroiliac joint; back to left; extremities to right, above.	One inch below, and to left of umbilicus.	5 per-cent.	Less than 1 per-cent.
		Left occipito-posterior.	L.O.P.		Occiput to left sacroiliac joint, forehead to right acetabulum; back in left flank; extremities to right, anteriorly.	In left flank, below a transverse line through umbilicus.	Over 9 per-cent.	
		Right occipito-anterior.	R.O.A.		Occiput to right acetabulum, forehead to left sacroiliac joint; back to right; extremities to left, above.	Near median line; below umbilicus.	Over 9 per-cent.	
		Right occipito-posterior.	R.O.P.	20 percent.	Occiput to right sacroiliac joint, forehead to left acetabulum; back in right flank; extremities to left, anteriorly.	In right flank, below a transverse line through umbilicus.	5 per-cent.	
Face.	1/2 of 1 percent.	Left mento-anterior.	L.M.A.	Second in frequency.	Chin to left acetabulum, forehead to right sacroiliac joint; back to right; extremities to left.	Left side of abdomen, below umbilicus.	13 to 15 per-cent.	6 per cent.
		Left mento-posterior.	L.MP.		Chin to left sacroiliac joint, forehead to right acetabulum; back to right; extremities to left.	Left side of abdomen, below umbilicus.		
		Right mentoanterior.	R.M.A.		Chin to right acetabulum, forehead to left sacroiliac joint; back to left; extremities to right.	Right side of abdomen, below umbilicus.		
		Right mentoposterior.	R.M.P.	Most common.	Chin to right sacroiliac joint, forehead to left acetabulum; back to left; extremities to right.	Right side of abdomen, below umbilicus.		
Brow.	1/4 of 1 percent.	Left frontoanterior.	L.F.A.		Brow to left acetabulum; chin to right sacroiliac joint; back to left; extremities to right, above.	Left side of abdomen, below umbilicus.	30 per-cent.	10 per-cent.
		Left frontoposterior.	L.F.P.		Brow to left sacroiliac joint; chin to right acetabulum; back to left; extremities to right, above.	Left side of abdomen, below umbilicus.		
		Right frontoanterior.	R.F.A.		Brow to right acetabulum; chin to left sacroiliac joint; back to right; extremities to left, above.	Right side of abdomen, below umbilicus.		
		Right frontoposterior.	R.F.P.		Brow to right sacroiliac joint; chin to left acetabulum; back to right; extremities to left, above.	Right side of abdomen, below umbilicus.		

TABLE OF POSITIONS AND PRESENTATIONS OF THE FETUS

Presentation.	Frequency.	Varieties.	Symbol.	Frequency of Varieties.	Position of Fetus.	Position of Fetal Heart-sounds.	Mortality.	
							Fetal.	Maternal.
Shoulder.	1/2 of 1 percent.	Left dorso-anterior.	L.D.A.	Most common.	Head in left iliac fossa, back anterior; extremities on right side, in upper part of abdomen.	Left side of abdomen, below umbilicus.	Almost 50 percent.	11 percent.
		Left dorso-posterior.	L.D.P.		Head in left iliac fossa, back posterior; extremities on right side, in upper part of abdomen.	Frequently cannot be heard.		
		Right dorsoanterior.	R.D.A.		Head in right iliac fossa, back anterior; extremities on left side, in upper part of abdomen.	Right side of abdomen, below umbilicus.		
		Right dorsoposterior.	R.D.P.		Head in right iliac fossa, back posterior; extremities on left side, in upper part of abdomen.	Right side of abdomen, below umbilicus toward the flank.		
Breech.	3 to 4 percent. of all cases.	Left sacro-anterior.	L.S.A.	Most common.	Sacrum to left acetabulum; back to left anterior; abdomen to right posterior.	Left side of abdomen, above umbilicus.	30 percent.	Less than 1 percent.
		Left sacro-posterior.	L.S.P.		Sacrum to left sacroiliac joint; back to left posterior; abdomen to right anterior.	Left side of abdomen, above umbilicus and toward the back.		
		Right sacroanterior.	R.S.A.		Sacrum to right acetabulum; back to right anterior; abdomen to left posterior.	Right side of abdomen, above umbilicus.		
		Right sacroposterior.	R.S.P.		Sacrum to right sacroiliac joint; back to right posterior; abdomen to left anterior.	Right side of abdomen, above umbilicus and toward the back.		

The Forceps.—The child's body, arms, and legs are raised toward the mother's abdomen. The blades of the forceps are applied to the sides of the head, and delivery is effected by traction made in the direction of the axis of the parturient tract.

The Deventer Method.—The mother's buttocks are brought well over the edge of the bed. The child is grasped as in the Prague method, and traction is made downward and backward. This method may be tried when great haste is demanded. It is not necessary to first deliver the arms.

If in the delivery of the after-coming head the face is found looking toward the symphysis, the following rules for management should be remembered: If the head is flexed, deliver by direct downward traction; if extended, with the chin caught upon the symphysis, deliver by carrying the body of the child upward over the mother's abdomen.

Perforation of the after-coming head is necessary in cases of hydrocephalus and in certain degrees of contracted pelvis.

It is usually performed in one of two ways: (1) When the occiput is anterior under the symphysis pubis, an assistant carries the body of the child upward over the mother's abdomen, and the perforator is introduced through the anterior part of the neck and hard palate. (2) When the occiput is posterior, the child's body is held as before, and the perforator is introduced at the nape of the neck, beside the foramen magnum or just back of the ear. In cases of hydrocephalus when the head cannot be reached, the spinal canal may be opened and the fluid evacuated through a catheter passed into the cranium through the foramen magnum.

Brow Presentation.—This is a very rare presentation, occurring once in about 1800 cases. There are 4 positions, as in face presentation, depending upon the direction of the chin.

Diagnosis.—This is determined by a vaginal examination. A broad, bony surface is felt presenting; the supraorbital ridge and the base of the nose may be distinguished; also the large fontanel.

Mechanism.—The mechanism of labor in a brow presentation is similar to that of a face. Anterior rotation is extremely slow, and may be impossible. The mechanism is further discussed in the paragraph on face presentation.

Prognosis.—Of all presentations, this is the most unfavorable for both mother and child. The

maternal mortality is 10 percent; the fetal mortality, 30 percent.

Treatment.—Except in very rare instances, brow presentations require prompt and active treatment. It may be possible to convert a brow into a vertex presentation. This may be done by external pressure upon the occiput or by combined external and internal manipulation. If this fails, and the chin is looking anterior, an effort should be made to convert it into a face presentation. Failing in this, podalic version should be attempted. This should not be resorted to if the presenting part is firmly engaged. If the chin is anterior, forceps may be tried. Great care must be exercised here or serious injury to the mother may occur. Forceps should never be used for traction if the chin is posterior. Finally, if the foregoing plan of treatment fails, craniotomy is indicated.

Version is an operation or maneuver by which the presentation of the child is changed. There are two varieties of version—*cephalic*, in which the head is made to present, and *podalic*, in which the breech or foot is brought to present.

Indications.—These are (1) cross presentations, (2) minor degrees of contracted pelves, (3) malpositions of the head, (4) placenta prævia, (5) prolapse of the cord, and (6) some sudden danger to the mother, before engagement of the head, which necessitates rapid delivery.

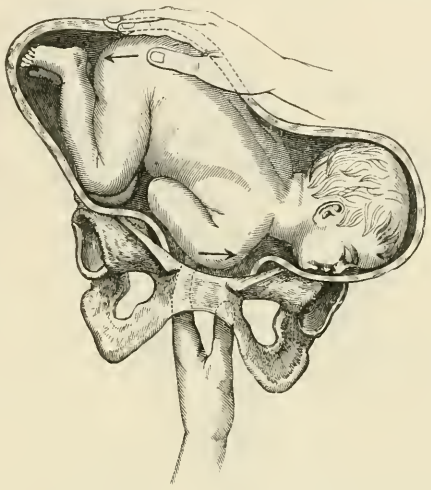
Contraindications.—Version must not be attempted (1) when the presenting part is firmly engaged, or (2) when there is a high position of the contraction ring. This latter condition is an indication of an overstretched and thinned lower uterine segment that might be ruptured by efforts at turning.

Methods.—The various methods resorted to in performing version are: (1) The postural method; (2) the method by external manipulation; (3) the combined method; and (4) the method by internal manipulation.

Version by the postural method is rarely resorted to. It may be tried in deviated vertex presentations, as a brow or an ear.

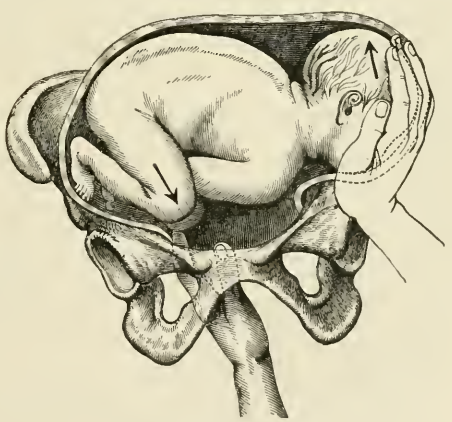
Version by the method of external manipulation is also of limited usefulness. It may be attempted in cross presentations, if seen early. For the operation to succeed, the abdominal and uterine muscles must not be too tense and the amount of liquor amnii must be at least moderate. After the head or breech has been brought to the pelvic inlet it must be fixed there by a pad and binder, or retrogression will occur. If the os is almost or quite fully dilated, the membranes may be ruptured; this will cause rapid fixation of the presenting part.

Version by the combined method is performed as follows: The patient is anesthetized and placed in the lithotomy position; the bladder is emptied; the vulva, vagina, and physician's hands are thoroughly disinfected. The operator, standing in front of the patient, uses that hand externally that corresponds to the part that is being brought to present. In this manner the external hand pushes the part downward toward the superior strait, while the index- and middle fingers of the internal hand, introduced through the cervix, push the other pole of the child upward. The head is preferably brought to the pelvic inlet, because it is easier manipulated externally, and because vertex presentations are more favorable for the child.



Combined Version (First Stage).

Version by the method of internal manipulation is the most generally useful of all the methods of performing version. It is performed as follows: The patient is anesthetized and placed upon that side toward which the fetal feet point; the bladder is emptied, and the vulva, vagina, and physician's hands are thoroughly disinfected. The operator,



Combined Version (Second Stage).

standing in front of the patient, introduces into the uterus that hand whose palm, midway between pronation and supination, corresponds to the abdomen of the child. The membranes are ruptured, the anterior foot is grasped, and traction is made until the child is born to the knee. Version is now completed, and unless there is some indication for

speedy delivery, the labor should be conducted as an ordinary breech presentation. The method of extraction of the arms and head is described under After-coming Head in the section on Breech Presentation.

Combined Version (Third Stage).

Face Presentation.—A face presentation occurs when the child's head, during labor, is extremely extended.

Face presentations are classified, according to the position of the chin, as *left mentoanterior* (chin toward the left acetabulum); *right mentoanterior* (chin toward the right acetabulum); *left mentoposterior* (chin toward the left sacroiliac joint); and *right mentoposterior* (chin toward the right sacroiliac joint).

Face presentations occur about once in 250 labors.

Cause.—This may be stated, briefly, to be: any condition preventing flexion of the head at the beginning of labor, as coiling of the cord around the neck, tumors of the anterior part of the neck, tonic contraction of the muscles of the back of the neck; any condition favoring extension of the head, as extreme mobility of the fetus, altered shape of the head, and distended maternal bladder pressing upon the child's back.

Diagnosis.—Abdominal palpation may reveal the deep groove between the child's occiput and back. Vaginal examination shows, at first, a high position of the presenting part; later, the characteristic features of the face, such as the mouth, chin, eyes, and nose.

Mechanism.—This comprises: (1) Extension of the head upon the trunk. When extension is complete, the cervicobregmatic diameter occupies the oblique diameter of the pelvis. (2) Molding of the face. This is imperfect, on account of the immobility of the bones of the face, and is very slow. (3) Lateral inclination of the face and head. This is for the purpose of accommodating the direction of the head to the direction of the pelvic canal. (4) Dilatation of the soft parts and descent of the chin to the pelvic floor. The descent of the chin is accomplished in part by extension of the fetal spine and in part by stretching of the neck. (5) Anterior rotation of the chin. This is extremely slow, and, under certain circumstances, impossible, the reasons for which will be explained under Abnormalities in Mechanism. (6) Delivery of the head by flexion. The chin engages under the symphysis pubis and is born, followed rapidly by the mouth, nose, eyes, brow, and occiput. (7) Restitution. This is an unimportant movement, which consists in a simple straightening of the neck, it having been twisted on account of the rotation of the chin. (8) External rotation of the head. This is due to the internal rotation of the shoulders. (9) Delivery of the shoulders and of the rest of the body.

Abnormalities in Mechanism.—The important abnormality in a face presentation is that occurring in the fifth step of mechanism—anterior rotation of the chin. This, as before stated, may be extremely slow or absolutely impossible. In order that forward rotation of the chin may occur, it must meet sufficient resistance: *i. e.*, it must strike the pelvic floor. If the chin is looking well anterior, when the depth of the pelvis is slight (1.5 inches), no difficulty is encountered. If it is looking to the side, when the depth of the pelvis is greater (3.5 inches), anterior rotation can be accomplished only after a most prolonged and difficult attempt, accompanied by excessive molding of the face and great stretching of the neck. If it is looking directly posterior, when the depth of the pelvis is even greater (5 inches), anterior rotation is absolutely delayed. If a case of this kind is left to nature, the upper part of the thorax (9 cm.) and the trachelobregmatic diameter of the head (9.5 cm.) are forced into the pelvis together, and this mechanism is impossible. If not terminated by artificial assistance, maternal death will occur from exhaustion or from rupture of the uterus, and the child will die from asphyxia or prolonged compression.

Prognosis.—The mortality for both fetus and mother will depend upon the position of the chin. If it is looking well forward, the death-rate should be no greater than in normal vertex presentations. The average mortality is 13 to 15 percent for the child and 6 percent for the mother.

Treatment.—The treatment of a face presentation will depend upon the direction in which the chin looks and upon the time at which it is first seen. If the chin is directed *forward*, little or no interference is necessary. If delay in anterior rotation should occur, labor may be assisted by supplying the deficient resistance. Thus, a single blade of the forceps or the fingers may be introduced into the vagina, making an artificial and more accessible pelvic floor, and in this way supplying the chin with a point of resistance upon which to rotate. Finally, if the chin is *anterior*, forceps may be used, a combination of rotation

and traction usually being necessary to effect delivery. Should the labor progress without interference, care should be exercised in the preservation of the membranes, as the hydraulic pressure of the liquor amnii is a particularly favorable factor in the mechanism of these cases.

If the chin is directed to the *side* or *backward*, prompt and active treatment will be necessary. If the case is seen early in labor, cephalic version (conversion of the face into a vertex presentation) may frequently be secured. This should first be attempted after the method of Schatz (external manipulation), which consists in making steady pressure upon the front of the fetal neck with one hand, while counterpressure is exerted upon the occiput with the other. An assistant at the same time presses the breech in the direction toward which the face is looking.

This failing, the method of Baudelocque (external and internal manipulation) should be tried. This consists in an effort to draw down the occiput with one hand introduced into the vagina, while with the external hand upward and backward pressure is made upon the thorax.

If cephalic version fail, and the face is not firmly engaged, podalic version should be performed. If the face is firmly engaged, and cephalic version fail, straight forceps may be applied and the chin forcibly rotated forward. This will usually fail or will fatally injure the child, but it may be tried before resorting to the next and final step, which is craniotomy. Forceps should never be employed as a tractor in face presentations with the chin *posterior*, for delivery by this means is impossible.

Shoulder Presentation.—A transverse position of the child *in utero*. Shoulder presentations are classified according to the position of the head and back. Usually the head is directed toward the left and the back looks anteriorly.

Causes.—These are: (1) Any disproportion in size between the fetus and uterus, as in premature births, hydramnios, and multiple pregnancy; (2) any condition preventing engagement of the head or breech, as contracted pelvis, placenta prævia, or monstrosities; (3) abnormalities in the shape of the uterus; (4) pendulous abdomen.

Diagnosis.—Inspection of the abdomen frequently reveals the peculiar shape of the uterus—the long axis is transverse instead of longitudinal. Palpation reveals the head in one iliac fossa, the breech and large extremities in the other. The heart-sounds are heard most distinctly below the umbilicus and to one side. Vaginal examination shows at first a high position of the presenting part. After the os has dilated, the characteristic parts of the shoulder can be distinguished—the triangular scapula, the long, thin clavicle, the axilla, the head of the humerus, and the ribs.

Mechanism.—The usual results in an unaided shoulder presentation are impaction of the shoulder, prolongation of labor, thinning of the lower uterine segment, and death of the mother from rupture of the uterus or exhaustion. The child dies from prolonged pressure.

Very rarely the child may be delivered by "spontaneous version," the breech or the vertex being substituted for the shoulder. This can only occur before rupture of the membranes.

"Spontaneous evolution," in which the breech slips past the shoulder and is delivered, is another remote possibility.

Delivery of the shoulder and then simultaneous birth of the head and trunk (corpore reduplicato) can only occur in premature births or when the child is macerated.

Treatment.—If the case is diagnosed early, it should be carefully watched, and as soon as the os has dilated sufficiently to admit 3 fingers, the membranes should be ruptured and podalic version performed. If an arm prolapses, it should be replaced or the hand may be introduced alongside of it and version accomplished. If the shoulder has become firmly impacted in the pelvis, decapitation is the only course that should be undertaken.

The expectant plan of treatment should never be pursued when the child is transverse, except in cases of miscarriage.

Vertex Presentations.—There are 4 positions of vertex presentations: (1) The *L. O. A.*, left occipitoanterior; (2) the *R. O. A.*, right occipitoanterior; (3) the *R. O. P.*, right occipitoposterior; and (4) the *L. O. P.*, left occipitoposterior.

Of these, the L. O. A. and R. O. P. are by far the most frequent, the former occurring in about 70 percent, the latter in about 20 percent, of cases. This is explained by the fact that the right oblique diameter of the pelvis is the longest, the left oblique being shortened by the position of the rectum. The longest diameter of the head will naturally adapt itself to the longest diameter of the pelvis, and an L. O. A. or an R. O. P. position is the result: the former if the occiput looks forward, the latter if it looks backward.

L. O. A.—Left occipitoanterior position of a vertex presentation.

Diagnosis.—Abdominal palpation reveals the child's back to the left; the extremities above and to the right; the head below. The heart-sounds are most distinctly heard to the left and below the umbilicus. Vaginal examination detects the sagittal suture in the right oblique diameter of the pelvis; the small fontanel looking toward the left acetabulum.

Mechanism.—This comprises: (1) Flexion of the head upon the trunk. This is for the purpose of accommodating the size of the fetal skull to the size of the maternal pelvis. (2) Molding of the head. This accommodates the shape of the child's head to the shape of the pelvic inlet. (3) Lateral inclination of the head. This is for the purpose of accommodating the direction of the head to the direction of the pelvic canal. (4) Dilatation of the lower uterine segment and cervical canal. (5) Descent of the head to the pelvic floor. This is accomplished by extension of the fetal spine. (6) Anterior rotation of the occiput. The occiput rotates in the direction of least resistance, which is forward, inward, and downward. (7) Delivery of the head by extension. The large fontanel, brow, eyes, nose, mouth, and chin pass in rapid succession over the perineum. (8) Restitution. This is an unimportant movement, which consists in a simple

straightening of the child's neck, it having been twisted on account of the rotation of the occiput. (9) External rotation of the head. This is due to the internal rotation of the shoulders. (10) Delivery of the shoulders and the rest of the body.

Abnormalities in Mechanism.—The important abnormalities are those that occur in labor complicated by a flat or contracted pelvis. These are: (1) The head descends in transverse diameter of the pelvis. In flat pelves the transverse diameter is the longest, and, naturally, the longest diameter of the head will engage in the longest diameter of the pelvis. (2) There is imperfect vertical flexion of the head. This occurs so that the shortest diameter of the head (bitemporal, 8 cm.) may engage in the contracted conjugate. (3) There is exaggerated lateral flexion of the head. This occurs so that it may take the direction of the sacral curve, which is always excessive in flat pelves.

Prognosis.—The maternal mortality in properly managed cases of normal labor should be less than 1 percent. In anterior positions of vertex presentations the fetal mortality is 5 percent.

Treatment.—For the treatment of normal anterior positions of vertex presentations see LABOR.

R. O. A.—Right occipitoanterior position of a vertex presentation.

Diagnosis.—Abdominal palpation reveals the child's back to the right; the extremities above and to the left; the head below. The heart-sounds are most distinctly heard to the right and below the umbilicus. Vaginal examination detects the sagittal suture in the left oblique diameter of the pelvis; the small fontanel looking toward the right acetabulum.

Mechanism.—Abnormalities, prognosis, and treatment are the same as in the L. O. A.

R. O. P.—Right occipitoposterior position of a vertex presentation.

Diagnosis.—Abdominal palpation reveals the child's back in the right flank; the extremities above and to the left; the head below. The heart-sounds are most distinctly heard in the right flank. just below the level of the umbilicus. Vaginal examination detects the sagittal suture in the right oblique diameter of the pelvis; the small fontanel looking toward the right sacroiliac joint.

Mechanism.—This is the same as the mechanism in anterior positions, except that the occiput must rotate through a much greater arc of circle—from the sacroiliac joint to the symphysis instead of from the acetabulum to the symphysis. It becomes necessary, therefore, for the body of the child to rotate with the head, a movement which is not seen in anterior positions. As a consequence of this increased rotation labor is more difficult and prolonged.

Abnormalities in Mechanism.—The only abnormality of importance is backward rotation of the occiput. This may be due to a variety of causes: (1) Anomalies of force, by interfering with normal mechanism, may cause backward rotation. This is seen in very large or small pelves, in diminished or increased expulsive power, and in cases in which the head is very large or very small. (2) Anomalies in flexion, by causing the large fontanel or brow to first strike the pelvic floor, will secure its anterior rotation, and therefore backward rotation of the occiput. (3) Insuperable hindrances to forward rotation, as occur in deformities of the pelvis, great size of the fetal head, or when an extremity prolapses by the side of the head.

Prognosis.—Although labor is prolonged and more difficult than in anterior positions, the maternal mortality should be less than 1 percent. Laceration of the soft parts is not an infrequent complication. The fetal mortality is about 9 percent.

Treatment.—In a large proportion of cases labor is entirely spontaneous, and requires no special treatment. In order to prevent backward rotation of the occiput the patient should lie upon her right side, so as to secure perfect flexion of the head. If the pelvic floor is torn or relaxed, it may be reinforced by a single blade of the forceps. If the expulsive forces are weak, forceps will usually have to be resorted to. Finally, if the occiput rotates into the hollow of the sacrum, forceps should be applied and the head extracted with the greatest care. The handles of the instrument should be raised more and more, until the perineum is well distended, when they should be depressed, thus sweeping the face out under the symphysis.

L. O. P.—Left occipitoposterior position of a vertex presentation.

Diagnosis.—Abdominal palpation reveals the child's back in the left flank; the extremities above and to the right; the head below. The heart-sounds are most distinctly heard in the left flank just below the level of the umbilicus. Vaginal examination detects the sagittal suture in the left oblique diameter of the pelvis; the small fontanel looking toward the left sacroiliac joint.

Mechanism, abnormalities, prognosis, and treatment are the same as in the R. O. P.

FEVER.—Fever is a condition in which the body temperature is above normal (98.6° F.) and which is attended by quickened circulation and respiration, marked tissue changes causing proportionate wasting of the body, and disordered secretions giving rise to anorexia, thirst, constipation, and scanty, high-colored urine of increased specific gravity.

The primary cause of the fever phenomena is still a moot question; it may be due to a disorder of the sympathetic nervous system inducing disturbances of the vasomotor filaments, or to a derangement of the nerve-centers adjacent to the corpus striatum which govern heat production, distribution, and dissemination. Fever may be said to result from a disturbance of the balance which normally exists between heat production and heat dissipation, and is usually toxemic in origin.

Rise of temperature is the most prominent feature of all fevers and can be accurately determined only by the use of the clinical thermometer placed in the mouth, axilla, rectum, or vagina. The mouth is usually selected by preference. There is a slight variation in the temperature of these various sites, as is shown in the following table:

Axilla, or groin,	98.4° F.
Mouth,	98.6° F.
Rectum, or vagina,	99.5° F.

The term *feverishness* is used when the temperature ranges from 99° to 100° F.; *slight fever*, if 100° or 101°; *moderate*, 102° or 103°; *high*, if 104° or 105°; and *intense*, if it exceeds 105°. The term *hyperpyrexia* is used when the temperature shows a tendency to remain at 106° F. and above.

Quickened circulation is the rule in fevers, the frequency usually maintaining a fair ratio with the increase of the temperature. A rise of 1° F. is usually attended by an increase of 8 to 10 beats of the pulse a minute.

The following table gives a fair comparison between temperature and pulse:

A temperature of 98° F. corresponds to a pulse of	60
A temperature of 99° F. corresponds to a pulse of	70
A temperature of 100° F. corresponds to a pulse of	80
A temperature of 101° F. corresponds to a pulse of	90
A temperature of 102° F. corresponds to a pulse of	100
A temperature of 103° F. corresponds to a pulse of	110
A temperature of 104° F. corresponds to a pulse of	120
A temperature of 105° F. corresponds to a pulse of	130
A temperature of 106° F. corresponds to a pulse of	140

Note.—This relation does not hold good in *yellow fever* after the first few days; in this disease the temperature remains high, while the pulse declines to 50 or even 40 per minute.

General Treatment of all Fevers.—All patients with fever should be placed at rest in bed in a moderately heated, quiet, and well-ventilated room; and, if possible, a sensible and well-trained nurse should be employed. The patient should be nourished by the administration of milk, beef-tea, animal broths, and peptonized or other highly nutritious food in small quantities at frequent but regular intervals. Solids should be interdicted. The secretions should be rendered free by the administration of laxatives, diuretics, and diaphoretics. Plenty of pure cold water should be given.

The temperature may be reduced by hydrotherapy or drugs. Hydrotherapy includes the cold pack, the cold bath, and sponging. The drugs employed to reduce temperature are quinin, antipyrin, antifebrin, and phenacetin, but their depressing action renders them somewhat dangerous, with the exception of the first named; and the tendency is now more and more toward hydrotherapy and less and less toward drugs (particularly the coal-tar derivatives). See BRAND TREATMENT, TYPHOID FEVER.

FEVER, SIMPLE CONTINUED.—A continued fever of short duration, mild in character, not the result of a specific poison; rarely fatal, and when death does occur, presenting no characteristic lesion.

Synonyms.—Febricula; ephemeral fever.

Etiology.—The following are causes: Fatigue, mental and physical; exposure to the sun; extreme heat or cold; excesses in eating and drinking, resulting in an attack of indigestion; excitement and violent emotion. It is most common in childhood. It is not a miasmatic fever, neither is it contagious.

Symptoms.—The onset is sudden, with an abrupt feeling of lassitude, followed by a decided chill or chilliness, a sudden and rapid rise of temperature, quick, tense pulse, headache, dry skin, great thirst, coated tongue, costive bowels, and scanty, high-colored urine. Cases due to errors in diet are accompanied by nausea and vomiting. Attacks occurring during childhood, due to excitement, fright, or the emotions, may be associated with convulsions. Within an hour or two the temperature may reach 103° F., or more, when slight delirium may occur. The affection has no constant or characteristic eruption. The duration is from 24 hours to 6 or 7 days.

The termination is usually within a few hours or in 1 or 2 days. The temperature rapidly falls to the norm (an instance of crisis), or it may continue for several days, gradually falling to the norm (lysis). Herpes about the lips and nostrils are often observed at the close of an attack. Convalescence is rapid.

Diagnosis.—Unless the fever can be attributed to some one of the causes that give rise to it, a doubt as to its character may exist for the first 24 hours, after which it is rarely mistaken for any other disease.

The following is a familiar instance of this affection: A child, apparently in the best of health, at play, or, may be, at school, suddenly complains of nausea and may vomit, the skin becoming hot, dry, and flushed, or soon covered with an erythematous rash; the pulse is quick and tense, there is headache, pains in the limbs, and great fretfulness or nervousness. The axillary temperature may reach 102° or even 104° F. The whole aspect is most alarming. A laxative is administered, the surface sponged with a tepid lotion, sleep follows, during which there may be free perspiration, and the following day the child is and continues perfectly well (Hughes).

Prognosis.—Recovery, without sequels, is the rule.

Treatment.—Rest in bed is indicated. If evidences of gastrointestinal disorder are present, prescribe a dozen or more powders containing calomel, 1/6 of a grain; sodium bicarbonate, 2 grains; powdered ipecac, 1/12 of a grain—1 every 2 hours; some hours after the last powder has been taken, an enema or a Seidlitz powder. Much comfort follows sponging the surface with tepid or cold water and the use of saline diaphoretics and diuretics. If the pulse is very quick, add small doses of aconite. The fever and nervous symptoms in cases not associated with digestive disorder may be relieved by acetanilid, 2 to 5 grains, according to age, every 2 or 3 hours. Liquid diet is most palatable. Cases in which nervous symptoms or insomnia are prominent should be given a few doses of potassium bromid during the day, or at bedtime a dose of trional, 5 to 20 grains. During convalescence administer tonic doses of quinin or tincture of nux vomica.

FEVERS.—The different fevers will be discussed under their separate headings. See SCARLET FEVER, TYPHOID FEVER, YELLOW FEVER, etc.

FIBROIDS.—See UTERUS (Fibroid Tumors).

FIBROLYSIN.—A sterilized solution of a double salt of thiosinamin and sodium salicylate. Its great use is to promote the absorption of cicatricial tissue. It has the action of THIOSINAMIN (*q. v.*), with the advantage of quicker absorption and freedom

from pain or irritation, on account of its free solubility. It is highly recommended by some in the treatment of deformities and fibrous contractions arising from chronic joint conditions, in keloid growths, and chronic X-ray dermatitis. Upon corneal nebulæ, it seems to have good effect when used locally. Dose, the contents of one vial (2. 3. c.c. = 0.2 gm. of thiosinamin) by subcutaneous, intramuscular or intravenous injection.

FIBROMA.—See Tumors.

FIBULA.—See Leg.

FIDGETS.—See Chorea.

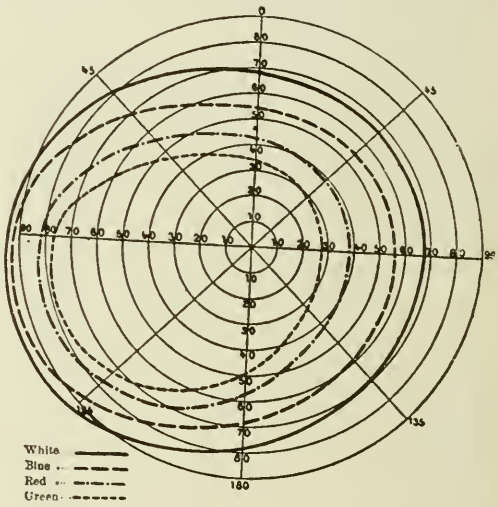
FIELD OF VISION.—The field of vision of an eye is that portion of space before the eye from which, when at rest, it can receive impressions of light. Ordinarily speaking, the field of vision is considered the space before the eye in which small objects can be seen while the visual axis is fixed in one position. The **binocular field** is the space in which objects can be seen by rotating the eyes without moving the head. The **field of fixation** designates that portion of the field of vision in which objects may be directly looked at.

Modes of Testing the Field of Vision.—The **simplest method** is to face the patient, covering the eye not under examination, the examiner closing his own eye opposite the patient's covered one: as, for instance, in testing the patient's left eye, his right eye and the examiner's left eye should be closed. The patient is told to look directly at the examiner's open eye, and while standing directly in front of him he meets his gaze; then, holding the finger off to the side beyond the field of vision, the surgeon gradually brings it in and notes the point at which the patient first sees the finger. This test can be tried in every direction, and if the surgeon's field of vision is normal, by comparison he can readily estimate any alteration in the patient's field. Due allowance must be made for extra prominence of the brow or nose. This test will serve for simple diagnosis, but it is somewhat unscientific, and does not bring out the finer points which it is so often necessary to detect.

The perimeter is an instrument for exact measurement of the field of vision. It consists of a graduated arc, which turns at its center upon a pivot. At the inner side of the arc, and directly opposite the pivot, is a small, white disc, upon which the patient's gaze must be steadily fixed. The most improved form of perimeter is self-registering, and marks on a special card the exact limitation of the field at every angle to which the graduated arc is turned. The patient is seated in front of the perimeter, with the chin on a rest, which brings the eye to be tested into the middle line directly opposite the point of fixation. The other eye is covered. During the whole examination the patient must gaze directly at the white spot in the center of the perimeter. A movable disc containing a small white surface is gradually brought in toward the center until it is seen by the patient as white. This is repeated at every angle, and the results recorded upon a special perimetric chart. The fields for color are obtained in the same manner, using instead of a white object a tinted one, corresponding to the color to be tested for. In order to detect scotoma, the disc should be moved all the way in to the center, and any point within the field at which the color disappears should be noted. If the patient is amblyopic or cataractous, instead of the ordinary disc a lighted candle may be moved along the arc of the perimeter and another light put at the point of fixation. The perimeter may also be used to examine the angle of deviation in strabismus.

The normal field of vision is naturally contracted at the nasal side, on account of the projection of the bridge of the nose. It contains a physiologic "**blind spot**" to the temporal side of the fixation point, between 10 and 20, as shown by the small circle in the diagram. The fields for blue and yellow are somewhat smaller than that for white, the field for red still more contracted, and green is the innermost field. However, the size of the field for any color varies considerably for different persons, and for the same person with different degrees of illumination.

Alterations in the field of vision may be concentric or regular contractions in all directions, or distinctly uneven and irregular contractions, according to the amount of fundus involvement. **Scotomata** are patches in the field of vision in which there is blindness to the object under observation. A **positive scotoma** appears as a dark spot before the patient's vision; a **negative scotoma** is generally only detected by examination with a perimeter, and appears as an appreciable interval in which there is blindness. It is usually due to some loss of perceptive power, which, when located at the macula, causes the well-known central scotoma, which is particularly noticeable for red. **Central scotoma** is an important sign in many toxic amblyopias. The physiologic scotoma, or **blind spot**, represents a point at which the optic nerve enters the eye. The changes in the field of vision are of diagnostic importance in many pathologic conditions of the fundus, and the perimeter is an efficient aid, not



Field of Vision of the Left Eye.

only in diagnosis, but in showing the exact results of treatment.

The disadvantages of limitation of the field of vision may be readily understood by looking through a long tube. Peripheral objects are not seen, and unless the patient continually moves the head from side to side and rotates the eyeballs, he will stumble over neighboring objects. It sometimes happens that the central vision may remain so good that the smallest print can be read while the peripheral vision is absolutely destroyed. In central scotoma the patient must look above, below, or to one side of the object, for if he fixes directly on it, the object is not visible. See HEMIANOPSIA.

FILARIASIS.—A condition associated with the presence of certain embryo nematode worms or filariæ in the blood. Of the several species of *filaria sanguinis hominis* the most common are the nocturna (f. Bancrofti), the diurna and the perstans, the night, day and constant worms.

Bancroft's filaria, the variety most frequently found, is observed in most tropical regions. It is held responsible for filarial diseases in man. The adult parasites are found in the lymphatic trunks while the embryos travel through the thoracic duct into the circulating blood and are observed in the peripheral blood during the night hours, or rather during the time, day or night, the human host takes for sleep. The embryo is about the thickness of a red blood-corpuscle and is encapsuled in a loose transparent sheath the ends of which project beyond the worm in a sac-like fashion. The embryo is actively motile—squirming, thrashing, curling—thus producing agitation among the corpuscles.

The intermediate host of the embryo filaria is the mosquito—the culex fatigans and probably the anopheles. Taken up by the bite of the mosquito it grows and develops within the insect and later re-enters human blood during the biting of the mosquito.

Symptoms may be absent for years. If, however, the worms, or their ova, obstruct the lymph circulation, dilated lymph-vessels may rupture and a fistula form communicating with the lateral surface of the body or the internal hollow organs. Such an opening into ureter or bladder results in **chyluria**—opaque urine due to the presence of chyle—or, if there is also a rupture of blood-vessels, in **hematochyluria**—admixture of chyle and blood with the urine.

Lymphatic obstruction may result in elephantiasis of scrotum, vulva, legs, arms, scalp and areas of the skin. The inguinal glands may enlarge to such an extent ("varicose glands") as to simulate hernia. In lymph scrotum and lymph varix the embryo filaria is usually present only in the early stages, the parent worm dying before the disease becomes far advanced. Manson's theory of the rôle played by the filaria in the production of elephantiasis is as follows: "Parent female filaria in the lymphatic stream of the affected part; injury of the filaria; premature expulsion of ova in consequence of injury; embolism of lymphatic glands by ova; stasis of lymph; lymphangitis from subsequent traumatism, or other cause (septic infection) in the congested area; imperfect absorption of the products of inflammation; recurring attacks of inflammation leading to gradual intermittently progressive inflammatory hypertrophy of the part."

Treatment by drugs is unsatisfactory. In certain regions, as the scrotum or vulva, surgical measures are valuable.

Prophylaxis is most important. Mosquitos should be destroyed and their breeding-places disinfected. Houses, and especially infected persons, should be screened. Water used in the preparation of food or for drinking should be boiled.

Filariasis has been found associated with the vague West African skin disease known as "craw-craw"—characterized by papules or pustules and itching—the etiology of which is still unknown.

Filaria medinensis is the cause of GUINEA-WORM DISEASE (*q. v.*).

Other filariæ are very infrequently found in man. **Filaria loa** occurs in Western Africa. The adults wander through the subcutaneous tissues especially of eyes, and face, producing inflammation.

FILIX-MAS.—See ASPIDIUM.

FILTER.—An apparatus for straining and removing from water or other liquid solution the impurities or suspended matters it may contain. Sponge, wool, etc., are liable to decompose, and should not be used. Asbestos acts only as a mechanic filter. Asbestos cloth may be used to support other materials when the water supply enters at the bottom, and it can be sterilized by fire. Tap-filters are insufficient, and soon clog. Pocket-filters are simply strainers, and have little oxidizing power, and should be frequently sterilized by boiling. Ordinarily, filters should not be placed in rain-water cisterns, but outside, where they may be easily cleaned.

The best filtering media are sand, gravel, animal charcoal, magnetic carbid of iron, spongy iron, etc. Unglazed porcelain or bisque is used in the Pasteur-Chamberland filter, and is an excellent medium, practically germ-proof. Stone filters resemble those of porcelain and are safe, but are slow, and must be cleansed often. Sharp, clean sand, not too fine, stops most suspended matters and bacteria, besides oxidizing dissolved organic matters. Crushed quartz is of practically the same nature. A mixture of pyrolusite and sand or crushed quartz makes an excellent filtering material.

A most economic filter is one made of clean sand, above which layers of gravel of a gradually increasing size are placed. Sand filtration is, in most cases, the most available, satisfactory, and efficient. A cheap and efficient filter is made by placing a sheet of druggist's filtering-paper in a glass funnel and filtering through it. The paper should be renewed daily. The Chamberland filter is claimed to be absolutely germ-proof, but these properties are not permanent. The Pasteur filter is one of the most efficient and successful.

All filters easily become fouled, and require frequent renewing or cleansing. Intermittent filters might prove better for the purification of sewage

or a very impure water, though their efficiency in removing bacteria seems inferior to that of continuous filters. The sides and bottom of filter-beds should be water-tight. The form is immaterial.

House-filters are dangerous unless properly cared for. The substances removed from the water remain in the filter, and, unless removed, the impurities cannot improve the water passing through them. A filter has no power to annihilate filth.

The requisites of a good filter are: (1) That every part shall be easily accessible for cleansing or renewing; (2) that the filtering medium shall have a sufficient purifying power and be present in sufficient quantity; (3) that the medium shall give nothing to the water favoring the growth of low forms of life; (4) that the purifying power shall be reasonably lasting; (5) that there shall be nothing in the construction of the filter itself capable of undergoing putrefaction or of yielding metallic or other impurities to the water; (6) that the filtering material shall not clog, and that the flow of water be reasonably rapid; and (7) that the filtering medium shall be such that it can be readily cleansed and sterilized or else so cheap that the removal and replenishing may not be neglected when necessary on account of expense.

House-filters are mainly of three kinds: (1) Those entirely disconnected from water-supply pipes of the house; (2) those connected with water-pipes, but intended to filter only a limited quantity, and (3) those connected with the house service-pipe and intended to filter all the water used. A settling tank is advantageous in those of the first class.

FILTERING-PAPER.—The best filtering-paper is made in Sweden (by Munktell) and is white. For ordinary use the "Prat Dumas White" is employed for filtering alkaline or alkaloidal solutions. For fluidextracts, tinctures, or colored liquids the gray French papers suffice, but they should not be used for solutions containing free alkali.

To fold filtering-paper, double the sheet upon itself and then fold again directly in the middle. Four distinct sections will appear when opened, one of which is separated from the other three, and the filter thus formed is placed in a funnel of glass or other material held by the ring or a retort stand. This filter is known as a plain filter, which, by repeated creasing, is converted into a plaited filter.

FINGER.—See HAND.

FINGER, BASEBALL.—See BASEBALL FINGER.

FINGER, MALLET.—See BASEBALL FINGER.

FINGER, TRIGGER.—See TRIGGER FINGER.

FINGERS, WEBBED.—See WEBBED FINGERS.

FINSEN LIGHT.—The ultra violet rays of the spectrum. They are used in the treatment of lupus, in which they are said to be very beneficial, and also occasionally in the treatment of epithelioma. Their power of penetration is slight, and as they do not pass through blood, compression upon the part treated is usually made with a piece of quartz, so that it may become anemic and permit their passage. See PHOTOTHERAPY.

FISH-POISONING.—The most serious form is produced by the mussel, from which a poison, *mytilotoxin*, existing chiefly in the liver, has been separated. The mussel, in all probability, becomes poisonous from its surrounding conditions.

The symptoms of fish-poisoning are those of acute general poisoning, with profound action on the nervous system. The eating of stale and decomposed oysters has been followed by symptoms of poisoning, usually gastrointestinal in character. The salted sturgeon of Russia has proved poisonous, as has the barb of middle Europe. In China and Japan species of the tetrodon are also toxic, sometimes proving fatal within an hour.

The treatment is mainly symptomatic. If the purgative and emetic effect of the poison has not already promptly rid the stomach or intestinal canal of any residue, calomel or other purge may be administered. Counterirritation by mustard, 1/4 of a grain of morphin hypodermically, 10 to 30 minims of digitalis, and 1/30 of a grain of strychnin may be employed. Stimulants by the mouth may be given if retained. Champagne or carbonated milk are very serviceable. Chlorate of potassium may be freely administered, and liquid acetate of ammonium, opium, capsicum, and chloroform employed as indicated. See PTOMAIN-POISONING.

FISHSKIN-DISEASE.—See ICHTHYOSIS.

FISSURE.—See ANUS, BREAST, etc.

FISTULA.—See ANUS, VAGINAL FISTULA.

FIT.—A popular name applied to any sudden paroxysm of a disease, but especially to one of epilepsy. See CONVULSIONS, EPILEPSY, TETANUS.

FIXING.—The first stage in the preparation of tissues for histologic or pathologic examination. The chief fixing agents are corrosive sublimate, nitric acid, alcohol, osmic acid, Flemming's solution, Zenker's fluid, Orth's fluid, Müller's fluid, picric acid, picrosulphuric acid, acetate of copper. See PATHOLOGIC TECHNIC.

FLAT-FOOT.—See TALIPES (Valgus, Pes Planus).

FLATULENCE.—The undue generation of gases in the stomach and intestines (flatus). The principal cause of flatulence is fermentation or decomposition of the contents of the stomach and bowels, usually induced by embarrassed function. It is a common symptom in so-called dyspepsia, particularly in the atonic forms. It is present in the debilitated and the aged. Constipation, gastritis, enteritis, hepatic disorders, and intestinal obstruction are causes. Tympanites, when too rapidly developed, overpowers the contractility of the hollow viscera.

Friction of the abdominal wall, or gentle kneading of the distended parts, large drafts of hot water, spirits and hot water, ammonia, ether, spirit of chloroform, the aromatic stimulants, such as ginger, capsicum, cloves, mint, anise, cajuput, camphor, or cascarilla, will often dislodge the flatus. Turpentine, rue, or the compound pill of asafetida, with nux vomica in tincture or fluidextract, and an aperient, are most useful measures. Enemata are often demanded.

The generation of flatus may be checked by sodium phenolsulphonate or sulphite, sulphurous

acid, carbolic acid, creosote, terebene, salol, or charcoal, and by correcting and improving the impaired digestive functions. Repeated doses of calomel are useful. Food likely to ferment, such as sugar, starches, fruits, or green vegetables, and warm liquids, are to be avoided. Alkalies and the bitter tonics are often useful. Pepsin or ingluvin after meals promotes digestion. Physostigma is given for flatulence in women at the climacteric.

℞. Tincture of nux vomica,
Tincture of physostigma,
Tincture of belladonna, } each, ʒ j.

Fifteen drops twice daily in a little water.

℞. Bismuth salicylate,
Magnesium calcinate, } each, ʒ iv
Powdered wood charcoal, ʒ vj
Oil of anise, ʒ ij.

A teaspoonful before meals.

FLAXSEED (**Linseed**).—The seed of *Linum usitatissimum*. Flaxseed, when reduced to a powder, forms the *ground flaxseed* of the U. S. P. It is of a dark gray color, and highly oleaginous. When mixed with hot water, it forms a soft, slightly adhesive mass. Much of the linseed of commerce is simply "cake-meal," left after the extraction of linseed oil, which is made by compressing the ground seeds. This cake-meal is unfit for medicinal purposes, not only because of its poverty in oil, but owing to the fact that exposure to the air may cause it to become rancid. The U. S. Pharmacopeia directs that flaxseed for medicinal uses should be freshly ground and free from unpleasant and rancid odors, and should contain at least 30 percent of oil. Flaxseed is demulcent and protective. When used in the form of a poultice, it is a convenient means of retaining heat and moisture, as well as of maintaining degrees of heat higher than that of the part upon which it is applied.

A flaxseed poultice, when properly made, is soft, moist, and bland. Its effects can be obtained from warm water, but the method of applying the agent last named, as a rule, is less convenient. The composition and mode of administration are described under Poultice. See Linseed.

FLOATING KIDNEY.—See Kidney, Movable.

FLOATING LIVER.—See Liver.

FLOATING SPLEEN.—See Spleen.

FLUCTUATION.—The wave-like or undulating sensation elicited by palpation of one hand while percussion is made with the fingers of the other. It is due to the presence of a fluid in a natural cavity. In surgery fluctuation means the sensation of the presence of a fluid felt when alternate pressure with the fingers is made, as over the seat of an abscess. On the abdomen fluctuation is sometimes mistaken for the vibrations of the abdominal wall. The edge of a hand placed along the linea alba will arrest these vibrations.

FLUIDEXTRACTS (**Fluidextracta**), are permanent and concentrated solutions of vegetable drugs, of uniformly definite strength if the crude drugs are so, a cubic centimeter in each case representing the medicinal powers of 1 gram of the drug; or, approximately, a minim of the finished preparation representing the active constituents of a grain of the drug. There are 85 official fluidextracts, which may be classified according to dose, as follows:

1 minim: Fluidextract of Aconite, belladonna root, cannabis indica, capsicum, digitalis, gelsemium, ipecac (expectorant), nux vomica, scopola, staphisagria, stramonium.

1 1/2 minims: Phytolacca (alterative) sanguinaria, squill, veratrum.

3 minims: Conium, quillaja.

5 minims: Savin.

8 minims: Convallaria, euonymus, lobelia, lupulin, podophyllum, quassia.

15 minims: Apocynum, aromatic, calamus, chirata, cimicifuga, cinchona, cubebs, cypripedium, eriodictyon, frangula, gentian, ipecac (emetic), krameria, leptandra, phytolacca (emetic), quercus, rhamnus purshiana, rhamnus pur. aromatic, rhubarb, rhus glabra, rubus, scutellaria, senega, serpentaria, zingiber.

30 minims: Berberis, buchu, calumba, chimaphila, coca, colchicum, ergot, eucalyptus, glycyrrhiza, granatum, grindelia, guarana, hamamelis, hydrastis, hyoscyamus, lappa, pilocarpus, prunus virginiana, rose, sarsaparilla compounds, senna, stillingia, sumbul, uva ursi, valerian, viburnum opulus, viburnum prunifolium, xanthoxylum.

1 dram: Matico, spigelia.

2 drams: Taraxacum, triticum.

For External Use: Mezereum.

FLUORESCIN.—$C_{20}H_{14}O_5$. A colorless, amorphous product of the reduction of fluorescein. On account of its neutral quality and green fluorescence, it has been used to study the movements of the intraocular fluids. The use of fluorescin has recently been introduced as a guide to the application of the actual cautery in sloughing keratitis. It outlines the precise area requiring cauterization, by giving a greenish tint to the portions of the cornea deprived of epithelium. "The finest divisions radiating from the ulcer into the clear cornea are, by means of fluorescin, exhibited to the naked eye with a distinctness formerly to be attained only by means of a lens or corneal microscope. Thus, the lateral spreading, and also the depth of the ulcer, are clearly shown, the green tint of the floor of the ulcer standing out sharply against the yellow pus on the posterior layers of the cornea and in the anterior chamber." Two percent of fluorescin can be dissolved in a 3 1/2 percent solution of carbonate of sodium.

FONTANEL.—A membranous space of the infant's skull, from delayed ossification of the cranial bones.

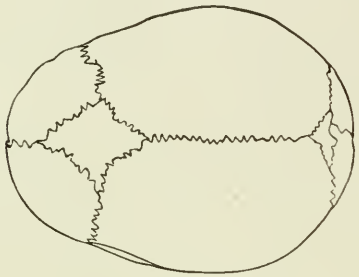
The anterior fontanel is the one at the point of union of the frontal, sagittal, and coronal sutures. It is larger than the posterior, sometimes remains open for two years, and occasionally persists throughout life. It is also known as the bregma, and occasionally as the sinciput. It is diamond-shaped.

The posterior fontanel is situated at the point of

juncture of the lambdoid and sagittal sutures, and is triangular in shape. It ceases to be a space during labor. The remaining fontanels are situated at the inferior angles of the parietal bones. The anterior and posterior fontanels are of importance, indicating as they do the variety of presentation of the head in labor.

Significance.—1. Involution of the fontanel occurs normally from the fifteenth to the eighteenth month. From birth to the ninth month the fontanel decreases gradually in area, and from this time until complete closure the decrease is more rapid. Retardation of normal involution indicates rachitis or hydrocephalus.

2. The fontanel presents pulsatory and respiratory phenomena. The pulsation increases if the tension is slightly increased; diminishes or is lost if the tension is greatly increased.



Fontanels of Fetal Skull.

3. A murmur over the fontanel occurs in certain children, most commonly in those who are anemic or rachitic. It is not pathognomonic.

4. A slightly prominent and pulsating fontanel indicates a cerebral hyperemia, such as occurs in fevers.

5. A protuberant and tense fontanel indicates an exudation or inflammation in the cranial cavity.

6. Retracted fontanel indicates a condition of collapse brought about by acute intestinal disease with profuse watery discharges, infantile atrophy from any cause, hemorrhage, effects of prolonged acute infectious disease, or marantic sinus thrombosis.

7. In acute infectious diseases with meningeal symptoms, examination of the fontanel shows no protuberance or tension, whereas in true meningitis these conditions are marked.

8. In the so-called hydrocephaloid, a terminal condition of cholera infantum marked by the occurrence of striking meningeal symptoms, the fontanel is retracted (Abt).

FOOD.—See Dietetics, Alcohol, Infant Feeding, etc.

FOOD-ADULTERATION.—Foods are unwholesome and deleterious to the health of the consumer under certain circumstances: (1) when prepared under unsanitary conditions; (2) when adulterants such as chemical preservatives, coloring matters, inferior and cheaper substitutes or "fillers," are used; (3) when pathogenic microorganisms are present; (4) when fermentation or putrefaction is taking place; (5) when the substance of which the container is composed acts chemically upon the food; (6) when, in the case of meats and dairy products, the animals are diseased or have eaten poisonous substances.

Fish.—Canned fish of all kinds should be completely sterilized. All material which is not absolutely fresh from water should be rejected. It has been a reprehensible practice to ship shrimps preserved in boric acid or sulphites. All chemical preservatives (the chief ones used being benzoic acid and sodium benzoate, boric acid, borax, sulphites and formaldehyd) should be excluded. The addition of fluorin compounds is reprehensible. Instead of olive oil in the packing, peanut, cottonseed or sesame oil is often substituted. Cod-liver oil is adulterated by fish-liver oil of lower quality, or blubber oil. The treatment of oysters with fresh water to swell them—"floating"—is reprehensible, because of the danger of their becoming infected with germs; this "floating" process is also a deception, in that it makes the oysters appear larger and firmer than they really are. See Fish-poisoning.

Preserved Chicken or Turkey.—The chief objection to preserved chicken meat is the use of old chicken, the substitution of cheaper meats, unlimited cold storage, and exposure in market in unsanitary condition and for an indefinite time. The keeping of poultry in edible condition depends most of all on its being properly killed and dressed and submitte do the action of cold immediately after killing.

Eggs.—Broken eggs preserved in borax are unfit for food. Dry egg products may be considered unobjectionable if made by rapid drying of fresh eggs, but they are sometimes made of decayed eggs.

Eggs with or without coating of surface, the best coating being soluble glass (silicate of soda), may be kept for months in cold storage, without deterioration, provided they are fresh when placed in cold storage. Gradually they acquire a different taste or aroma from the fresh article. The average age of cold storage eggs is probably more than 6 months—such eggs should be marked.

Egg products sold under the guise of eggs are often adulterated. Even fresh eggs, unless sanitary conditions in which the fowls live are well cared for, may become very poisonous. Injurious organic matter rich in microbes and parasites may contaminate the egg. Eggs contaminated in this way may give rise to toxic phenomena, even in a fresh state. Experiments have shown that the food material of eggs if directly injected into the blood of an animal produces toxic effects, whereas, if injected into the stomach no such action ensues. It is advisable in all cases in which eggs must be kept for some time, even in cold storage, to varnish them in some substance impenetrable to air.

Meat.—Noncondimental chemical preservatives are highly objectionable. Those chiefly used are sulphite of sodium, as a preservative of color, boric acid and borax. By their use less care need be taken in the preserving process, which becomes therefore less expensive. No matter how small the quantity of an injurious substance or pre-

servative, it will still produce an injurious effect which may be infinitely small if the dose is infinitely small. Even in small quantities ultimate injury may result.

The best way to preserve meat is by cold, or sterilization, *i. e.*, canned meats. Meats selected should be free from disease, obtained under sanitary conditions, and subjected to cold or sterilization before decomposition occurs.

Canned ham, bacon and tongue are adulterated with coloring matter (usually saltpeter) and preservatives.

Potted meats, deviled meats, minced meats, sausages, prepared meats are adulterated chiefly by saltpeter, starch, as a "filler," benzoic acid, sulphite of sodium, borax, boric acid, sometimes tin and zinc from the solder or can.

Canned Fresh Meat, or Canned Cured Meat.—If it is properly sterilized no additional preservative (such as saltpeter, sulphite of sodium (which are used as color preservatives), boric acid, or borax) is necessary. Adulteration with cheaper meat or use of tainted meat is a most serious one.

Canned sausage is adulterated by (1) admixture of meat of unknown and miscellaneous origin and possessing inedible character; (2) starch; (3) preservatives.

No tinned, canned or sterilized meat should be allowed to enter into consumption, except when prepared under inspection. Health of animals should be ascertained by inspection both before and after slaughter, all diseased animals being excluded. The sanitary conditions under which meats are prepared are of highest importance. Workmen should be free from disease, neatly dressed and required to observe all necessary sanitary precautions.

Lard is adulterated by admixture with other, and sometimes cheaper, fats (stearin, beef fat, cottonseed oil especially). Cottonseed oil is detected by the Halphen test or Bechi test; but it must be remembered that animals fed on cottonseed meal will give a reaction for cottonseed oil. Though the vegetable oils are as wholesome as animal, to those who prefer the animal the pure article should be available.

Beef extract as food has little value—its chief value is in the ease and speed with which it may be absorbed. Beef juice is a misnomer so far as the commercial product is concerned. Few, if any, of the so-called beef juices are true to name, and it is doubtful if beef juice can be or is preserved.

Dried and powdered meats are of less value than fresh. Somatose is a meat powder, largely made up of albumoses rather than peptones.

Meat preparations are adulterated by salt, glycerol, alcohol—reprehensible preservatives which are seldom used. In some cases of meat extract 30 percent of the total extract is composed of common salt; sometimes artificial coloring matter is added. Another adulterant is extract of yeast, detected by treating mixtures with a strong solution of zinc sulphate and filtering—in meat extract the filtrate is clear, in yeast extract the filtrate is turbid. Addition of lecithin or glycerophosphoric acid to meat extract is sometimes practised.

Gelatin is adulterated by raw material unfit for food and prepared under unsanitary conditions, by bleaching agents—sulphurous acid or sulphites, mineral acids, by the presence of tetanus bacilli.

Lard oil is adulterated by the addition of cheaper animal or vegetable oils. Neat's foot oil is adulterated with cheap vegetable oils, as cottonseed, or fish oil.

Halphen Reaction for Cottonseed Oil.—Carbon disulphid, containing about 1 percent of sulphur in solution, is mixed with an equal volume of amyl alcohol. Equal volumes of this reagent and the oil under examination are mixed together and heated in a bath of boiling brine for fifteen minutes. In the presence of as little as 1 percent of cottonseed oil an orange or red color is produced, which is characteristic.

Lard and lard oil from animals fed on cottonseed meal will frequently give a decided reaction; also the fatty acids thereof.

Bechi Test for Cottonseed Oil.—Two grams of silver nitrate are dissolved in 200 c.c. of 95 percent alcohol and 40 c.c. ether, one drop of nitric acid being added; 5 c.c. of this reagent are mixed with 10 c.c. of oil or melted fat and 10 c.c. of amyl alcohol. One-half is heated in a boiling water-bath for 10 minutes and compared with the half not heated. Any blackening due to reduced silver shows the presence of cottonseed oil.

Sugar.—White earth and flour have been added, but in America the only adulterant is incident to its manufacture. A trace of sulphurous acid may adhere when sulphur is used before clarifying, or particles of ultramarine blue may attach themselves when bluing is used. If in washing the sugar tin salts are used, a trace of these may be found. Cane-sugar has also been mixed with dextrose.

Syrups.—Instead of pure maple, sorghum, or cane syrup the consumer is usually furnished with syrup made of glucose, melted brown sugar or molasses, or a mixture of these. Table syrups are made up largely of glucose colored and flavored with maple sugar or cane-sugar. The glucose often contains sulphurous acid, or sulphate or chlorid of lime incident to its manufacture. The final molasses in the sugar refining is used extensively for mixing purposes. This product, deprived as it is of all the sugar possible to extract from it, is practically inedible and should be eliminated from human food. The molasses, too, may contain sulphurous acid, lime, salts of tin, excess of bluing, large quantities of acid phosphates acquired in its manufacture. Then, too, metallic salts may be found from the addition of a metal or acid in order to get nascent hydrochloric acid to bleach the molasses if it is very dark.

Confections.—The use of harmful colors such as anilin dyes should be forbidden. The abandonment of sulphur in the bleaching of glucose is the only safe way of protecting the consumer against the presence of sulphurous acid in glucose. The use of poisonous artificial flavors, such as benzaldehyd

or its derivatives, etc., is not uncommon and is absolutely reprehensible. Alcohol enclosed as drops in candy is a serious adulteration by reason of the danger of children acquiring the habit and sustaining injury.

Honey.—Perhaps no common food product, with possibly the exception of condiments like pepper and spices, has been subjected to such general adulteration. Glucose has been extensively used with the minimum of honey to give its flavor and taste. Inverted sugar and also cane-sugar are other adulterants.

Ginger.—The roots are often sent to canners covered with lime, *i. e.*, for the purpose of preserving or bleaching them. This is such a common condition that limed or bleached ginger is a legitimate article of commerce.

Nutmeg.—The seed is sent into commerce with a thorough coating of lime, which, of course, must be removed before the nutmeg is used.

Mustard is often ground before sold and frequently mixed with other spices and oils and known as prepared mustard. This latter variety is subjected to all kinds of adulterations, frequently containing very little mustard, but with enough turmeric to give the preparation a yellow color resembling that attributed to the pure article. Prepared mustard should be a thick paste composed largely of ground mustard seed mixed with salt, various spices and vinegar. It may also be ground in oil.

Milk.—The character of milk is greatly influenced by the environment in which the cow lives. Cleanliness and good ventilation of the stable are of paramount importance. Cows should be supplied with an abundance of pure water and not allowed access to stagnant pools when pasturing in the summer. From time to time they should be examined by a competent veterinarian for tuberculosis, and if diseased should be isolated and killed. Dairies should be subjected to the most rigid expert inspection periodically and frequently. Only by the exercise of unusual care is it possible to keep milk from becoming contaminated. Every part of the cow, especially the udder, should be kept scrupulously clean. The milk should be collected in clean vessels with as small an orifice as possible, then strained and cooled to 30° F., or lower. It should be put into sterilized bottles, stoppered with sterilized cork and kept cold until delivered and used.

Certified milk is the ideal food of a milk character. The dairies furnishing it are inspected at frequent intervals by experts.

Pasteurized Milk.—The killing of the beneficial organisms of milk by heating it to 140° or 160° is only justified when there is danger of pathogenic germs being present. It is desirable when the origin of the milk supply is unknown or when it is necessary to keep the milk for some time. Hence, Pasteurization of milk cannot be regarded as a substitute for inspection and certification.

Curd Test for Purity of Milk.—The Wisconsin curd test is conducted as follows: 1. Milk containers are sterilized so as to destroy all bacteria in the vessels. . This step is very important, and can be done by heating cans in boiling water or steam for no less than one-half hour.

2. About one pint of milk is placed in a covered jar and heated to about 98° F.

3. Ten drops of standard rennet extract are added and mixed thoroughly with the milk to quickly coagulate.

4. After coagulation, the curd is cut fine with a case knife to facilitate separation of whey; curd is left in whey one-half to an hour; the whey is then drained off at frequent intervals until the curd is well matted.

5. Curd mass is incubated at 98° to 102° F. by immersing jar in warm water. Jars are kept covered to retain odors.

6. After 6 to 9 hours of incubation, jar is opened and odor observed; curds are examined by cutting same with sharp knife and texture observed as to presence of pin holes or gas holes. Odor is noted.

7. Very bad milks will betray presence of gas-producing bacteria by the spongy tissue of the curd and will have an off flavor.

8. If more than one sample is tested at the same time, knife and thermometer are dipped in hot water each time before being used.

"Normal" milk contains practically no organisms but the straight lactic acid bacteria. These germs produce no gas and no bad odors, but purely lactic acid and the curd formed therefrom.

Milk contaminated by the introduction of dust, fecal matter, or kept in imperfectly cleaned cans becomes fouled with gas-producing bacteria that break down the milk-sugar and so produce gases and usually undesirable odors. Therefore milks showing the presence of gas or bad odors in any considerable degree are milks that have been more or less polluted with extraneous organisms or carelessly handled, and as a consequence such milks show various types of curd, containing pin holes, the number of which extend upon the extent of contamination.

Butter.—Coloring butter with anilin dyes is very prevalent and is unnecessary. If cows are properly fed during the winter with wholesome nutritious food to which a small proportion of roots, such as carrots or ruta bagas are added, or with yellow maize, or clover hay, even in winter the butter produced will have an attractive amber tint.

Salting butter excessively is common. The more salt it contains the less value it has as butter, hence the quantity should be limited to the smallest possible amount demanded by the consumer's taste. It should not exceed 2 percent.

Normal butter has 12 to 14 percent water. It is sometimes adulterated by being rechurned with water to raise the water-content to 16 percent.

When cows are fed cottonseed meal or its products the quality of cottonseed oil which responds to the Halphen test is transmitted to the butter, sometimes with an intensity claimed to be equal to that of the admixture of 5 percent cottonseed oil with the butter.

Oleomargarin is a food product, the only objection to which is its sale as butter. Coloring (usually with anilin dyes) is permitted on payment of a

tax. It is sometimes adulterated by the admixture of preserved egg yolks. Preservatives are not used to any extent in this country.

Cheese.—The most common adulterant is the misbranding. Next is the artificial coloring, usually with coal-tar dyes, because they are cheaper and more natural looking than the vegetable colors, such as annoto and saffron. These in a concentrated form are highly poisonous and injurious. Adulteration by impure raw material can be excluded only by careful sanitary inspection of cheese factories. Filled cheese now under the law requires a label and payment of a tax.

Rennet.—The material most useful in the precipitation of the curd in cheese-making is sometimes treated with borax to preserve it during transit. This may be found in ripened cheese. American cheeses are often colored artificially. In the curing of the cheese sometimes it is coated with paraffin to prevent loss of weight. This may interfere with the normal ferments and be injurious if swallowed.

Preparations of Casein.—Samose contains 8 percent casein, 20 percent protein derived from white of egg. To avoid this unstable form, casein has been adulterated with alkalies—nutreose and eucasein. Casumen and sanatogen are preparations of casein with alkalies or glycerophosphates.

Olive Oil.—By reason of its close resemblance to many of the edible vegetable oils, extensive adulterations may be practised. In the United States the chief one is cottonseed oil, to which no objection can be made from a dietetic point of view, though its price is probably not greater than one-fifth of the olive oil. In Europe, peanut oil or sesame oil is used.

Baudouin's test for sesame oil is characteristic. A few drops of a 2 percent solution of furfurol are added in a test-tube to 10 c.c. of the oil under consideration, and 10 c.c. hydrochloric acid of 119 specific gravity. After the mixture is shaken 1/2 minute an aqueous layer which forms will have a distinct crimson color if sesame oil is present.

Peanut oil is distinguished by the saponification of the oil, separation of fatty acids and consequent crystallization of the arachidic acid. Other adulterants are rapeseed oil, poppyseed oil, castor oil, lard oil, fish oil and petroleum oil. Sesame oil is often adulterated with cheaper vegetabel oils. So, too, is almond oil, apricot and peach oil especially being used.

The degree of absorption of iodin is in a measure the test for the varieties of oil. This degree expressed in the percentage by weight of the oil itself is known as **the iodin number.** If, for instance, a gram of any particular oil absorbs 1 gram of iodin it is said to have an iodin number of 100. Nearly all adulterations of olive oil have high iodin numbers, therefore, whenever an iodin number is above 89 to 90, it may be regarded with suspicion.

Cocoa butter is often adulterated with cheaper vegetable fats. These are detected by increase of the percentage of iodin absorbed. As they reduce the melting-point of cocoa-butter, however, they are not used extensively as adulterants. Beeswax, paraffin wax and tallow are other adulterants.

Cereals.—Adulteration of **buckwheat flour** is extensive, other flour being substituted, and is easily detected by the microscope (the buckwheat grain being very characteristic). Any mineral adulteration is easily detected by incineration.

Rice is adulterated by coating with talc, paraffin, glucose.

Rye flour is frequently mixed with other flours. It has characteristic starch granules.

Wheat flour may contain dirt, rust, smut, etc., mixture of wheat flour or other cereals. Flour is extensively bleached with oxids of nitrogen; although, owing to adverse court decisions under the Food and Drug Act, such bleaching is not common in this country. Admixture of inert substances with wheat flour are found mostly in times of famine.

Other adulterations are the mixture with the flour of maize or other cereals.

The principal part of the protein in wheat is gluten, formed when the wheat flour is mixed with water. To determine the character of a wheat flour determine the quantity of gluten it contains, and the separation of the gluten depends on the fact that by washing and kneading the flour nearly all the starch can be removed from the mass. A simple test is the following: Place 10 grams of the sample in a porcelain dish and moisten with 6 or 7 c.c. of water, knead, stand 1 hour. Work into a ball carefully so that none of the material adheres to the dish. Knead in the hands in a slow stream of cold water till all the starch and soluble material is washed out. Place the ball of gluten thus formed in cold water and let stand 1 hour. Remove, press dry as possible between the hands, roll in ball, weigh in a flat-bottomed dish. After weighing place the ball of moist gluten in the drying oven for 20 hours, cool and weigh.

The principal objection to the use of **baking powder** lies in the fact that the residue arising from the chemical reaction is necessarily left in the loaf. Cream of tartar baking powder leaves a residue of Rochelle salts; phosphate powders, a residue of sodium and calcium phosphate; alum powders leave a sodium sulphate and aluminum hydroxid. It must be acknowledged that the ferment with yeast also introduces extraneous matter into the food, viz., alcohol and allied products of fermentation.

Cakes are colored artificially by coal-tar dyes or derivatives as naphthol yellow, or by mineral matters which are even more objectionable. They are further adulterated by molasses, and by sulphurous acid in the sugar. Too often passé storage eggs or eggs broken and preserved with borax or formaldehyd have been used.

Canned corn is adulterated with sugar to cover up defects of corn and maize starches. Sulphurous acid is detected by adding to 25 grams of a sample (in water if necessary) pure zinc and several centimeters hydrochloric acid. If sulphites are present hydrogen sulphid is generated and may be tested for with lead paper. Traces

of metallic sulphides are occasionally present in vegetables and by the above test will indicate sulphites. Hence, positive results obtained by this method should be verified by the distillation method.

Detection of saccharin (formerly often present in canned peas and corn). Add 25 to 40 c.c. water to 20 grams of sample; macerate and strain through muslin; acidify with 2 c.c. sulphuric acid (1:3) and extract with ether. Separate the ether and allow it to evaporate spontaneously and take up the residue with water. If saccharin is present a sweet taste will be imparted to the water. To confirm this test add 1 to 2 grams sodium hydroxid and place in oil-bath at 280° for 20 minutes. The saccharin will be converted into salicylic acid; cool and acidify with sulphuric acid, extract, and test for salicylic acid. If salicylic acid is present in original sample it must of course be removed before making this test.

Canned Vegetables.—Beans and peas are adulterated by copper sulphate—a highly poisonous substance—and by saccharin.

Test for Copper.—Peas rubbed to a fine paste are mixed with water and acidified by 2 or 3 drops of hydrochloric acid. The paste upon boiling will deposit copper on silver, steel or iron, *i. e.*, a steel knife or iron nail.

Canned tomatoes are often adulterated. Antiseptics are unnecessary—tomatoes become sterile easily; and sometimes unripe unfit tomatoes are used. Water is sometimes added; and very commonly the can only partially filled with tomatoes is filled up with the juice which escapes on the peeling table, and which is piped into a tank and held for the purpose of filling the cans.

Tomato ketchup is unnecessarily adulterated with salicylic acid, benzoic acid, artificial coloring, or sometimes imperfect tomatoes.

Tapioca is adulterated by other starches.

Starches are adulterated by sulphurous acid as a bleach. Starch may be an adulterant as when maize starch is mixed with wheat flour or powdered starch mixed with granulated sugar.

Fruit.—Evaporated apples are subjected to a bleaching process—exposed to sulphur fumes, *i. e.*, sulphurous acid. This has a deleterious effect, decreasing the number of red corpuscles, etc.

Lime juice is often marketed in spurious forms, *i. e.*, mixtures made up with flavoring of an acid character resembling that of the natural juice. Often also adulterated by preservatives, especially sulphurous acid and salicylic acid—not necessary if sterilized.

Pineapple is not extensively adulterated.

Cherries, Canned.—The addition of artificial coloring matter is reprehensible. Maraschino cherries are bleached in the brine of common salt and sulphurous acid, washed thoroughly, then saturated with sugar or glucose and colored by coal-tar dye or cochineal. Then, if the natural flavor is destroyed by bleaching, artificial flavor is added. They are preserved in alcohol.

Canned fruit is adulterated by (1) unnecessary artificial colors (2) saccharin. This is reprehensible.

Fruit syrups are extensively adulterated. By reason of laws against salicylic acid, benzoic acid or benzoate of sodium are used as preservatives. This is unnecessary for they can be preserved by sterilization. Imitation fruit syrups should never be used.

Jams, jellies, preserves and fruit butter are artificially colored and flavored; glucose and preservatives are found in them. Pure glucose being simply a hydrolyzed starch is not injurious. By converting the starch from which it is made with diastase and avoiding bleaching agents all objections to glucose for food purposes can be removed.

Brandied fruit should be restricted, especially with children. An imitation of brandy is used.

Mince meat usually contains artificial colors and chemical preservatives of which sodium benzoate is chiefly used. In view of the fact that waste materials from table or factory and poor fruit enter into the manufacture of mince meat and pie fillers, it is wisest to make them at home.

A most exacting supervision over the preparation of **fresh mushrooms** for the market should be required. In **canned mushrooms** the presence of sulphurous acid as a bleaching agent is an adulterant, for it is not needed as a preservative, if sterilization is complete.

FOOT, AMPUTATIONS.—Amputation of the foot may be performed by one of the following methods:

Disarticulation at the ankle-joint (Syme's amputation) consists in removing the foot at the ankle-joint, cutting off the ends of the tibia and fibula, and retaining the integuments of the heel as a covering for the bones. An incision down to the bone is made across the under surface of the heel from the tip of the external malleolus to a little behind and below the internal malleolus, *i. e.*, to a point exactly opposite its commencement. This incision should incline slightly backward, so as to cross the os calcis just in front of the tubercles. A second incision is next made across the front of the ankle, the joint is opened, the lateral ligaments are divided, and the os calcis cleared from its posterior and lateral connections by cutting from above downward. Syme, however, formed the heel-flap by dissecting it from the bone from below upward, a more difficult procedure than cutting from above downward. The knife should be kept close to the bone, to avoid injuring the posterior tibial artery or buttonholing the integuments. The malleoli and a thin slice of the tibia are finally sawed off. The anterior tibial and plantar arteries require ligating; the latter are situated at the extremity of the inner side of the heel-flap.

Pirogoff's operation is a modification of Syme's. It differs in that the posterior part of the os calcis is left in the heel-flap to unite with the sawed end of the tibia. It is performed in a similar manner, except that the sole incision is carried slightly forward instead of backward; after the ankle-joint is opened and the os calcis exposed, the posterior part of the latter is sawed off instead of being dissected out. The sawed surface of the os

calcis is then turned up and placed in contact with the sawed end of the tibia, to which it may advantageously be fixed by an ivory peg driven through the heel-flap and os calcis into the lower end of the tibia.

The mediotarsal amputation (Chopart's) consists of amputation of part of the foot through the transverse tarsal joint, *i. e.*, the joint formed by the os calcis and astragalus behind, and the cuboid and scaphoid in front. A curved incision with its convexity forward is made across the dorsum of the foot from immediately behind the tubercle of the scaphoid to a point midway between the tip of the external malleolus and the base of the fifth metatarsal bone. The extremities of this incision are connected by tracing out from the sole a flap that should reach just above the balls of the toes, and should be longer on its inner than on its outer side. The dorsal ligaments are now divided, and the knife is passed beneath the bones and made to cut its way outward, thus completing the flap already marked out on the sole. The astragalus and os calcis are, of course, left in the stump. The chief objection that has been urged against the operation is the tendency of the tendo Achillis to draw up the os calcis, and consequently depress the anterior part of the stump so that the cicatrix becomes the lowest part. But if care is taken to make the dorsal incision nearly straight across the foot, this drawing up of the heel can, to a great extent, be prevented, and an excellent and useful stump may be obtained; or Tripier's suggestion may be adopted, and the under surface of the os calcis be sawed off, so as to leave a flat surface for walking upon.

The tarsometatarsal amputation consists of removing the anterior part of the foot at the joints between the tarsus and metatarsus, leaving the tarsus intact. It may be done (1) by disarticulating the metatarsal bones; (2) by sawing across the bases of all the metatarsal bones; (3) by disarticulating the four outer metatarsal bones and sawing across the projecting internal cuneiform bone; (4) by disarticulating the three outer and the first metatarsal bones, and sawing across the prominent base of the second. The disarticulating method is usually called Lisfranc's operation; the disarticulating, with sawing across the internal cuneiform or base of the second metatarsal bone, Hey's. Hey, however, it appears, performed all of the first three operations, but not the last; and so much confusion has arisen as regards what is meant by Lisfranc's and what by Hey's operation that the terms should be disregarded (Walsham). In the disarticulating method, which alone need be described, an incision is made across the tarsus, from the fifth metatarsal bone to an inch in front of the prominence of the scaphoid; a sole-flap is next traced out, as in Chopart's amputation, but it should reach as far as the web of the toes. The metatarsus is then disarticulated from the tarsus, the only difficulty in doing this arising from the second metatarsal bone dipping in between the cuneiform bones. The knife is now placed behind the bones and made to cut its way out, thus completing the sole-flap, or the flap, if preferred, may be dissected up from without inward.

The great toe may be amputated at its tarsometatarsal joint by a flap taken from the inner side of the foot, or by an oval incision, which is carried along the metatarsal bone to about the middle of its shaft, then made to diverge to the web between the first and second toes, and carried round the plantar surface of the big toe and back to the spot at the middle of the metatarsal bone. The incision should extend down to the bone, which should next be freed from its remaining connections and disarticulated, the knife being kept close to the metatarsal bone to avoid injuring the communicating branch of the dorsalis pedis with the external plantar artery. When the operation is completed, merely a single longitudinal scar remains on the inner side of the foot (Walsham). See AMPUTATION.

FOOT, DEFORMITIES.—See TALIPES.

FOOT, INJURIES.—**Fracture of the tarsal bones** is rare, and is generally the result of direct crushing force or of a severe fall upon the foot. The tuberosity of the os calcis may be torn off by sudden violent action of the calf-muscles. The fragment is drawn up by the muscles and can be replaced by flexion of the knee and fixation dressings, or perhaps best by direct suture. With this exception, fracture of the other bones is difficult to detect without the aid of the X-rays, and is generally uncertain.

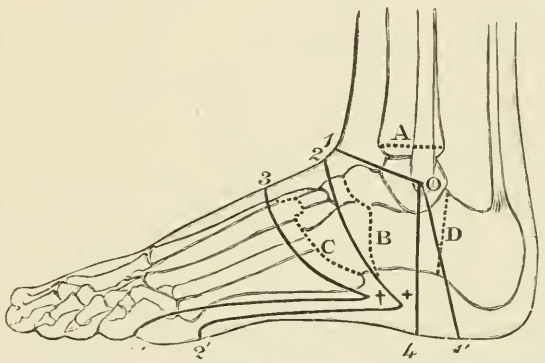


DIAGRAM OF THE ARTICULATIONS OF THE FOOT, SHOWING THE LINES OF INCISION IN THE VARIOUS AMPUTATIONS.—(*From Walsham.*)

A. Line of incision through malleoli in Syme's amputation. 1—O, O—1'. Lines of incision through soft parts in Syme's amputation. D. Line of incision through os calcis in Pirogoff's operation. 1—O, O—4. Lines of incision through soft parts in Pirogoff's operation. B. Line of articulation between os calcis and astragalus behind, and cuboid and scaphoid in front. 2—+, +—2'. Lines of incision in Chopart's operation. C. Line of articulation between tarsus and metatarsus. 3—†, †—3'. Lines of incision in tarsometatarsal operation.

Treatment consists of rest in fixed dressings, and then massage and passive movements. Some of these injuries are followed by considerable impairment of function and a persistent painful condition.

Fracture of the metatarsal bones is infrequent;

it is the result of direct injury, which frequently compounds the fracture.

Fracture of the phalanges is easily recognized, and requires simple treatment (fixation, rest, protection).

Dislocation of the metatarsal bones occasionally happens upward, downward, or laterally (chiefly upward). The displacement is marked by a corresponding prominence on the dorsal or plantar aspect of the foot, and by a shortening of the toe affected. Reduction is by traction and direct pressure.

The phalanges of the toes are occasionally dislocated as a result of the extreme dorsal or plantar flexion. These dislocations are less frequent than similar displacements of the fingers, and are marked by a corresponding prominence, with a shortening of the toe. Traction, with hyperextension and direct pressure over the displaced bone-end, produces reduction easily. See ANKLE.

Compound fractures and dislocations are common, but no definite rules can be given for their treatment. Warm antiseptic lotions are generally used for the first day; after that, if there are signs of vitality and healing, the immovable plaster dressing may be applied. In lacerated wounds amputation of any but gangrenous tissue should be a last resort. In operations the tread of the sole should be interfered with as little as possible, and it must always be remembered that stability is the first consideration.

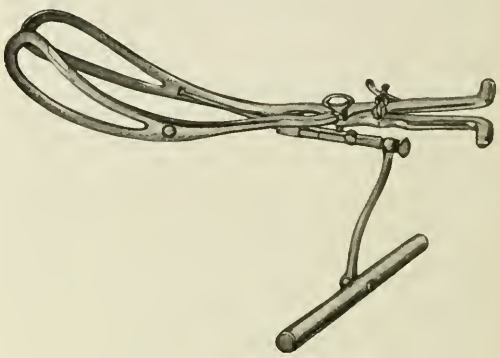
FOOT-AND-MOUTH DISEASE.—Aphthæ epizooticæ. An acute infectious disease of animals transmissible to man especially during epidemics. It is a severe form of aphthous stomatitis due to drinking milk or eating cheese or butter from infected cattle, or through contact with the fluid of the vesicles in the mouth or on the teats. It is characterized by vesicles containing yellow serum on the lips, tongue, pharynx, and on the skin especially of the fingers and toes, and on the nipples in women. Salivation is profuse and the mouth is swollen and hot. There is fever, malaise, anorexia. Prophylaxis consists in boiling suspected milk, and cleanliness of man and cattle. Treatment is mainly symptomatic. See STOMATITIS, APHTHOUS.

FORCEPS, OBSTETRIC.—An instrument devised for the purpose of grasping the child's head and aiding its extraction during labor.

Varieties.—Of the large number of obstetric forceps manufactured at the present day, 3 are deservedly the most popular. These are: (1) **The Tarnier axis-traction forceps,** which is used when the head is at or above the superior strait (high forceps operation). The special advantage of the axis-traction forceps is that its construction is such that traction can be made in the direction of the parturient tract. (2) **The Simpson forceps,** which is used when the head is in the pelvic canal (median forceps operation). (3) **The Sawyer forceps,** which is used when the head is on the perineum (low forceps operation).

Uses.—The most important use of the forceps is *traction.* This should be made in the direction of the parturient tract. No more strength should be exerted than that possessed by the arms and forearms. Traction should be made with the pains, when present; at corresponding intervals, when absent. To avoid slipping of the blades, the tip of the index-finger of the right hand should be kept in contact with the scalp.

Forceps may occasionally be used to secure *anterior rotation,* as in face or brow presentations with chin posterior. Finally, forceps may be used as a *lever* or as a *compressor.*



TARNIER'S AXIS-TRACTION FORCEPS. LATEST PATTERN.

Indications.—The indications for the use of forceps are the following: (1) *Lessened expulsive power,* as occurs in uterine and abdominal inertia. (2) *Increased resistance,* as in certain degrees of contracted pelvis, great rigidity of the cervix or vagina, and oversized child. (3) *Endangered fetal or maternal life,* as prolapse of the cord, prolonged compression of the fetal head, heart-clot, eclampsia, and hemorrhage. The best indication of the condition of the child is its heart-beat; should this fall to 100 beats a minute, its life is seriously endangered. (4) *Acute or chronic diseases of the mother,* as pneumonia, typhoid fever, phthisis, and valvular heart-disease. Under these circumstances the mother's strength is weakened, and forceps should be applied as soon as the os dilates, in order to prevent exhaustion. (5) *Abnormal positions and presentations,* as face or brow with chin posterior, and persistent posterior position of the occiput.

Contraindications.—(1) *An undilated os.* If forceps is applied before full dilatation of the os, the cervix will probably be lacerated. Should any grave danger threaten the child or mother, however, it would be perfectly justifiable to assume this slight risk. (2) *Nonengagement of the head at the superior strait.* While this is a general contraindication, it is not absolute, since forceps may be applied to *secure engagement* in minor degrees of contracted pelvis, and also to bring down the head in placenta prævia. (3) *Unruptured membranes.* This is an absolute contraindication, since traction on the membranes may cause premature separation of the placenta. (4) *Too great disproportion between the child's head and the parturient canal.* In this case some other operation is indicated, such as symphyseotomy, cesarean section, or

craniotomy. (5) *Impossible presentations and positions.* Forceps should never be used *as tractors* in face or brow presentations with chin posterior.

Application.—Before application the forceps should be sterilized, preferably by boiling; the physician's hands and the patient's vulva and vagina should be thoroughly cleansed. If the operation promises to be an easy one, no anesthetic is required; as a rule, however, it is best to anesthetize the patient. She should then be placed across the bed, in the lithotomy position, with her buttocks extending well over the edge. The steps of the operation are as follows: (1) Introduce two fingers of the right hand into the vagina, if possible, between the cervix and the child's head. (2) With the thumb and two fingers of the left hand grasp the left blade at the lock, holding it almost perpendicularly. (3) Introduce the tip of the blade into the vagina, passing it along the floor toward the sacrum. (4) Rotate the blade outward in its long axis, in order to escape the promontory of the sacrum. (5) Depress the handle toward the perineum, and carry it to the left side of the vulva. (6) The right blade is introduced in a similar manner—held in the right hand and passed to the right side of the pelvis. It will now be found that the forceps will not lock. To facilitate this and to grasp the head properly, one of the blades must be rotated forward. If the head occupies the *right oblique diameter* of the pelvis, as in the L. O. A. and R. O. P. positions, the *right* blade must be rotated; if it occupies the *left oblique diameter*, as in the R. O. A. and L. O. P. positions, the *left* blade must be rotated.

Delivery.—The blades having been properly applied, the handles should be grasped with the left hand, the index- and middle fingers hooked over the shoulders of the instrument, the base of the right palm resting upon the knuckles of the left hand, and the tip of the right index-finger touching the scalp. Traction is now made in the direction of the pelvic axis, until the occiput has well distended the perineum. The grip on the forceps is now changed; the right hand grasps the handles firmly, the four fingers encircling them; the left hand protects the perineum, and the face is swept over it by an upward movement of the instrument.

In posterior positions (R. O. P. and L. O. P.) the instrument is first applied in the usual manner, and the head drawn down to the pelvic floor. It is then removed until anterior rotation of the occiput is secured, when it may be reapplied and the head delivered in the manner just described. Should the occiput rotate into the hollow of the sacrum, the handles of the instrument should be depressed as the face is finally swept out under the symphysis pubis.

FORCIPRESSURE.—The arrest of a minor hemorrhage by catching the end of the divided vessel with a pair of spring-forceps, the pressure being kept up for from 24 to 36 hours, or very gently withdrawn after a short interval; the surrounding tissues are caught up with the forceps at the same time. It is a means often used to control hemorrhage during an operation, and is sometimes employed to check hemorrhage from a vessel that from its depth or other cause, cannot be tied.

FOREARM, AMPUTATIONS.—These operations should always be performed as near the wrist as possible.

Circular.—The limb being supported with the thumb uppermost, and an assistant drawing up the skin, a circular incision is made through it, down to the fascia. When the integument is retracted and folded back about an inch, the muscles and tendons are divided by a second circular incision; the interosseous parts and the remaining fibers are next cut through; the bones are then sawed through together and of equal length, and projecting tendons trimmed off. The *radial*, *ulnar*, and one or two *interosseous* arteries require ligatures.

Flaps.—The limb being placed in a state of pronation, the surgeon makes a flap from the extensor side by cutting from without inward; in width the flap should be one-half of the circumference of the limb at the point to be removed; its length should be a little more than its semidiameter. The posterior flap is to be of the same size and made in the same manner as that for the flexor side. The interosseous parts are then divided, the flesh drawn upward, the bones sawed through, and the tendons trimmed off. The vessels to be secured are the *radial*, *ulnar*, and *interosseous* articles, and probably some of their muscular branches.

Long Rectangular Flap (Teale).—This flap is made from the back of the forearm. The radial vessels are included in the shorter flap. In tracing the long flap a longitudinal line is drawn over the radius external to the vessels; at the distance of half the circumference of the limb another line is drawn parallel over the ulna. These are joined across the dorsum by a transverse line. The short flap is formed by a transverse line across the front, joining the long at the upper fourth. When dissecting the long flaps from below upward, the tissues must be separated close to the periosteum and interosseous membrane, and the bones sawed through at the angle of union. The vessels having been ligated, the stump is to be placed in the prone position, so that the long flap may fall over the ends of the wound and be approximated to the short flap, in the usual method.

FOREARM, FRACTURES.

Fractures of the Ulna

Fracture of the olecranon results directly from a fall or blow upon the elbow; rarely from muscular pull of the triceps or from hyperextension. The fracture is generally transverse through the center of the olecranon, the fragments becoming distinctly separated by the muscular pull of the triceps drawing the upper fragment upward. The superficial position of the parts makes the condition easy of recognition; the forearm being flexed, the patient has lost the power to extend it voluntarily. Sometimes the periosteum and lateral tendinous fibers remain intact in whole or in part. In such case the fragments remain in contact, or nearly so, and the prognosis as to bony union is favorable. The more the fragments are separated, the more improbable

is bony union and the greater the probability of connective-tissue union.

Treatment.—The most important point in treatment is to fix the arm in the position that permits the nearest apposition of the fragments. This, of course, is one of complete extension. Aspiration of the joint for the removal of effused blood is sometimes useful and necessary. After bringing

Fracture of the Olecranon.—(*Liston.*)

the upper fragment down as far as possible by manual force, the effort is made to hold it there by passing a strip of adhesive plaster over the tip of the olecranon and bringing the two ends obliquely downward on each side toward the flexor side of the forearm; it is better still to bring the ends obliquely downward, and to cross and fasten them around a splint that has already been made fast to the flexor surface of forearm and arm. This serves the purpose much better as a point from which to make traction.

If the fragments cannot be nearly apposed, and in chosen cases, primary bone suture of the fragment promises brilliant results. But it must be borne in mind that such invasion is dangerous unless proper understanding of and facilities for aseptic work are at hand. As a matter of course, this injury is to be treated as an articular fracture. The triceps should be massaged early. Recently the massage treatment alone of this fracture has given good results.

Fracture of the coronoid process is not frequent, occurring generally in association with backward dislocation of the forearm. Only when the fracture is through the base of the process does the brachialis anticus control the separated fragment, the muscle being inserted not at its point, but below it, toward the base. The depth of the soft parts over the anterior aspect of the joint usually prevents satisfactory direct palpation of the fragment; the olecranon is likely to project backward, this being corrected by traction on the forearm. By slightly flexing the forearm this displacement may be readily produced by backward pressure on the forearm. Crepitation may be evident. The fracture is an articular one, but as such the prognosis is fairly good.

Treatment demands reposition by forward traction on the forearm, and then fixation by splints with the forearm acutely flexed. Further treatment is the same as that of articular fracture in general.

Fracture of the ulna at its upper third is frequently associated with dislocation of the head of the radius over the external condyle or the anterior surface of the joint. Such an injury is always accompanied by marked displacement and shortening of the ulna. No difficulty exists in recognizing the fracture, but the dislocation of the radius is not infrequently overlooked. The prognosis is good if the condition is recognized early, as reposition by vigorous traction on the forearm offers no special difficulties. The head of the radius is brought into place by direct pressure of the thumb during flexion of the forearm. The dressing is a right-angled splint, which is best applied with the elbow at a right angle, the hand almost supine, with a pad at the bend of the elbow to make pressure over the head of the radius, and so combat any tendency to recurrence of the dislocation.

Fracture of the diaphysis of the ulna usually results from striking on the forearm with the elbow bent, as in falling or in warding off a direct blow (parrying fracture). The superficial position of the bone renders the ordinary diagnostic signs very distinct. When only one bone of the forearm is broken, marked displacement is not likely to occur.

The treatment is best effected by fixing the forearm from elbow to fingers in two splints slightly wider than the forearm, one applied to the flexor and the other to the extensor side of the forearm, the hand meanwhile being held midway between pronation and supination. This position of the hand brings the two bones parallel and effects the widest separation between them, in contrast to the position of pronation, which causes the bones to cross and brings them into closer apposition. In fracture of one or both bones of the forearm the possibility of callus-formation interfering with or abolishing the power of pronation and supination is to be borne in mind. Fixation with the forearm midway between pronation and supination is the best safeguard against this misfortune.

The styloid process of the ulna is rarely fractured alone. Fibrous union frequently results.

Fractures of the Radius

Fracture of the head of the radius is altogether intraarticular, and may be complete or incomplete; in the latter case the diagnosis is only problematic. Undoubtedly, this fracture is often mistaken for a simple contusion of the joint. Complete fractures are sometimes recognizable by the demonstration of the abnormal mobility of the head under crepitation. Resulting sometimes directly, the fracture is more frequently caused by a fall upon the hand, a marginal portion of the head of the bone being thereby forced off against the eminentia capitata (chisel fracture). The X-ray should be employed in all fractures involving or in close relation to the joint.

Treatment calls for fixation of elbow-joint and wrist-joint by means of an internal right-angled splint, with a sling for the forearm; considerable stiffness of the elbow-joint frequently results from this injury, and may demand subsequent resection of the capitulum.

Fracture of the neck of the radius below the head is rare; in such cases the head does not move in pronation and supination of the hand, and sometimes a bony prominence may be made out at the point of injury. Treatment is the same as that given for fracture of the head of the radius. Traumatic separation of the upper radial epiphysis is rare.

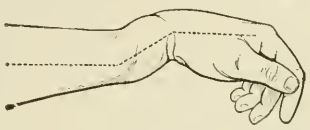
Fracture of the shaft of the radius is rare, and may be caused by direct or indirect force. The

symptoms are distinct and the diagnosis is easy. The ulna remaining intact, displacement is not likely to be marked. If the fracture is oblique, the fragments sometimes have a tendency to slip by each other, shortening the radial side of the forearm and giving a bowed appearance, the convexity being toward the ulna. This position is best

Fracture of the Radius.

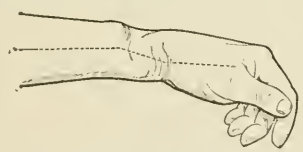
corrected by first applying a narrow, well-padded, and stiff splint to the ulnar side of the arm, with a pad under the middle of the ulna; the two ends of the radius are now bandaged securely to this splint, care being taken not to make pressure over the seat of fracture with any circular turns of the bandage; the arm, meanwhile, is held in a position midway between pronation and supination. Two splints slightly wider than the forearm are now applied to the flexor and extensor sides respectively, including the hand, the dressing being completed by the application of a sling.

Fracture at the lower epiphysis of the radius (Colles' fracture) is very frequent and is of grave importance. This fracture is typical, and occurs from 0.5 to 2 or more cm. above the lower articular



Colles' Fracture. Showing silver fork deformity.—(*Stewart.*)

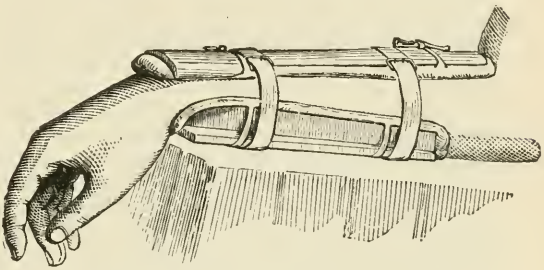
surface, just where the compact bone of the shaft passes into the cancellous expansion of the distal end. The line of fracture may pass through the epiphysis proper, causing in such cases the separation of a smaller fragment. The fracture nearly always results from a fall in which the weight is



Fracture of Lower End of Radius With Anterior Displacement. Showing gardener's spade deformity.—(*Stewart.*)

caught on the palmar surface of the hand, causing at first a hyperextension of the hand on the forearm, and then, by traction of the very strong ligamentum carpi volare, fracture of the radius at the point named. The force acting in this way always causes a dorsal displacement of the separated lower fragment. The ulna has no direct connection with the wrist-joint itself, and, as a rule, does not suffer injury in this fracture. The chief symptom of this fracture is the typical displacement; the lower fragment of the radius is displaced dorsally and at the same time radially, producing the classic "silver-fork" deformity; the styloid process of the ulna is thrown out conspicuously, and there is a prominence on the volar side of the arm and a depressed angle on the dorsal side. Abnormal mobility and crepitation are not demonstrable, as a rule, owing to the partial impaction that generally results. Of great importance is the demonstration of the painful spot above the joint, which corresponds to the line of fracture.

Treatment.—This fracture is serious, the prognosis depending, in the main, upon the intelligence with which it is treated. An anesthetic should nearly always be employed in effecting reposition, which is accomplished by forcible extension and then flexion. Sometimes this flexion is impossible until the fragment has been loosened by forcibly hyperextending the hand. At the same time the hand must be carried into ulnar flexion, otherwise there will result an ugly prominence of the styloid

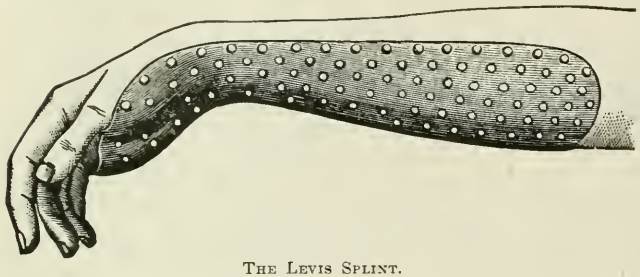


Gordon's Splint for Colles' Fracture.

process of the ulna. As a rule, the displacement has little tendency to recur after reposition. The hand is now to be fixed in this position of partial volar and ulnar flexion, the forearm being in a position half way between supination and pronation. For this purpose a "pistol" splint is most convenient; it is usually applied to the flexor aspect of the arm, extending from the elbow to the bases of the fingers; a soft pad is placed under the end of the diaphyseal fragment; a shorter splint, extending to the root of the hand, is applied to the extensor side of the arm, a soft pad being placed just over the epiphyseal fragment. A roller bandage holds the splints in place; the shape of the splint and the position of the pads insures the maintenance of the hand in the desired position of volar and ulnar flexion. The fingers are left free, and the patient is encouraged to move them both passively and actively, as they are prone, otherwise, to become excessively stiff. The dressing is to be removed during the first week, when passive motion with massage, should be carefully begun; further treatment is to be carried out as for other articular fractures. At the end of about the second week, or even earlier in some cases, the whole hand is to be left free of the splint and movements encouraged, thus combating the decided tendency to stiffness.

Several forms of splints are serviceable in this fracture, as Levis' metal splint, Sands' splint, Gordon's splint, etc. The plaster-of-Paris splint is the least satisfactory of all. After reposition, as stated, the displacement is not likely to recur, so

that the fracture may be dressed by simply supporting the site of fracture by a circular adhesive plaster strapping, and then placing the arm in pronation in a sling, the hand hanging down free over the edge of the sling. This dressing requires careful watching, but gives the best possible result in so far as mobility of the joint is concerned.



The Levis Splint.

Sometimes fracture of the styloid process of the ulna is associated with the epiphyseal fracture of the radius. In such case the wrist-joint is particularly liable to be implicated. The fracture is to be treated on much the same principles as the foregoing. Imperfect mobility may later demand the resection of the styloid process of the ulna.

Fracture of both forearm bones, resulting, as a rule, directly from a fall or a blow, occurs generally in the median third of the forearm. Here the usual signs of fracture are easily recognized. Displacement is likely to be greater when the bones are fractured at the same level than when at different levels. If there is a lateral approximation of the two bones, together with marked injury of the interosseous ligament, the functions of supination and pronation may suffer, as a result either of osseous union of the two bones or of conic articulation. In the leg such complications are of no moment functionally, but in the arm they may gravely compromise the capacity for work.

Treatment.—After reposition the dressing must hold the fragments steadily, without forcing them together by compression. Therefore, the two splints must be wider than the arm; they are best made of board, leather, or heavy cardboard—one longer, one shorter. They encase the hand and fingers, should be well padded, and are applied with the forearm midway between pronation and supination, as this is the position, as already pointed out, that places the two bones parallel and the most separated from each other. Furthermore, as most of these fractures occur below the attachment of the tendon of the biceps muscle to the radius, this muscle pulls the upper radial fragment into supination. If the lower arm, then, remains in a partially prone position, it is manifest that union of the radius will take place with the fragments rotated on one another, and a subsequent loss of the power of supination results. This dressing must be well padded, and carefully and not too tightly applied; it is especially following this injury that gangrene and ischemic contractures have occurred as a result of too tight dressings.

FOREIGN BODIES.—See Cornea, Ear, Nose, etc.

Foreign Bodies Swallowed.—Children frequently swallow pins, marbles, coins, fruit-stones, etc. While any of those that are sharp pointed or have sharp edges may perforate or cause an injury to the walls of the digestive canal, such results are very rare, considering the variety of objects of this class that a child may swallow. Anything that is not too large to swallow will usually pass safely through the intestines without giving any symptoms of distress.

Treatment.—The best methods of hastening the expulsion of the article swallowed is to give for 24 hours *dry, solid, bulky food,* such as bread, potatoes, and rice, which will form a mass in the bowels that, when expelled, will carry the offending substance with it. If there is constipation after this food has been given for the time mentioned, a purgative, as, *e. g.*, 1 to 4 teaspoonfuls of castor oil, should be given, and repeated if necessary. If sharp-pointed or sharp-edged substances are swallowed, immediate administration of a saline or other purgative, producing a very liquid stool, should be forbidden.

FORMALDEHYD.—A gaseous body prepared by subjecting methyl alcohol to oxidation. It is readily absorbed by water, and is sold in the form of a 40 percent aqueous solution named Formalin (*q. v.*). It is powerfully antiseptic and disinfectant, ranking next below mercuric chlorid as a germicide. It has considerable penetrating power, and is much better than chlorin or sulphur dioxid for disinfecting clothing, rugs, hangings, etc. Matting, bedding, and pillows are, perhaps, better disinfected by steam. It does not act destructively on clothing or furniture, and is virtually nonpoisonous. For the production or liberation of formaldehyd in rooms and buildings, the best results are obtained from formalin heated and vaporized. Trillat's apparatus allows the solution of formalin to flow in a fine stream through a copper coil heated to redness by a flame beneath, the gas and vapor passing directly into the room. The apparatus may be operated outside of a room, and the amount of gas liberated depends directly upon the strength and quantity of the solution evaporated. In Schering's method the solid paraform is heated in a receptacle over an alcohol lamp, and is especially valuable in disinfecting small rooms, closets, and cases for instruments, dressings, etc. The cheapest and most common form develops the gas directly by the oxidation of methyl alcohol, the vapors of the latter passing over or through tubes or coils of heated metal. The amount is uncertain and results indefinite.

Whenever used, the apertures in a room should be carefully and tightly closed, and the vapor and gas should be allowed to act as long as possible, preferably 24 hours. About 5 ounces are required for each 1000 cubic feet of space. Its odor may be quickly dissipated from a room by evaporating a little ammonia therein. See Disinfection.

FORMALIN (Liquor Formaldehyd).—A 40 percent aqueous solution of the gas formaldehyd, or formic aldehyd, a powerful antiseptic, disinfectant, and deodorant. It has been used heretofore mainly as a preservative of meat, for injecting the cadaver, and in histologic work as a fixing agent. It is superior to mercuric chlorid in that it is far safer and is not actively poisonous. It will disinfect instruments without dulling their edges, and is useful in sterilizing catgut. A 2 percent solution is used to wash wounds, and a weaker solution to irrigate foul ulcers, abscess cavities, and sinuses. Such strengths are not irritant. Strong solutions are irritant even to sound tissues, and may be used to produce caustic effects. Formalin vapor is used to sterilize catheters, and may be introduced into the abdomen after incision in peritonitis. A 1 percent solution deodorizes feces, destroying all pathogenic spores within an hour. It is made by adding to 40 parts of water 1 part of formalin (1 ounce to 2 1/2 pints). Weak solutions (0.5 percent) are used as gargles and mouth-washes, and stronger ones (2 1/2 percent) as lotions for psoriasis, lupus, and other skin-diseases. In abrasions of the cornea ending in ulceration and hypopyon a solution of 1:2000 or 1:3000 is advised. Applied to the skin it gives it a leathery quality; it has marked toxic properties when inhaled in quantity. As a local application it has been highly recommended in superficial cutaneous cancer.

It is a most energetic disinfectant, and may be sprayed over floors or walls or dropped on hot plates or sheets of metal. See FORMALDEHYD.

FORMICATION.—A sensation like that produced by ants or other insects crawling upon the skin. The sensations are prickling or tingling in character, and are usually observed in organic diseases of the spinal cord; very rarely in hysteria.

FOUL BREATH.—See BREATH, FOUL.

FOURTH DISEASE.—A mild eruptive affection simulating measles, rötheln, scarlet fever, but considered a separate entity by Dukes. Many observers, however, doubt its existence. It has been suggested that it may be an infection with scarlet fever and rötheln conjointly.

FOURTH OF JULY ACCIDENTS.—A record of the accidents in the United States, due annually to the celebration of Independence Day, is thus given in the Journal of the American Medical Association:

Year.	Killed.	Injured.	Total.
1903	466	3,983	4,449
1904	183	3,986	4,169
1905	182	4,994	5,176
1906	158	5,308	5,466
1907	164	4,249	4,413
1908	163	5,460	5,623
1909	215	5,092	5,307
1910	131	2,792	2,923
1911	57	1,546	1,603
1912	41	947	988
1913	32	1,131	1,163
1914	40	1,466	1,506
1915	30	1,135	1,165
1916	30	820	850
Total, 14 years	1,892	42,909	44,801

The decrease from 466 deaths in 1903 to 131 in 1910 is due to more intelligent methods of celebration; the most marked decrease taking place in States where the agitation for restrictive measures has been strongest.

Treatment.—It is the duty of every doctor to warn his clientele of the danger of these "Fourth of July" injuries. Every case is to be treated as if lock-jaw is not merely a remote possibility, but a probability. Free cleansing and douching with peroxid of hydrogen is indicated.

Luckett says: "These wounds should be freely incised, particularly if not seen on the first day of the injury, and thoroughly curetted with a small sharp spoon until all the small pieces of wad, the unburned grains of powder, and all the dirt have been removed. If the wad has entered a metacarpal space a counter-incision must be made for through-and-through drainage. Having cleaned the wound as thoroughly as can be done mechanically, we now resort to chemicals and irrigate with some mild antiseptic. After next drying the wound thoroughly, the entire cavity should be swabbed out with one of the following, named in order of choice:

1. Pure carbolic acid followed by alcohol.
2. Twenty percent tincture of iodin (made by dissolving iodin crystals, 20 parts, in ether and alcohol, each 40 parts).
3. Plain tincture of iodin.

The wound should now be packed with moist iodoform gauze. A wet dressing is then applied, to be *changed daily*. Permission should be obtained for a prophylactic injection of antitetanic serum. Ten c.c. are intramuscularly injected in the buttocks or thigh, under thorough antiseptic precautions.

FOWLER'S SOLUTION.—See ARSENIC.

FOXGLOVE.—See DIGITALIS.

FRACTURE. Causes.—A fracture implies a breaking of bone wholly or in part, and is produced by **direct violence**, as a blow directly over the shin bone; by **indirect violence**, as catching the weight of the body on the hand in falling, producing a fracture of the bone or bones of the forearm above the wrist; by **muscular contraction**, as by violent contraction of the quadriceps extensor muscle, with the leg flexed and foot fixed, producing a transverse fracture of the patella.

Varieties.—Fractures are **complete** or **incomplete**: complete when the solution of continuity between the fragments is entire; incomplete when the solution is only partial, as in the greenstick fracture, which occurs most commonly in the long bones of children. In this case the fracture occurs on the convex side of the bent bone, while the continuity of the bone on the concave side is not disturbed.

When, on fracture, one fragment is driven sharply into the other fragment and sticks fast, the fracture is termed **impacted.** Impaction is commonly the result of indirect violence.

Fractures are, further, **single** or **multiple**: single when only one bone is fractured in one place; multiple when one bone is fractured in two or more places, or when two or more bones are fractured in one or more places.

It is at once evident that fractures the result of direct violence are most likely to be accompanied by more or less extensive injury of the contiguous and surrounding soft parts. This may vary from a simple contusion to a complete mangling and destruction of all the soft parts surrounding the broken bone. Fractures the result of indirect violence, most commonly the result of bending the bone beyond its limits of elasticity by forcing

Greenstick Fracture of Radius, Showing the Longitudinal Splintering.—(*Moullin.*)

the two ends of the bone nearer together, are less likely to be accompanied by serious injury to the soft parts. In such cases injury to the soft parts results from the sharp, broken edges of bone, which perforate the skin or wound muscle, vessels, or nerves. Fractures the result of violent muscular action alone are, in the nature of things, not commonly associated with any great amount of injury to the soft parts.

Fractures are described as **simple** when there results no open wound communicating with the outer surface of the body, and as **compound** when such communication is established. When extensive laceration of surrounding parts occurs, or when a fracture near a joint is accompanied by a dislocation of the head of the bone, the fracture is described as **complicated.** When the bone is shattered, usually by direct violence, and a number of larger or smaller pieces of bone are separated from the bone mass, the fracture is **comminuted.** A complicated or comminuted fracture may be at the same time a compound one, but in defining should not be described as **simple,** even though there exists no communication with the outer surface. Such fractures are best described as **closed,** complicated, or comminuted fractures.

Certain pathologic conditions predispose to fracture of bones, as atrophy from disuse or dis-

Comminuted Fracture of Clavicle.—(*Moullin.*)

ease, necrosis and caries, malignant disease, osteomalacia, partial absorption of bone from pressure of an aneurysm, a tumor, or ecchinococcus cysts; rachitis is also a common predisposing factor. A fracture under such conditions is termed a **pathologic fracture.** Under this head are also to be included the **epiphyseal separations** occurring in bones that are still growing, in which the diaphysis and epiphysis are still connected by a cartilaginous symphysis. In such bones separation may occur as a result of an inflammatory process, as in syphilis, scurvy, and primary infectious inflammation of bone (osteomyelitis).

In addition to the fragility from the causes enumerated there also exists another variety, fragilitas ossium, the etiology of which remains as yet unknown. This condition is known technically as idiopathic **osteopsathyrosis.** In these cases fracture may have resulted from the very slightest degrees of violence, such as a light blow or a thrust, a misstep, or even turning over suddenly in bed.

As regards direction, a fracture is **transverse,** the bone being broken square off and straight across; **oblique,** the fracture line running higher on one side than on the other; **longitudinal,** the fracture line running up and down the length of the bone and not infrequently extending into a joint; **spiral** or **torsional,** the fracture line running obliquely around the bone in a spiral curve.

The transverse fracture is usually the result of direct violence, and is not very common if the epiphyseal separations are not included. The most frequent fracture is the oblique; in this the breaking force is applied longitudinally, fracturing by forcible bending. The spiral fracture results from a violent twisting of the bone. Longitudinal fracture is rare, and when it does occur, is most frequently the result of a shattering of the bone due to a gunshot injury.

Displacement after fracture may be angular, the fractured ends of the bone coming together at an angle; **lateral,** when the end of one fragment rests in part on the end of the other fragment (this form of displacement is observed usually in transverse fracture, and may be associated with a certain amount of rotary displacement); **rotary,** one fragment being turned on its long axis to one side or the other (this form of displacement is very likely to accompany fracture of the long bones of the extremities, especially fracture of the femur and the bones of the leg); **longitudinal,** occurring chiefly in oblique fracture, because of one fragment being made to overlap or override the other fragment, as a result of the initial application of the breaking force or the subsequent muscular pull. Muscular action may also cause **longitudinal separation, diastasis** of the fragments, as in transverse fracture of the patella and of the olecranon process. In fractures with depression one or more fragments are depressed below the general surface of the bone. This deformity occurs chiefly in fracture of the skull and face, but may occur in comminuted fracture of the long bones.

The objective signs of fracture are:

1. **Abnormal mobility,** the cause of which is obvious. The range of such mobility is very great, all the way from a scarcely appreciable motion to a complete and easy mobility in all directions, the degree depending on the completeness of the fracture and the fixation afforded by the surrounding structures; in impacted fracture this sign is absent.

2. **Crepitus,** which is the rubbing or grating sensation or sound produced by the rubbing of one fragment against the other fragment. Crepitus may usually be produced in fractures of the long bones especially, and, when present, is the most certain and valuable sign of fracture; it may be determined by the sensation imparted to the hand

placed over the part during manipulation, but can sometimes be distinctly heard. Subjectively, the patient can ordinarily feel this grating himself. Sometimes crepitus may be absent because of the interposition of soft parts between the fragments, as muscle or fascia. In impacted fracture, of course, no crepitus can be elicited.

3. **Deformity**, which is in proportion to and in consequence of the mobility of the fragments on one another and their displacement. The presence and degree of deformity are always best determined by comparing the fractured part with the corresponding sound part, both by means of eyes and hands. By following up the sound limb with one hand and the injured limb at the same time with the other hand, any deformity becomes more certainly apparent than by simple inspection. While abnormal mobility and crepitus are necessarily absent in impacted fracture, the symptom of deformity may or may not be present.

The subjective symptoms are:

1. **Pain**, which may be felt continuously, or may only be elicited by attempts at motion, voluntary or passive; or may only be produced by local and direct pressure over the seat of fracture.

2. **Disturbance of function**, due, of course, to the break in the longitudinal axis along which muscular action exercises its mechanic function.

The constitutional symptoms are sometimes marked. Fever may manifest itself in subcutaneous and uncomplicated fractures, particularly during the first few days following a fracture, the temperature frequently rising to 102° F., sometimes even to 104° F. This is due essentially to a ferment intoxication the result of absorption of dead tissue elements, especially of fibrin ferment and others formed in the blood extravasated at the point of fracture.

Suppuration may occur; in such event microorganisms have gained access to the seat of fracture through some contiguous cutaneous wound or have been carried and deposited there by the blood. The injured and contused tissues around the seat of fracture and the extravasated blood furnish a congenial soil for their growth.

In **compound fracture** the external wound may close up quickly without any infection, the fracture then following the course of a subcutaneous fracture. On the other hand, virulent infection may occur, with considerable destruction of the injured parts, or even complete loss of the limb. Between these two extremes may occur any grade of infection and attendant inflammation. Further, the clinical course of a compound fracture is materially affected by the way it is treated. The earlier the wound is thoroughly cleansed, effective drainage provided, and sufficient dressings applied, the earlier a favorable course of repair is to be expected.

If infection is virulent and drainage insufficient, there may occur considerable and serious extensions of inflammation and burrowing of pus. The formation of any new pocket of pus or the invasion by inflammation of any new area is marked by a rise in temperature; for this reason a close inspection of the temperature-chart should be kept up during the period of the reparative process. If the inflammation and suppuration about the ends of the fragments have been sufficient to cause necrosis of bone, the process of repair may be very tedious; fistulæ leading down to remaining carious areas or sequestra may persist for a long time after the actual repair of the fracture is complete.

The urine after fracture sometimes contains a varying amount of fat, which is derived as fluid fat from the crushed medullary substance of the bone; it finds its way into the blood and is excreted by the kidneys. It can sometimes be seen by the naked eye in the form of small fat globules swimming on the surface of the urine. Its excretion begins from the second to the fourth day; ordinarily its presence is not attended by any symptoms, but it sometimes accumulates to a dangerous degree, death even ensuing as a result of its accumulation in the capillaries of the lungs and brain.

Albumin and **casts** may also occur, but are without any grave significance.

Hematogenous jaundice sometimes occurs, and is explained by the presence in the blood of disintegrated red blood-cells and blood coloring-matter.

Repair of fracture begins with the deposition at the seat of fracture of a germinal tissue rich in cells and blood-vessels, termed the provisional callus. This tissue replaces the extravasated blood, which takes no part in its formation. It is produced from the inner layer of the periosteum (the external callus), the medulla of the bone (the internal callus). The intermediary callus is that part between the broken ends of the bone, and is derived chiefly from the periosteum, the medulla and the opened Haversian canals having little part in its formation. The amount of callus depends on the mobility of the fragments and on the conditions of blood supply, being greatest when there is much motion and a plentiful blood supply, least when there is perfect fixation and a meagre blood supply. The further steps of repair are essentially those of an ossifying periostitis and osteomyelitis. By the deposition of lime salts the soft cellular tissue gradually becomes more firm, while osteoclastic action hollows out trabeculæ. By about the second week the two fragments are bound together by a medium of wide-meshed bone tissue; by the end of the third week the periosteal callus usually consists of fairly firm spongy bone. Meantime the medullary callus develops in the same way, sometimes occupying the whole of the medullary cavity. There now begins a retrogressive metamorphosis of the callus, the provisional callus being transformed into the permanent bone cicatrix by becoming more compact, so that later on this cicatrix may scarcely be visible. The closed medullary cavity may also become opened and completely reestablished by this process of absorption and compaction. The amount of callus remaining permanently seems to be in proportion to the functional necessity of the union. Thus, if perfect reduction has been accomplished and the limb has been held in a mechanically correct axial line, a minimum of permanent callus remains, forming the bone cicatrix. On the other hand, if reduction is imperfect and the axial line faulty, a much larger permanent

callus will result. In this manner the structure of the bone at the point of fracture is regenerated as completely as possible and in accordance with the demands of the laws of statics.

When, in consequence of splintering, fragmentation results, such fragments as remain attached to the periosteum or bone heal in place most readily. In subcutaneous fracture and in compound fracture healing without infection and suppuration, frequently even wholly detached fragments heal in place. Very small entirely detached splinters may become completely absorbed, while larger ones may die and much delay or prevent union of the fracture, unless or until this dead portion of bone (sequestrum) is removed.

Bony union of fracture is sometimes delayed or fails entirely; in this latter event the union by fibrous tissue may be sufficiently firm and close to restore in part or fully the usefulness of the limb. Many cases of fractured patella heal in this way; or a condition of **false joint**, or **pseudoarthrosis**, results, the fragments being bound together less securely by fibrous tissue and the false point of motion persisting. This delay or final failure of union is due in the majority of cases to a tendency to arrest of callus-formation before the stage of ossification is reached, and is particularly likely to occur when certain constitutional anomalies exist, as syphilis or scurvy, or during typhoid fever or pregnancy, in diabetes mellitus, and in certain diseases of the peripheral nerves and central nervous system. Sometimes failure of union and pseudoarthrosis result from the interposition of the soft surrounding structures, as a fragment of muscle, between the fragments, whereby the continuous callus-formation cementing the divided ends together is prevented.

Pseudoarthrosis may also result from a diastasis of the fragments, as in transverse fracture of the patella, in which case the powerful quadriceps extensor pulls the upper portion upward, causing a wide separation of the two. Insufficient nourishment of one of the fragments may bring about a similar result, as in intracapsular fracture of the neck of the humerus and femur.

The time required for the healing of a simple subcutaneous fracture is given by Gurlt as follows:

For a broken phalanx, about 2 weeks; metatarsus, metacarpus, and the ribs, 3; the clavicle, 4; the forearm, 5; the humerus and the fibula, 6; the neck of the humerus and the tibia, 7; both bones of the leg, 8; the femur, 10; and the neck of the femur, 12 weeks before consolidation is complete. Compound, comminuted, or complicated fracture requires relatively a longer period of time.

After healing of the fractured bone, more or less disability of the limb involved is likely to persist for a greater or less length of time. While it has been well determined that the larger joints, when not diseased, can be immobilized indefinitely without producing ankylosis or anything more than temporary limitations of motion, this is not true of the smaller joints, as the fingers and the joints in the neighborhood of fractured bones. Here inflammatory deposits may result in a persisting interference with free motion, or even in complete ankylosis; stiffness is also caused sometimes by the implication of contiguous tendons in the callus-formation. Very serious disability is frequently produced by the atrophy of muscle caused by the long-enforced immobilization and the interference with the circulation. Great injury to the muscular structure may result from tightly constricting bandages applied for a long time; sometimes an ischemic paralysis may follow this shutting-off of the blood supply. In such cases the muscle is altered and maimed. Pain may also persist for a long time, or permanently, due to the pressure on nerves by a large callus. It happens sometimes in fracture of the humerus that the musculospiral nerve is included in the callus-formation, in which event the muscles supplied by this nerve are likely to be disabled. After fracture, edema of the skin and subcutaneous soft parts of a limb may persist for a long time.

Separation of the epiphyses runs essentially the same course as fractures of the bone, except that sometimes marked shortening occurs as a result of the interference with the growth of the bone. This is most prone to occur when the epiphysis and diaphysis are driven into each other and heal in this position.

The diagnosis of fracture is included in the enumeration of symptoms already made. A systematic and careful examination of the injured and of the corresponding sound part should be made, any change in shape or outline and any disturbance of function being carefully noted. Palpation of the place where the fracture is presumed to be, combined with passive motion, will demonstrate crepitation, false point of motion, and the characteristic pain along the line of fracture, which in itself may be enough to establish the existence of fracture. Diastasis of fragments and careful measurement of the length of limb from fixed points will do much to help the determination. Frequently it becomes necessary to administer an anesthetic before the existence or exact condition of a fracture can be discovered. Sometimes it is necessary to distinguish between fractures and dislocations.

Fracture.	Dislocation.
1. Crepitus may be present.	1. Crepitus never present.
2. Preternatural mobility.	2. Rigidity rather than mobility.
3. Easily reduced—but	3. Difficult to reduce—but
4. Deformity more liable to recur after reduction.	4. Deformity less liable to recur after reduction.
5. The head of the bone is in its proper place.	5. The head of the bone is not in its proper place.
6. The socket containing the head of the bone is not empty.	6. The socket which should contain the head of the bone is empty.
7. When rotated the bone does not move as one piece.	7. When rotated the bone moves as one piece.

When available, the **X-ray** furnishes an invaluable and almost sure means of diagnosis. The conditions of city and hospital practice more and more demand that the surgeon shall have at command this wonderful aid, both in diagnosis and as a means of control during the time of repair of the fracture.

Complications of Fracture.—(*a*) *Simple fracture* may be complicated by: (1) local concomitant conditions, as dislocation, extravasation of blood, rupture of the main artery, vein, or nerve, implication of a joint; (2) circulatory complications, venous thrombosis, embolism, fat-embolism; (3) nervous complications, shock, retention of urine, traumatic delirium; (4) later complications, gangrene from tight bandaging, crutch paralysis, or involvement of a nerve in callus; (5) late septic complications, bed-sores, sloughing over the fracture, followed by erysipelas, tetanus, or malignant growth.

(*b*) A *compound fracture* may in consequence of the open wound becoming septic be complicated, in addition to the above mentioned suppuration and sloughing, by any of the following, viz., osteomyelitis, necrosis, acute arthritis, septic intoxication, septicemia, pyemia, hectic fever, and tetanus.

The prognosis of subcutaneous fracture without complications is good, as a rule. Transverse fractures heal more readily, and are less likely to cause lasting deformity, than oblique fractures.

Fractures of the hip and thigh in old persons, which necessitate confinement to bed for weeks, are always to be regarded as severe and serious injuries. In such cases the dorsal decubitus readily produces hypostatic processes in the lungs, together with a general disturbance of nutrition, frequently with a fatal termination. When the articular ends of bones are involved, the prognosis is generally unfavorable as regards the complete restoration of the function of the joint. The prognosis of complicated and compound fracture varies, naturally, within wide limits, dependent on the extent of the initial injury to surrounding soft parts and on the aseptic or infected course of the fracture.

Treatment.—In the treatment of fractures the question of **first aid** is of the very greatest importance. The layman, to whom this task generally falls, frequently offers assistance with hands more full of sympathy than of wisdom, and succeeds in doing harm instead of intended good. When an upper extremity is broken, the patient himself usually places the fractured member in a good position. But he has not this power in the case of fracture of the lower extremity. In this instance he should be lifted cautiously only after securely supporting the point of fracture, so as to prevent any unnecessary pain or further displacement of the ends of the fragments, or further injury to soft parts from the rough ends of the fragments. By a little ingenuity one can always find materials for these temporary dressings close at hand. It should always be borne in mind that a broken arm can be well splinted against the thorax for first transportation, and a broken leg against its fellow.

In general terms, the treatment of fracture consists in reposition or reduction, bringing the displaced ends of the bone in as nearly normal a relationship as possible, and then in maintaining them there by means of splints or dressings until the process of repair is complete. In order to put the fracture at complete rest, such dressings should always include the two joints adjoining the seat of fracture. For such dressings use is made of a great variety of materials; of these, the most generally serviceable are bandages made of plaster-of-Paris and splints of wood, metal, heavy cardboard, felt, and leather. In the treatment of many fractures, especially of the lower extremity, extension by means of weight and pulley is of the greatest service. While it is true that surgeons possessed of skill and experience attain excellent results by the exclusive use of one or the other method, it is still desirable that certain definite principles should be followed. It is still the practice of many surgeons to inclose a recent fracture in plaster-of-Paris at the first visit, and to leave the dressing undisturbed for weeks, until the fracture is supposed to be consolidated. This is wrong in principle, and it is not surprising that, as a result, recovery frequently takes place with more or less marked deformity. It is practically impossible to apply plaster-of-Paris to a fractured limb and to keep it in close apposition to the limb after the expiration of the first week. Swelling is either present at the time of such application, or it must be provided for by liberal padding. In either event the splint is bound to become loose when swelling begins to subside, which is ordinarily by the eighth day. After this time the plaster-of-Paris splint can no longer be expected to grasp and hold the fragments firmly; and as they are not yet fixed by the callus, more or less displacement usually results. It is dangerous to apply a plaster-of-Paris dressing excessively tight, with the idea of compressing the fracture. In such cases interference with the circulation may lead to ischemic paralysis and contracture, or to gangrene at the seat of fracture, or even of the whole limb. Furthermore, it is frequently very difficult to reduce and hold a fracture while plaster-of-Paris is being applied and is hardening. Even with skilled assistants, who are by no means always at hand under such circumstances, there is frequently lack of assurance after the dressing is complete that the reduction has been maintained, and that the axial line of the limb is correct. With splints this assurance is much more readily gained, as the maintenance of reduction during the application of the dressing is easier. If it were deemed especially important for particular reasons to employ plaster-of-Paris, there would seem to be no good reason why it should not be applied as a final layer over the splints. Plaster-of-Paris is especially indicated in fractures of the lower extremity after the second week.

Reduction is to be accomplished by means of extension and counterextension and manipulation. While an assistant makes traction on the proximal side of the fracture, the surgeon grasps and extends with one hand the distal portion of the limb,

manipulating and controlling the fractured ends of bone with the other. When the patient is sensitive, or muscular relaxation cannot be otherwise attained, a general anesthetic should always be administered. Failure to do this not infrequently permits an unsatisfactory and blameworthy result.

The first dressing of a fracture must take into consideration the fact that swelling of the soft parts will give an increased diameter to the limb; hence the splints must be well padded. At the end of the first week the swelling will ordinarily have begun to subside, and the dressing will begin to loosen. It should be reapplied, less thickly padded than before; careful attention should be given the position of the broken ends, and any axial error corrected. At the end of another week, or about two weeks from the time of fracture, the dressing will again have become somewhat loose, and should be reapplied. By this time the swelling will have largely subsided, and while the callus completely surrounds the seat of fracture, it still remains so soft as to permit of reduction of any still existing malposition. This third dressing will ordinarily remain in place until complete consolidation has occurred. Finally, a light and removable dressing may be supplied, to be worn as necessity demands.

After consolidation of the fracture great importance attaches to the **after-treatment** that is instituted to restore the injured limb to usefulness. Massage and passive movements are of great service. Indeed, daily massage alone has been urged, as an excellent method of treating fractures, the claim being made that union is thereby facilitated and hastened, and that after consolidation the limb is in much better and more useful condition than after ordinary fixation treatment. However, treatment by massage alone will hardly come into general use. But in those cases in which the blood supply is poor, or when there is reason to suspect a delayed union, massage is a most important adjunct to treatment. In all cases in which it is found expedient to change the dressings massage should be practised, and the neighboring joints should be carefully subjected to passive movement. The importance of passive movement increases as the size of the joint diminishes, being most important and imperative in fractures of the phalanges or about the wrist, when the possibility of entanglement of the tendons exists.

When a fracture involves a joint, the difficulties of treatment are necessarily much increased, as the task set for the surgeon is to immobilize sufficiently to secure consolidation of the fracture in good position and yet prevent ankylosis of the joint. In such injuries the joint capsule is usually distended with effused blood, whose removal is effected either by aspiration or by a dressing that will exercise compression and favor absorption. Dressings must be changed frequently, massage and passive movements being practised almost from the first, and active movements being early encouraged. Such treatment entails much labor upon the surgeon, but consolidation, with good mobility, may result.

Sometimes as a result of inadequate, and occasionally despite the most intelligent, effort of the surgeon, the result of treatment will be unsatisfactory, and union of a fracture will occur in malposition. Such deformity should be treated by speedy refracture of the bone by hand, osteoclast, or chisel, after which treatment will not differ from that of ordinary fracture. In badly united articular fractures such operative interference is most urgently indicated.

The callus forms sometimes in excess, and may even produce true tumors (osteoma, enchondroma), though this rarely occurs; on the other hand, its development may occasionally be very much retarded, as already stated. In such case the employment of proper measures will usually result in consolidation. Besides an appropriately strengthening diet, measures should be adopted to improve and increase the blood supply to the part: notably massage and such dressings as will permit the patient to move about, and, in the case of the lower extremity, to use the limb for weight-bearing purposes. A favorable effect is also produced by the application of a moderately tight rubber tube above the seat of fracture, the distal portion of the limb being protected by bandages. This establishes a venous hyperemia at the seat of fracture. A more vigorous measure is to rub the fragments against each other under anesthesia, and so to excite a more decided formative action on the part of the periosteum and medulla.

See Arm, Forearm, Leg, Thigh, etc.

FRAMBESIA.—See Yaws.

FRANGULA.—The bark (one year old) of *Rhamnus frangula*, or alder buckthorn. The fresh bark is a violent irritant; the old bark is a non-irritant purgative, much used in the constipation of pregnancy. **F., Fluidextract.** Dose, 10 to 30 minims.

FRECKLES (Lentigo, Ephelis).—The lesions commonly known as freckles are pinhead- to pea-sized, round, oval, or irregular, and of a yellowish, brownish, or blackish color. They occur chiefly upon the face and the backs of the hands, although they are occasionally observed on the trunk. They are more common during adolescence than at any other period, and are most marked in individuals of blond complexion, particularly red-haired subjects. They ordinarily make their appearance during the summer and fade partially or completely during the cold season. The condition is due to exposure to the light and heat of the solar rays. Some writers believe that a congenital predisposition is necessary. Freckles are due to an increased deposition of pigment in circumscribed areas of cells in the basal layer of the epidermis. A disappearance of the freckles may be brought about by treatment, but they are extremely likely to return.

Treatment.—The object of treatment is to produce an exfoliation of the epidermal cells containing the pigment. For this purpose solutions of mercuric chlorid, acetic acid, and similar preparations are used. Bulkley advises the following.

℞ Mercuric chlorid, gr. vj
Dilute acetic acid, ʒ ij
Borax, gr. xl
Rose-water, ʒ iv.

Apply night and morning; at first gently, later vigorously.

℞. Mercuric chlorid, gr. iij to viij
Zinc sulphate, Lead acetate, } each, ʒ ss
Water, ʒ iv.

Apply 2 or 3 times daily. Discontinue for 2 days when irritation is produced.

Hardaway obtains satisfactory results from the use of the electrolysis needle.

Equal parts of glycerin and lactic acid may be used as an application to remove freckles from the face.

FREEZING.—See Cold.

FRIAR'S BALSAM.—A name given to the *Balsamum traumaticum*, N. F., and also to the very similar *Tinctura benzoini composita*, U. S. P. See Benzoin.

FRIEDREICH'S ATAXIA.—See Hereditary Ataxia.

FRONTAL SINUSES.—See Nose (Disease of the Accessory Sinuses).

FROST-BITE (Chilblain, Pernio).—A form of inflammation of the skin and deeper parts produced by prolonged exposure to cold and tending to terminate in gangrene. Chilblains may be defined as cutaneous inflammation due to cold. The toes and neighboring parts of the lower extremities, the fingers and hands, the nose and the ears, are most frequently affected. Anemic persons and those debilitated from insufficient nourishment or from fatigue are especially prone to suffer. Transient redness of the parts first occurs, accompanied by hyperesthesia and tingling. Purplish lividity quickly follows, with diminished sensibility. Blanching, with numbness, supervenes. Coagulation next takes place, signalized by hardness, whiteness, and absolute insensibility. If the process is severe, dry gangrene is soon established, and the parts shrivel up and blacken. An inflammatory line of demarcation shows itself later.

Treatment.—Chilblain, or frost-bite, in which the skin is not yet livid or gangrenous, should be treated by friction with snow or with towels soaked in ice-water. When the congestion has disappeared and the parts have become warmer, they should be wrapped up in cotton-wool. The patient suffering from frost-bite should not be brought suddenly into a warm room. If the cold has induced coma, the best remedy is friction with flannel all over the surface of the body. Warm drinks must be administered, such as coffee, tea, weak wine, and water, to which a few drops of ammonia water may be added. If the patient cannot swallow, an enema of milk containing a little brandy may be resorted to. When reaction is restored, the temperature of the room may be gradually raised. Stimulating applications are to be used to relieve the itching and burning that accompanies chilblain; of these, tincture of iodin painted over the part; Wardrop's liniment, consisting of tincture of cantharides, 3 drams; soap liniment, 9 drams; diluted turpentine and carbolic acid, are most highly recommended. Cod-liver oil, quinin, and tonic treatment generally are necessary.

If small areas only are involved, which are dead or gangrenous, allow them to come away spontaneously, meanwhile treating antiseptically. If cartilage, ligament, or bone delays the removal, the retaining structure should be cut through and the part removed. When amputation becomes necessary, await a line of demarcation, and amputate above it, when tissue damage has not extended. Parts that have been severely frost-bitten are likely to suffer permanently from more or less serious impairment of nutrition. The skin is often hyperesthetic, and sometimes more or less numb, and is prone to become inflamed and to ulcerate.

FUCHSIN.—One of the anilin dyes much used in histologic and bacteriologic work for staining solutions.

The Ziehl-Neelsen's **carbolfuchsin** dye is very powerful, stains quickly, keeps well, and can be employed for a variety of purposes, particularly for staining tubercle:

Saturated alcoholic solution of fuchsin, 10 c.c.
Five percent carbolic acid water, 90 c.c.

Anilinfuchsin dye:

Saturated alcoholic solution of fuchsin, 16 c.c.
Anilin water, 84 c.c.

See Pathologic Technic.

FUMIGATION.—See Disinfection, Formaldehyd, Sulphur.

FUNIS.—See Umbilical Cord.

FURUNCLE.—See Boil.

FURUNCULUS ORIENTALIS.—Oriental boil, Aleppo boil, Delhi boil, Biskra button, Gafsa button, Kandahar sore, Pendjeh sore, Natal sore. A local disease, marked by the successive formation of papule, tubercle, scab, and sharply circumscribed ulcer on the face, especially on the cheeks and at the angles of the mouth. It is frequently seen in those residing along the shores of the Mediterranean Sea. See Boil.

G

GAIT.—See Nervous Diseases (Examination), Locomotor Ataxia, Paralysis Agitans, etc.

GALACTAGOGS.—Medicines that increase the lacteal secretion. The value of galactagogs is doubtful. Pilocarpus approaches the true galactagog, but its influence is very transient. One-eighth of a grain given in brandy at bedtime is efficient directly in proportion to its diaphoretic and sialagog effects. See Breast (Diseases), Milk (Mother's).

GALACTORRHEA.—See Breast (Diseases).

GALL-BLADDER, DISEASES.

Carcinoma

It is usually primary, often undoubtedly due to the prolonged irritation of a stone. Secondary cancers develop by contiguous invasion from the liver or adjacent abdominal organs.

There is usually a history pointing to chronic cholecystitis or gall-stones; on this follows the growth of an irregular, nodular tumor, continuous with the liver, which is invaded directly from the gall-bladder. The tumor moves with respiration. Malignant disease involving the hepatic or common duct may begin quite insidiously in a painless manner, with slowly increasing *jaundice* until there is complete obstruction. When there is also rapid loss of weight and distention of the gall-bladder, cancer of the head of the pancreas is indicated. If with the jaundice the loss of weight is not so rapid, the cancer may have formed around a calculus in the lower part of the common duct, but pancreatic fluid can still escape and fat is absorbed. Increasing jaundice with steady enlargement of the liver, painless and without fever, points to malignant disease involving the hepatic ducts, and this is generally secondary to a growth in the pancreas or elsewhere. In the biliary passages cancer may be primary or secondary, the first symptom generally being jaundice. If the disease is in the gall-bladder alone there is no jaundice. Enlargement of the gall-bladder is characteristic of carcinoma of the common duct.

Gall-stones

Synonyms.—Biliary calculi; cholelithiasis.

Definition.—Hard concretions formed in the gall-ducts or gall-bladder.

Etiology.—(1) Women after the age of 30; (2) sedentary habits; (3) constipation; (4) tight lacing; (5) catarrh of the biliary passages; (6) gouty diathesis.

Microorganisms play an important rôle in the causation of gall-stones by exciting a catarrhal inflammation which modifies the chemical composition of the bile.

Pathology.—The gall-stone is usually brownish in color externally, and has a roughened appearance. In some cases gall-stones are almost round, while in others they show distinct facets, due to constant attrition from the presence of other calculi. Interiorly, they may be dark in color, with here and there yellowish or brownish spots. Bacteria are usually found in the center of gall-stones along with epithelial débris, lime salts and *cholesterin*. See Colon Bacillus Infection.

Symptoms and Clinical Course.—In a great many cases so long as the calculus remains free in the gall-bladder, no symptoms are produced, but when impaction occurs in the common bile-duct or cystic duct, certain phenomena manifest themselves.

Symptoms of Stone in the Common Bile-duct.—*Jaundice* is the cardinal symptom in chronic catarrhal cholangitis. This jaundice is usually transient, coming on after an attack of hepatic colic, nausea, and vomiting, lasting a few days, but recurring again after an indefinite interval. Intermittent attacks of jaundice occur at intervals during the course of years, becoming more frequent as the occlusion becomes more complete. In the diagnosis of common duct obstruction, the absence of dilatation of the gall-bladder is an important sign (Courvoisier's law).

Hepatic colic (biliary colic) indicates the impaction of a stone in the cystic or common duct, but it is by no means constant in cholelithiasis. The attack may occur at any time during the day or night, with sudden onset, ushered in by a sharp pain in the right hypochondriac or epigastric region, frequently radiating toward the right scapula. In some cases the pain may be of a girdle sensation, and in others may be so severe as to be indescribable. Persistent nausea is present, and a burning sensation occurs in the epigastrium. *Nausea* and *vomiting* often occur, but are not invariably present. Profuse *sweating* and grave depression nearly always occur. The attack usually passes off in the course of a few hours, though slight intermittent pains may follow for several days. Rarely the stone may be found in the stool. Gall-stone crepitus may sometimes be elicited over the gall-bladder.

Hepatic fever (Charcot's intermittent fever) occurs from autointoxication, and is characterized by *rigors*, sweats and an intermittent fever (101 to 103°) of an indefinite duration. In clinical manifestations it closely resembles malarial fever.

Symptoms of Stone in the Cystic Duct.—Jaundice is less common, and only occurs when the gall-bladder is distended to such an extent as to cause pressure-symptoms. Hepatic colic is very severe, and occurs when any concretion passes downward through the cystic duct into the common bile-duct; after lodgment there, jaundice is produced.

Dropsy of the gall-bladder (hydrops vesicæ felleæ) occurs when the cystic duct is occluded. This is due to the fact that one of the functions of

the gall-bladder is to secrete mucus, which, if pent up, will so accumulate as to produce a tumor often so large as to extend below the umbilicus and beyond the median line.

Complications and Sequels.—(1) Suppurative cholangitis, and suppurative cholecystitis (empyema of the gall-bladder); (2) secondary abscesses; (3) permanent jaundice, with production of Charcot's intermittent fever; (4) ulceration and passage of stone into the intestine; (5) obstruction of the bowels from gall-stone; (6) stricture of the ducts and atrophy of the gall-bladder.

Diagnosis.

Biliary Calculi.	Gastralgia.	Intestinal Colic.	Renal Colic.
1. Usually in women after the age of 30.	1. Adult life.	1. Age has no influence.	1. Adult life more frequently.
2. History of previous attacks of hepatic colic, transient jaundice, often of intermittent fever (Charcot).	2. Absence of jaundice and intermittent fever.	2. Absence of jaundice and intermittent fever.	2. Absence of jaundice and intermittent fever.
3. Pain in right hypochondriac or epigastric region.	3. Pain in epigastric region relieved by pressure.	3. Pain in umbilical region.	3. Pain in right or left lumbar and inguinal region, radiating toward penis and causing retraction of the testicle.
4. Urine dark amber color and contains bile: feces may contain gall-stone.	4. After attack copious secretion of clear urine.	4. Urine normal.	4. Urine often contains blood.

The prognosis depends upon the position of the stone and upon the length of time the condition has existed. Hepatic colic nearly always terminates favorably.

Treatment.—If the pain is severe, morphin, 1/4 grain, with atropin, 1/125 grain, should be given hypodermically. Care should be exercised, however, in its use to prevent the morphin habit. An accidental overdose taken by the patient has destroyed life. In many cases, however, nothing else will so quickly relieve the pain. Chloroform or ether may be inhaled. Locally, hot applications may be made over seat of pain, and, if persistent, a series of small blisters may be produced by means of cantharidal plaster. As soon as relief of pain is afforded, the bowels should be opened by means of saline purges.

The preventive treatment is important. Sodium phosphate (1 dram) may be given 2 or 3 times daily to keep the stools semisolid. Large doses of sweet oil, frequently repeated, are recommended. Chloroform internally has been of great service. Carlsbad salts (1 dram), Hunyadi János, and the Saratoga mineral waters may also be used. If constipation is persistent, possibly nothing is better than the fluidextract of cascara (1/2 dram) and glycerin (1/2 dram) taken at bedtime.

If nausea and vomiting continue, and there is an excessive eructation of gas, with dyspeptic symptoms, lavage may be practised 2 or 3 times a week. Flushing the colon by means of a rectal tube and a fountain syringe, as recommended by the older writers, gives much comfort. If flatulence is present, naphthalin, 5 grains every 4 hours, may be tried. Autointoxication is always pronounced, and may be prevented in a measure by lavage, irrigation of the bowels, and intestinal antiseptics.

Between attacks salicylic acid or the bile salts may prove of value. Sodium succinate in doses of 5 grains three times a day and sodium glycocholate in doses of 1/2 to 3 grains are extremely effective.

The diet is very important. There are few diseases in which the diet needs careful supervision than in cases of biliary calculi. Doubtless a catarrhal condition of the stomach and bowels is nearly always present, and dyspeptic symptoms are a constant menace. For several days subsequent to the attack liquid food is best. If sweet milk disagrees, light broth, beef-juice, soup, whey, malted milk, or barley-water may be substituted.

Carbohydrate foods, such as potatoes, rice, and bread, produce eructation of gas and gastric distress. Desserts are distinctly contraindicated. Fruits and vegetables are well borne, and may be largely used.

Surgical Treatment.—Should the attacks of hepatic colic become greater in severity, or recur at more frequent intervals after the proper medicinal treatment has been tried, should the patient's strength show signs of failing, if there is permanent jaundice, or if there is tenderness over the gall-bladder with associated digestive disturbances, surgical interference is advisable. If an operation is too long delayed, suppurative cholecystitis or suppurative cholangitis may supervene and add to the gravity of the case. The trend of surgical opinion at the present time is toward early operation.

Inflammation (Acute Cholecystitis)

This affection is always due to infection by pathogenic bacteria, especially the colon bacillus and typhoid bacillus. See Colon Bacillus Infection. Occasionally the pneumococcus, staphylococcus, and streptococcus are the exciting causes. It may follow irritation from gall-stones, pneumonia, or typhoid fever and occasionally result from adhesive inflammation between the gall-bladder and intestines.

The inflammation may be of varying grades. In mild forms the exudate is mucoid or mucopurulent; in the more severe forms it is purulent (*empyema of the gall-bladder*) and the inflammation may proceed to ulceration, perforation, or gangrene. In rare instances the gall-bladder may be distended with blood.

Pain at the border of the thorax to the right of

BREWER'S DIAGNOSIS OF DISEASES

Pathological Condition.	Pain.	Fever.	Vomiting.	Jaundice.	Tumor of Gall-bladder.
I. Calculous Disease.					
(*a*) Stone in healthy gall-bladder, ducts free.	No.	No.	No.	No.	May be present from large number or size of stones.
(*b*) Stone in healthy gall-bladder, cystic duct temporarily obstructed.	May be absent; generally present during obstruction; paroxysmal.	No.	May be present when colic occurs.	No.	May be present from distention.
(*c*) Stone impacted in cystic duct.	No.	No.	No.	No.	Present; may attain large size.
(*d*) Stone in hepatic duct.	Frequently present; irregular type.	Occasionally present.	May be present during pain.	Frequent.	No.
(*e*) Stone in common duct; acute obstruction.	Present; acute, paroxysmal, radiating to back.	Generally present	Present.	Present.	No.
(*f*) Stone in common duct; movable; chronic.	Periodic attacks of acute radiating pain.	Present with chills and sweats.	Present.	Present; intermittent.	Rarely present.
(*g*) Stone in common duct; impacted; chronic.	May be absent; frequently present early; may be intermittent; variable.	May be present; variable.	Often present.	Present; progressive; may vary in intensity.	Rarely present.
II. Inflammatory Disease.					
(*a*) Cholecystitis subacute.	Present; paroxysmal during periods of cystic duct closure from stone or swollen mucous membrane.	Present during attacks of colic.	May be present.	No.	Present during attacks of cystic duct obstruction.
(*b*) Cholecystitis acute.	Acute paroxysmal radiating pain; extending to back and shoulder; may be very severe.	Present with chills and sweats.	Present often: severe.	No.	Present; tenderness; often muscular rigidity.
(*c*) Cholecystitis chronic (empyema of gall-bladder).	Severe radiating pain at first; may disappear later; tendency to recur.	Present; severe at first, may diminish later.	Present at first.	No.	Present; with tenderness; may attain large size.
(*d*) Cholecystitis in previously diseased and contracted gall-bladder.	Present; often severe; paroxysmal.	Present; often with chills and sweats.	Present.	No.	No (occasionally present due to pericystic exudate).
(*e*) Cholangitis of hepatic and common ducts.	May be absent; generally present when obstruction exists, or severe infection; tenderness and pain over liver in intrahepatic cholangitis.	Present; chills; sweats; severe prostration; general sepsis.	Present.	Present; variable.	No.
III. New Growths.					
(*a*) Carcinoma of gall-bladder.	No; may occur late in disease.	No.	No.	Present late (portal glands).	Hard, irregular, movable tumor at first, later diffuse infiltration.
(*b*) Tumor of cystic duct.	No; may occur late.	No.	No.	No.	Present when obstruction exists.
(*c*) Tumor of hepatic or common duct.	No; may occur late.	No.	No.	Present; progressive.	May be present from distention with bile.
(*d*) Tumor of neighboring viscera producing chronic obstruction of common duct.	No; may occur late.	No.	No.	Present; progressive; may become extreme.	Present; generally from distension with bile.

OF THE GALL-BLADDER AND DUCTS.

Urine.	Stools.	Liver.	Spleen.	Ascites.	Remarks.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Generally discovered by accident; often unrecognized.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	All symptoms promptly relieved as soon as obstruction removed.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Hydrops of gall-bladder often unrecognized.
Contains bile pigment at times.	May be clay-colored if obstruction occurs.	Frequently enlarged.	Not enlarged.	No.	Diagnosis extremely difficult; symptoms generally due to coexisting cholangitis.
Contains bile pigment.	Clay-colored.	Not enlarged.	Not enlarged.	No.	Symptoms rapidly disappear when stone passes papilla.
Contains bile pigment.	Clay-colored.	May be enlarged during attack.	May be enlarged from pressure of stone on vein.	No.	"Fièvre intermittente hépatique" of Charcot resembles malaria: all symptoms disappear during interval.
Contains bile pigment.	Clay-colored.	Enlarged.	May be enlarged.	No.	Condition may remain for many years; may only be jaundice with digestive disturbances and loss of weight; history of previous attacks (?). Ascites may be present from pressure of large stone or possibly from hydremia.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Tenderness over gall-bladder; tendency to recurrence; generally associated with stones in gall-bladder.
May contain albumin and casts.	Normal.	Not enlarged.	May be enlarged (sepsis).	No.	May follow typhoid or other septic diseases; onset often sudden; rapid development of severe symptoms resembling appendicitis; may be necrosis of walls of gall-bladder with perforation: local or general peritonitis.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Frequently follows acute cholecystitis; occasionally becomes quiescent, presenting practically no symptoms.
Negative.	Normal.	Not enlarged.	May be enlarged (sepsis).	No.	Generally tenderness over gall-bladder area, but no tumor; local peritonitis; diagnosis often extremely difficult.
May contain bile pigment, albumin and casts.	May be clay-colored.	Enlarged.	Enlarged (sepsis).	No.	Often follows severe infections of gall-bladder; generally associated with stones in common or hepatic duct; severe sepsis; generally fatal in virulent infections (streptococcus).
Negative (at first).	May be clay-colored late.	Enlarged late in disease.	May be enlarged late (pressure on vein).	Present late.	Digestive disturbances, progressive loss of weight and asthenia; cachexia; rapidly fatal.
Negative.	Normal.	Not enlarged.	Not enlarged.	No. (?)	Very rare; both benign and malignant growths have been reported; diagnosis difficult.
Contains bile pigment.	Clay-colored.	May be enlarged.	Not enlarged.	May be present late.	Very rare; diagnosis difficult.
Contains bile pigment.	Clay-colored.	Enlarged.	May be enlarged late.	Present late.	Malignant tumors most common; chronic interstitial pancreatitis from previous infection of biliary passages may remain after cause has disappeared; enlarged portal glands; Hodgkin's disease.

BREWER'S DIAGNOSIS OF DISEASES

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(*b*) Stone in healthy gall-bladder, cystic duct temporarily obstructed.	May be absent; generally present during obstruction; paroxysmal.	No.	May be present when colic occurs.	No.	May be present from distention.
(*c*) Stone impacted in cystic duct.	No.	No.	No.	No.	Present; may attain large size.
(*d*) Stone in hepatic duct.	Frequently present; irregular type.	Occasionally present.	May be present during pain.	Frequent.	No.
(*e*) Stone in common duct; acute obstruction.	Present; acute, paroxysmal, radiating to back.	Generally present	Present.	Present.	No.
(*f*) Stone in common duct; movable; chronic.	Periodic attacks of acute radiating pain.	Present with chills and sweats.	Present.	Present; intermittent.	Rarely present.
(*g*) Stone in common duct; impacted; chronic.	May be absent; frequently present early; may be intermittent; variable.	May be present; variable.	Often present.	Present; progressive; may vary in intensity.	Rarely present.
II. Inflammatory Disease.					
(*a*) Cholecystitis subacute.	Present; paroxysmal during periods of cystic duct closure from stone or swollen mucous membrane.	Present during attacks of colic.	May be present.	No.	Present during attacks of cystic duct obstruction.
(*b*) Cholecystitis acute.	Acute paroxysmal radiating pain; extending to back and shoulder; may be very severe.	Present with chills and sweats.	Present often: severe.	No.	Present; tenderness; often muscular rigidity.
(*c*) Cholecystitis chronic (empyema of gall-bladder).	Severe radiating pain at first; may disappear later; tendency to recur.	Present; severe at first, may diminish later.	Present at first.	No.	Present; with tenderness; may attain large size.
(*d*) Cholecystitis in previously diseased and contracted gall-bladder.	Present; often severe; paroxysmal.	Present; often with chills and sweats.	Present.	No.	No (occasionally present due to pericystic exudate).
(*e*) Cholangitis of hepatic and common ducts.	May be absent; generally present when obstruction exists, or severe infection; tenderness and pain over liver in intrahepatic cholangitis.	Present; chills; sweats; severe prostration; general sepsis.	Present.	Present; variable.	No.
III. New Growths.					
(*a*) Carcinoma of gall-bladder.	No; may occur late in disease.	No.	No.	Present late (portal glands).	Hard, irregular, movable tumor at first, later diffuse infiltration.
(*b*) Tumor of cystic duct.	No; may occur late.	No.	No.	No.	Present when obstruction exists.
(*c*) Tumor of hepatic or common duct.	No; may occur late.	No.	No.	Present; progressive.	May be present from distention with bile.
(*d*) Tumor of neighboring viscera producing chronic obstruction of common duct.	No; may occur late.	No.	No.	Present; progressive; may become extreme.	Present; generally from distension with bile.

OF THE GALL-BLADDER AND DUCTS.

Urine.	Stools.	Liver.	Spleen.	Ascites.	Remarks.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Generally discovered by accident; often unrecognized.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	All symptoms promptly relieved as soon as obstruction removed.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Hydrops of gall-bladder often unrecognized.
Contains bile pigment at times.	May be clay-colored if obstruction occurs.	Frequently enlarged.	Not enlarged.	No.	Diagnosis extremely difficult; symptoms generally due to coexisting cholangitis.
Contains bile pigment.	Clay-colored.	Not enlarged.	Not enlarged.	No.	Symptoms rapidly disappear when stone passes papilla.
Contains bile pigment.	Clay-colored.	May be enlarged during attack.	May be enlarged from pressure of stone on vein.	No.	"Fièvre intermittente hépatique" of Charcot resembles malaria: all symptoms disappear during interval.
Contains bile pigment.	Clay-colored.	Enlarged.	May be enlarged.	No.	Condition may remain for many years; may only be jaundice with digestive disturbances and loss of weight; history of previous attacks (?). Ascites may be present from pressure of large stone or possibly from hydremia.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Tenderness over gall-bladder; tendency to recurrence; generally associated with stones in gall-bladder.
May contain albumin and casts.	Normal.	Not enlarged.	May be enlarged (sepsis).	No.	May follow typhoid or other septic diseases; onset often sudden; rapid development of severe symptoms resembling appendicitis; may be necrosis of walls of gall-bladder with perforation: local or general peritonitis.
Negative.	Normal.	Not enlarged.	Not enlarged.	No.	Frequently follows acute cholecystitis; occasionally becomes quiescent, presenting practically no symptoms.
Negative.	Normal.	Not enlarged.	May be enlarged (sepsis).	No.	Generally tenderness over gall-bladder area, but no tumor; local peritonitis; diagnosis often extremely difficult.
May contain bile pigment, albumin and casts.	May be clay-colored.	Enlarged.	Enlarged (sepsis).	No.	Often follows severe infections of gall-bladder; generally associated with stones in common or hepatic duct; severe sepsis; generally fatal in virulent infections (streptococcus).
Negative (at first).	May be clay-colored late.	Enlarged late in disease.	May be enlarged late (pressure on vein).	Present late.	Digestive disturbances, progressive loss of weight and asthenia; cachexia; rapidly fatal.
Negative.	Normal.	Not enlarged.	Not enlarged.	No. (?)	Very rare; both benign and malignant growths have been reported; diagnosis difficult.
Contains bile pigment.	Clay-colored.	May be enlarged.	Not enlarged.	May be present late.	Very rare; diagnosis difficult.
Contains bile pigment.	Clay-colored.	Enlarged.	May be enlarged late.	Present late.	Malignant tumors most common; chronic interstitial pancreatitis from previous infection of biliary passages may remain after cause has disappeared; enlarged portal glands; Hodgkin's disease.

the median line is invariably present; and the gall-bladder is enlarged and tender. Vomiting is common. Fever accompanies the condition and jaundice may or may not be present. In the presence of pus the fever becomes irregular and attended by chills and sweats, and an examination of the blood will show leukocytosis.

The features of this affection that serve to distinguish it are the history, the preceding affection and the location of the pain and circumscribed tenderness. The presence of a tumor in the region of the gall-bladder is confirmatory.

Many mild catarrhal cases undoubtedly terminate in recovery without being recognized. Suppurative cases are unfavorable and tend toward a fatal termination. The case should be placed in the care of a skilled surgeon as soon as detected. See GALL-BLADDER (Surgery).

GALL-BLADDER, SURGERY.—Operation is required in nearly all cases of empyema, dropsy, and persistently recurring colic. When jaundice is present, the prognosis is much more grave, not only for the reasons mentioned, but because of the much greater risk of hemorrhage and the feeble power of repair. Still, it may be necessary to avoid the occurrence of cholemia, and sometimes, even under these conditions, it is possible to effect a permanent cure—by crushing, for example, a calculus impacted in the common duct.

Aspiration through the abdominal wall cannot be recommended; it is not likely to effect a permanent cure, and it may lead to leakage through the puncture and to peritonitis. Free incision can only be practised when there is an abscess pointing through the skin.

Cholecystotomy.—Incision of the gall-bladder after exposure through an opening in the abdominal parietes is a most successful operation. A vertical incision is made over the most prominent part of the swelling, and the muscles and peritoneum are divided in the ordinary way; the finger is then introduced to ascertain the condition of the gall-bladder, and, if it is much distended and not too much bound down by adhesions, a fine trocar and cannula are thrust into it to draw off some of the contents, thus allowing the organ to be pulled out through the wound, the greatest care being taken that the fluid does not enter the peritoneal cavity. If catch-forceps or tooth-forceps are used, they should be placed above and below the opening of the trocar, so that if the tissues, which are often very thin, are bruised, the injured part may lie in contact with the parietal peritoneum. As soon as the wall of the bladder is drawn out through the wound, a free incision is made into it, the rest of the contents are allowed to escape, the interior is carefully sponged out, and the finger is introduced to ascertain if there is any obstruction present. Loose calculi present no difficulty, but if they are impacted far down in the neck or in the cystic duct, the greatest care is required to avoid injury. Sometimes they may be removed by special forceps, the surface being gradually nibbled away while the stone is fixed by the forefinger of the other hand pressing against it from outside the duct. On one or two occasions the stone has been broken by pressure from the outside, forceps guarded with rubber tips being used to avoid bruising as far as possible. Needling has been recommended. The mucous membrane has been very carefully nicked from the inside. The calculus has been left and the fistulous opening syringed out constantly with warm water for a fortnight, and, finally, when everything else has failed, the gall-bladder has been excised.

In a few cases the wound in the gall-bladder has been successfully sewed up, and the emptied sac returned into the abdomen, but Tait condemned this strongly. The walls are frequently exceedingly thin, it is very often impossible to make sure that the opening into the bowel is patent, and if any further operation is required, it is decidedly advantageous to have the fundus of the gall-bladder adherent to the cicatrix. The walls of the sac, the parietal peritoneum, and the skin should be accurately sewed together. Tait used two continuous sutures, one for each side of the wound, the ends being tied together afterward, above and below. A large drainage-tube is inserted, in order, if possible, to carry all the bile away from the wound, and ordinary absorbent dressings are applied. When the wound is healed, the drainage-tube may be withdrawn. If the obstruction has been removed, the bile soon finds its way into the intestine again; if, on the other hand, this is impossible, a biliary fistula is left, which may be dealt with later on.

Cholecystectomy, or removal of the whole gall-bladder, is a more serious operation, and should be practised only when, from the condition of the parts at the time of the operation, it is clear that incision and drainage are either impracticable or would fail to give relief. Sometimes this occurs after prolonged inflammation; the gall-bladder is so utterly disorganized that it is not possible to suture it securely to the abdominal wound; and this may happen in cases of impacted calculus, if it is not possible to extract or crush the stone without injuring the wall of the duct. The preliminary steps are the same: the gall-bladder must be separated from adhesions, all hemorrhage carefully arrested, the peritoneal flaps united with continuous suture, and the end of the cystic duct tied.

Cholecystenterostomy may be performed by uniting the gall-bladder to the intestines by means of the Murphy button, Senn's bone plate, or other mechanic appliance. See INTESTINES (Surgery).

GALLIC ACID.—From tannic acid. An astringent and hemostatic feebler than tannic acid. It differs from the latter in that it does not coagulate albumin and gelatin. It is preferable to tannic acid when an astringent effect is desired on a part reached only through the circulation. Dose, 15 grains in powder or capsule.

GALVANISM.—See ELECTRICITY.

GALVANOCAUTERY.—The thermal effects of galvanism used for the heating of cauteries. The chemic effect of the negative pole of a galvanic battery has been used as a caustic to destroy

tissues and tumors of considerable size. The forms in use are numerous, but one general plan of construction prevails The cauteries consist of small loops of platinum wire mounted on straight or curved copper supports, insulated from one another and bound together to form a convenient stem. They fit into a handle provided with binding screws and a key for easily opening and closing the circuit. The current should be turned on only when the cautery is in actual use. Besides simple loops, cutting instruments of various shapes are made by hammering the platinum flat or by bending it in various ways. A loop of wire is sometimes used as an ecraseur, being adapted cold and then heated. The temperature of the galvanocautery must never be allowed to rise above dull redness. At white heat the cauterizing action is so rapid that searing of the surface does not take place, and hemorrhage follows as profusely as after the knife. Currents for use in the cautery vary from 8 to 10 amperes for the smallest to 20 for the largest. For cautery batteries, large bichromate cells have been used, but are untrustworthy, rapidly polarizing at times. The most convenient form of battery for cautery purposes is an accumulator to which an electric current is attached. See ELECTRICITY.

GAMBIR.—Pale catechu. An extract prepared from *Ourouparia gambir*. Owing to its tannic acid, it is an astringent and hemostatic. With chalk-mixture it is efficient in the diarrhea of children, and with opium in dysentery. Dose, 15 grains. **G. Tinct. Comp.,** contains gambir 5, cinnamon 2 1/2, diluted alcohol to 100. Dose, 1/2 to 1 1/2 drams. **G. Trochisci,** each troche containing nearly 1 grain of gambir.

GAMBOGE (Cambogia).—A resinous gum from *Garcinia hanburii*, a tree native to Southern Asia. Its properties are due to *gambogic acid*. It is a drastic hydragog cathartic, decidedly diuretic. It is officially a constituent of **Pil. Cath. Comp.** See COLOCYNTH. Dose, as a cathartic, 2 to 5 grains; as a diuretic, 1 grain.

GANGLION.—A small, tense, round swelling, firm and growing progressively, although slowly, in connection with a tendon sheath. It is painless when uninflamed, and the simple ganglion is found to contain a fluid in appearance and consistence not unlike glycerin jelly. The most common situations are the dorsum of the wrist or hand, the dorsum of the foot, the palm of the hand at the root of the finger, and behind the inner or outer malleolus. The size varies from that of a pea to that of a pigeon's egg. Fluctuation is not distinct, and the tumor is not adherent to the skin or tendon with which it is in relation. Persons who constantly use the wrist-muscles are most likely to develop ganglions. The *simple ganglion* is supposed to be due to cystic degeneration of a synovial fringe inside a tendon sheath. The fluid of the ganglion does not communicate with the fluid of the tendon sheath.

A *compound ganglion* is almost entirely confined to the sheath of the common flexors of the fingers, and most usually contains melon-seed-like bodies that give rise to a sense of soft crackling when manipulated. The compound ganglion is a chronic tubercular thecitis.

Treatment.—In treating a simple ganglion forcible rupture of the cyst by a blow or by pressure sometimes effects a cure. Puncture with a clean, grooved needle, squeezing out the contents and afterward applying pressure over the collapsed cyst is another method. Aspiration, followed by the injection of iodin, has been of service in treating both the simple and the compound ganglion. The seed-like bodies are to be removed. Aseptic puncture with a tenotome, evacuation, scarification of the walls, antiseptic dressing, and pressure is the modern treatment. Recurrent ganglions should be dissected out.

GANGRENE.—Mortification, or death in mass of a portion of living tissue, *i. e.*, macroscopic or molar death, in contradistinction to ulceration, or death of molecular parts—too small to be seen. Molecular death of the bone is called caries, whereas a gangrenous portion of the soft tissues cast off is called a slough or sphacelus. Molar death of a portion of bone is known as necrosis, the dead mass being termed a sequestrum. See NECROSIS. The parts in gangrene may either dessicate or putrefy.

Three chief forms of gangrene are recognized: *dry*, *moist*, and *septic*. The first is due to interference with the arterial supply, the venous return of the blood being still active. The tissues dessicate and mummify. Moist gangrene is due to interference with both the arterial and the venous circulation, the parts remaining moist and putrefying. Septic gangrene arises from virulent septic matter, and is rarely seen since the introduction of asepsis and antisepsis.

Dry and moist gangrene may coexist in different parts of the invaded structure. Dry gangrene is usually dependent on senile changes, chiefly arterial degeneration, and is more limited and more chronic than moist gangrene.

Examples of moist gangrene are inflammatory gangrene, hospital gangrene, cancrum oris, or noma, bed-sores, traumatic gangrene, phagedena, carbuncles, and diabetic gangrene.

Examples of dry gangrene are senile gangrene, Raynaud's disease, gangrene from frost-bite, and gangrene from embolism or ligation of a main artery.

Traumatic gangrene is of common occurrence. It may be local or spreading, and is usually the result of a severe injury, such as a crush, or it may be due to rupture of a main artery or vein without any skin-lesion. Spreading traumatic gangrene (emphysematous gangrene, malignant edema) is usually due to the *bacillæ œrogenes capsulatus* and pyogenic organisms especially the *streptococcus pyogenes;* sometimes, however, it is due to the bacillus of malignant edema. The first symptoms are those of cellulitis rapidly extending, then gangrene and a grave septicemia.

Gangrene due to infective organisms comprises traumatic spreading gangrene, hospital gangrene, phagedena, noma vulvæ, and cancrum oris, or noma.

The causes of gangrene are local or constitu-

tional. Of the former, injuries, mechanic violence, caustics, extremes of heat and cold, as in burns and in frost-bite, the application of a ligature, embolic plugging, strangulated hernia, intussusception, ligated hemorrhoids, very tight bandaging, paraphimosis, even extravasation of urine and feces, and continued pressure, as in bedsores, may be given. Of constitutional causes, a deficient blood supply or senile changes may be cited. In certain diseases, as diabetes, typhus, typhoid, measles, and scarlatina, embolism is the usual cause of gangrene. Gangrene from ergotism is due to the effect of this drug on the vessels. Septic gangrene is due to septic infection.

Treatment of Gangrene.—The general rule in **dry gangrene** is to wait for a line of demarcation before amputating, but the treatment depends much upon the cause and nature of the gangrene. The general indications are: (1) To remove, when possible, the cause, as a tight bandage, putrefactive processes, tension, pressure, etc.; (2) to prevent gangrene, whenever threatened, from actually occurring by maintaining the warmth of the part and relieving the embarrassed circulation by elevation of the limb and gentle friction when there is venous congestion; (3) to check the spread of the process; (4) to promote the separation of the dead from the living tissue, and to remove it by amputation; (5) to control the formation of the products of putrefaction by keeping the parts dry and by the free use of antiseptics; (6) to support the patient's strength and counteract the deleterious effects on the constitution from the absorption of septic poisons and to soothe pain by opium.

More particularly, in those disposed to senile gangrene, caution should be advised against injuring the feet, as from carelessly cutting the corns, etc. Woolen stockings should be worn, the feet kept warm—especially at night and in cold weather, as by the use of the hot-water bag—and the general health supported. A small amount of whisky after meals is useful and strengthening. If exhaustion ensues or sepsis develops, and gangrene has actually occurred, amputate at once, but high up—at least above the knee. The tubercle of the tibia is too low a place at which to amputate for senile gangrene. If the disease confines itself to one or two toes, treat antiseptically, and do not amputate, unless it spreads to the sole or dorsum of the foot. Generally, in senile gangrene it is best to wait for a line of demarcation before amputating high up. The presence of fever is no contraindication to amputation.

Moist gangrene is treated antiseptically until a line of demarcation between healthy and diseased parts has formed. Stimulants, good food, tonics, and opium are used simultaneously. When the line of demarcation forms, amputation is made clear of and above it, far enough to reach sound tissues and arteries.

In **traumatic gangrene**, when it is spreading, no line of demarcation can form, and it should not be waited for, but amputation should be done at once, and high up, and a very great amount of stimulation, continued for some time, should be provided.

Hospital gangrene has practically disappeared. Antiseptic fomentations until the sloughs separate, removal of the large sloughs by the scissors or forceps, under ether, and the use of bromin after drying the parts with cotton are indicated. To use bromin, pour it into a tumblerful of water and draw up with a syringe and inject into the depths of the wound. If damaged hopelessly, the limb should be amputated.

In the treatment of symmetric or **Raynaud's gangrene** massage is useful. The patient should be in bed, the parts affected elevated, if possible, and kept warm by heat applications. When a line of demarcation forms, the parts should be removed by scissors, forceps, and antiseptic poultices, or amputation may be performed, which is rarely necessary.

In **diabetic gangrene** there is little tendency to the formation of a line of demarcation, but amputation should be performed at once, and, if the leg is involved, above the knee.

Gangrene from ergot usually affects the toes and fingers. A line of demarcation forms, when amputation can be performed.

In gangrene from **frost-bite** the dead parts should be allowed to come away spontaneously, covering them in the meantime with antiseptics. If a structure—as, *e. g.*, a ligament, cartilage, or bone—retains the dead portions, it should be cut through. When amputation becomes necessary, the surgeon should wait for a line of demarcation before operating.

The treatment of **cancrum oris**, or **noma**, must be energetic, and should consist in the destruction of all the diseased tissue by caustics or nitric acid, and in the use of antiseptic washes and hydrogen peroxid and internal stimulation, giving food and tonics. **Phagedena**, of which noma vulvæ is a form, is treated by repeated applications of the tincture of chlorid of iron, the local use of an antiseptic powder, such as iodoform, continued irrigation, and the actual cautery or acids. A high degree of stimulation is to be maintained and a nutritious diet given.

Bed-sores may be prevented by changing the posture, by frequent cleansing, by rubbing the skin with alcohol, and by keeping the sheet clean and smooth. The use of an air-cushion or water-bed will sometimes check a beginning sore. Spirit of camphor, glycerol of tannin, boroglycerid, alcohol, salt, and alum may be used. Solutions of 20 grains of silver nitrate to 1 ounce of water may be applied to a sore on the verge of breaking. The spot may be covered with protective collodion or with zinc ichthyol gelatin. Antiseptic poultices may be used when sloughing threatens. Stimulation, nourishment, and plenty of sleep are indicated.

General Rules.—In dry gangrene, ordinary moist gangrene, hospital gangrene, Raynaud's gangrene, ergot gangrene and frost gangrene, it is well to wait for a line of demarcation. In senile gangrene the parts may be allowed to sever spontaneously. In traumatic spreading gangrene and in diabetic gangrene the rule is immediate amputation.

GARGLE.—A wash for the throat and upper

part of the pharynx. A gargle should never contain any very active drug that will produce dangerous symptoms if swallowed, or any agent that will injure the teeth or the mucous membrane. It is ordered and compounded in the same manner as a mixture, and usually contains astringent or disinfecting salts, such as alum, borax, zinc sulphate, potassium chlorate, with a vegetable astringent, and often honey. Von Troltsch's method of gargling is performed by taking a mouthful of fluid, throwing back the head, and then, instead of making the customary gurgle, allowing the liquid to pass as far down as possible. The act of deglutition is then performed, without, however, swallowing the fluid. By this procedure contact is made with a large portion of the pharyngeal mucosa, and the effort involves an effectual means of exercising the muscles of the throat. A tablespoonful is the usual quantity for a single gargle. With most persons, unless the head is thrown back, a gargle usually goes little beyond the uvula and the base of the tongue. When it is desirable to gargle the back of the pharynx and the posterior nares, the patient must take a mouthful of the gargle and use it while he lies on his back with his tongue drawn forward.

Gargles are contraindicated in parenchymatous inflammation of the tonsils, and in all cases when movement of the fauces causes severe pain, and when, in some persons, an inability to retain liquid beyond the anterior pillars of the fauces exists. Gargles of cold or iced water are sufficient to exercise the muscles of the soft palate and to increase their tone.

To allay inflammation of the throat, solutions of chlorate or nitrate of potassium, of borax or acetate of ammonium, combined with infusion of linseed, thin gruel, or warm water, are used. Excitation of mucous glands and membrane calls for stimulating gargles, such as contain tincture of capsicum, of arnica, or myrrh, pyrethrum, or eucalyptus. To check secretion, the salts of iron and zinc, of alum, tannin, or rhatany are used. Antiseptic gargles check ulceration and purify foul or putrid secretions. Of these are potassium permanganate (5 grains to 1 pint), chlorinated soda (20 grains to 1 pint of water), sulphurous acid and water (1:4), and boroglycerid (10 to 20 percent). In syphilitic sore throat a solution of mercuric chlorid (3 grains) and water (8 ounces) is advised. Water, barley-water, rose-water, or orange-flower water sweetened with honey, glycerin, or syrup, form bases for most gargles.

℞. Ammoniated tincture of guaiac, } each, ℥ ss
Compound tincture of cinchona, }
Clarified honey, ℥ jss.
Mix well together and add mixture of—
Potassium chlorate, ℥ ijss
Water, enough to make ℥ viij.

GARROD'S THREAD TEST.—It is generally agreed that there is an excess of uric acid in the blood in gout. Garrod devised a rough method for the detection of uric acid in the blood, as follows: Two drams of blood serum are obtained from a blister, and 10 drops of strong acetic acid are added. These are mixed in a watch glass, and one or two linen threads are immersed in the mixture, and allowed to remain therein for 24 hours. At the end of that time the threads are examined with a low power of the microscope, and if there is excess of uric acid in the blood, numerous rhombic crystals of uric acid will be found on the thread. Apart from gout, an excess of uric acid in the blood has been observed in several other diseases, chief among which are anemias, leukemias, splenic tumors, malignant growths, pneumonia, malaria, endocarditis, and some forms of nephritis, and granular kidney.

GAS GANGRENE.—See War Surgery.

GAS, POISONING.—See Coal-gas.

GASTRALGIA. Synonyms.—Gastrodynia; cardialgia.

Definition.—A form of neuralgia of the stomach occurring at irregular intervals.

Etiology.—(1) Nervous temperament; (2) mental anxiety; (3) certain habits, as the tobacco-habit; (4) certain diseases, as anemia, gout, gastric ulcer, carcinoma; (5) abnormal action of stomach, causing hypersecretion or hyperacidity; (6) reflex from ovaries, uterus, or bladder. True idiopathic cases of gastralgia are perhaps rare.

The pathology is undetermined. It may be looked upon as a symptom, rather than as a definite disease.

Symptoms and Clinical Course.—Mental depression, headache, fullness in the epigastrium, great increase of saliva, may mark the onset of the disease.

Other cases are met in which these prodromes are absent, and there may be a sudden, sharp, agonizing cutting or boring pain, occasionally localized, but sometimes radiating throughout the entire epigastrium and relieved by pressure over that area.

The patient's forehead may be bathed in a cold perspiration, pulse small and irregular, the extremities cold, and all the outward manifestations of collapse supervene. The frequency of the attacks is variable with reference to periodicity, seeming to depend upon some peculiar condition of the system that brings about the crisis. Eructation of large quantities of gas, and nausea and vomiting may occur late in the attack. The paroxysms occur without reference to time of taking food; sometimes after a meal, and again in the early morning hours, when the stomach is empty. Considerable depression follows these attacks, and often there is a copious discharge of urine. The temperature may remain normal or be slightly subnormal. The bowels are usually constipated.

Diagnosis.

Gastralgia.	Angina Pectoris.	Cancer.	Ulcer.
1. Neurotic or anemic women.	1. Sex has no influence.	1. Sex has no influence.	1. Sex has no influence.
2. Pain occurs at irregular intervals.	2. Same as gastralgia.	2. Pain continuous.	2. Pain after eating.

Gastralgia.	Angina Pectoris.	Cancer.	Ulcer.
3. Pain in epigastric region, often extending toward right hypochondrium.	3. Pain in region of heart extending up neck and down left arm, which may feel numb.	3. Pain localized at all times: jaundice: high fever.	3. Localized pain.
4. Pain relieved by pressure or on taking food.	4. Pressure has no effect on symptoms	4. Pressure increases pain.	4. Pressure increases pain.
5. Often terminates with nausea, vomiting, and copious discharge of urine.	5. Same as gastralgia.	5. Copious vomiting some time after eating; material color of ground coffee.	5. Vomiting occurs soon after eating.
6. Food undigested and hyperacid.	6. Vomiting uncommon.	6. Undigested food or ground coffee appearance.	6. Vomitus often mixed with blood.

The prognosis for the immediate attack is favorable, but there is a great tendency to recurrence.

Treatment.—If the pain is extreme, with symptoms of collapse, morphin (1/4 grain) with atropin (1/125 grain) may be given hypodermically. Hot applications may be made over region of epigastrium.

Pepper and Tyson recommend:

℞. Chloroform, ʒ iv
Compound tincture of cardamom, ʒ iv
Aromatic spirit of ammonia, ʒ iv
Brandy, ʒ iv.

Teaspoonful every half hour until relieved.

℞. Codein sulphate, gr. iv
Antipyrin, gr. xl
Tincture of belladonna, ♏ xl
Simple elixir, ʒ iij
Peppermint water, enough to make, ʒ iv.

Tablespoonful every 3 or 4 hours.

℞. Compound spirit of ether, ʒ j
Compound tincture of valerian, ʒ j.

Teaspoonful every 3 hours.

Bicarbonate of sodium in hot water sometimes relieves the pain by neutralizing the excess of acid in the stomach. The following powder may be ordered:

℞. Calcined magnesia, gr. x
Sodium bicarbonate or potassium bicarbonate, gr. x
Anesthesin, gr. iij
Aromatic powder, gr. 1/2.

One powder every hour until relieved.

The galvanic current often gives relief quicker than drugs by the mouth. It is best to apply the anode, which has been heated, to the epigastrium, and kathode over spinal column in cervical region.

If anemia is present, elixir of the phosphates of iron, quinin, and strychnin (1 dram), 3 times daily after meals, is indicated.

GASTRECTASIA.—See Stomach (Dilatation).

GASTRIC NEUROSES.—It is difficult to attach precise limitations to the use of the term "gastric neuroses," owing to the fact that there is a class of gastric derangements that are undoubtedly functional in nature, but in which the chain of events leading up to their appearance varies so widely as to tempt the pathologist to separate them into different orders. There are objections to this, however, for the reason that the clinical picture presented is practically identical, even when the etiology and the previous history show a real difference in nature. The difficulty is still further increased by the fact that in certain affections the functional disorder seems closely allied to, and sometimes is actually associated with, definite structural changes in the digestive organs. Occasionally the process may be traced from a state that in the beginning was apparently purely functional, to one in which structural changes are unquestionably present. There would seem to be no doubt but that a functional disorder may lead to a structural disease. On the other hand, certain clinicians believe that sometimes the symptoms that are attributed to the neuroses are, as a matter of fact, symptoms arising in mild inflammatory processes, not easily recognized until the disease is considerably advanced.

Classification.—Perhaps the difficulty can be lessened and the real nature of the gastric neurosis made more evident by discussing the subject under two heads:

1. Gastric neuroses occurring as one of a series of manifestations in individuals who are distinctly neurotic, and that attacks are no more to be considered diseases of the stomach than is migraine a disease of the brain. This class comprises a varied array of conditions, such as nervous anorexia, bulimia, rumination, and nervous vomiting; yet, taken as a whole, instances of it are infrequent as compared with other functional stomach disorders.

2. Gastric neuroses associated with continued irritation of the nervous system, sometimes local and sometimes general, accompanied by diminished nervous resistance. This state is often secondary to physical or mental strain; to the exhaustion of one or more of the special apparatus of the body; to weakness, oversensitiveness, and depravity of the nervous system, such as results from lack of suitable physical exercise in the open air, unnatural emotional excitement, and other disobediences to hygienic laws. To this second class belongs the great majority of those functional derangements of digestion that are usually classified as gastric neuroses, and here may be found the causes of the disease with most of those individuals who confess to being victims of dyspepsia or indigestion.

Etiology.—The right understanding of this question is so important as guiding one to the

rational management of cases, that it should be closely studied. When the nervous system is subjected to excessive irritation, and when it is denied the proper opportunity for recuperation, it cries out in one of a number of ways. Headache, neuralgia, insomnia, lassitude, are common examples of this. The fact that gastric distress of some form is one of the most frequent of these complaints seems not to have attracted enough attention. Stomach symptoms are often so prominent that indigestion is regarded as the real trouble, and to this the other evidences of depreciated health are attributed. While the stomach derangement undoubtedly adds much to the general discomfort and the further loss of health, it will be found, as a rule, that the gastric symptoms are secondary, and that the symptom-complex depends upon some common cause or causes to be ascertained. The mistake lies in looking to the stomach alone, whereas the individual as a unit should be studied if permanent relief is to be obtained. Very often the chief fault is to be found in brain irritation following too close application to study, or in continued mental tension, produced by business or social life. There is no one cause so important in this connection as eye-strain, particularly when the general health is at the same time below the standard.

It would appear that when eye-strain expends itself in headache it is less likely to produce gastric symptoms; in other words, headache, and disorders of digestion depending upon this cause, are less frequently associated than might be supposed. Often there is a history of previous headache, which has subsided to give way to dyspeptic symptoms. It seems reasonable to suppose that the stomach disturbances are the result of irritation reflected from the brain through the pneumogastric nerve to its terminal fibers in the abdomen. Remembering that the pneumogastric is a cranial nerve, the fact that the organs supplied by it may suffer through reflex action when the brain is irritated does not seem difficult to accept. The ocular errors most likely to give rise to gastric derangement are astigmatism and anisometropia. Hyperopic astigmatism more often than myopic leads to stomach disorders, particularly when the axes are unsymmetric or irregular. Anisometropia, even when slight, is competent to produce serious functional disturbance in the stomach. Imbalance of the ocular muscles is also commonly concerned.

Symptoms.—When a gastric neurosis is closely studied, it will be found that in some cases it is represented by symptoms of excitement and irritation, and in others by symptoms showing lack of activity and depression. It is, therefore, common to divide all cases into, first, gastric neuroses showing excitement; and, second, gastric neuroses showing depression.

In a given case the symptoms may at first denote excitement, to be succeeded by those showing depression, and occasionally the clinical pendulum swings back and forth from one of these states to the other. The stomach is seldom equally disturbed in all its activities at the same time. As a rule, it would be found that the disorder is chiefly one of motion, and, again, that sensation or secretion is mainly involved. Although it is true that two or more of these varieties of disturbances may be present at the same time, it is usually practicable to classify cases into motor neuroses, secretory neuroses, and the sensory neuroses. Any of these three may show either excitement or depression, as previously stated.

Motor Neuroses of the Stomach Showing Excitation

To this group belong spasm of the cardia, spasm of the pylorus, gastric spasm, gastric unrest, or hyperperistalsis, some forms of regurgitation, eructation, and vomiting.

Cardiospasm is often a symptom of local irritation at the cardia, and may occur in gastritis, round ulcer, carcinoma, etc. It, nevertheless, occurs as a pure neurosis, sometimes in the hysteric and sometimes in the neurasthenic. The effort to swallow solid food, and perhaps even liquids, is unsuccessful, owing to the sudden closure of the cardia. The food accumulates in the esophagus, and gives rise to sensations of pressure, distress, and, sometimes, palpitation of the heart and a feeling of apprehension. In aggravated cases the patient suffers from innutrition, and the neurosis is thereby exaggerated. This symptom is usually relieved by the passage of the stomach-tube. The attack may recur, but after the practice of gavage and treatment directed toward the general health the condition is overcome.

Pyloric spasm is more often associated with structural disease causing irritation at the pylorus, round ulcer being the most common. While it has been denied, there are good grounds for believing that it also occurs as a pure neurosis. The condition is followed by food stagnation, by increased acidity of the gastric contents, accompanied by a feeling of distress in the epigastrium, and sometimes by severe pain. The symptoms are relieved by vomiting. The stomach-contents show good digestion. There is usually an excess of hydrochloric acid, both free and combined. The condition is relieved by lavage, followed by physiologic rest of the stomach and rectal alimentation; by the application to the gastric mucosa of bismuth, cerium, ichthyol, resorcin, menthol, and other gastric sedatives; and by electricity. General faradization, hydrotherapy, and other measures directed toward the nervous state are of decided use.

The condition known as **gastrospasm**, in which the walls of the stomach violently contract, sometimes accompanied by pain, is similar in nature to the conditions described, and should receive similar treatment.

Gastric unrest, or hyperperistalsis, sometimes called *tormina ventriculi*, is an infrequent affection, characterized by unusually vigorous and frequent gastric movements that are excited by taking food, but that continue at times when the stomach is empty. Occasionally the peristalsis reverses the direction, the waves going from right to left. It differs essentially from the vigorous peristalsis

often to be seen through the stomach-wall in cases of gastrectasis from pyloric obstruction. Occasionally, however, in cases of gastroptosis, it is possible to see as well as to feel the movement of the stomach during the violent contractions. Like the other conditions of excitement, it requires local sedatives, a bland and unstimulating diet, and measures looking toward the improvement of the nervous equilibrium.

Rumination, or merycismus, usually begins as a neurosis, and presents features that suggest a psychosis. The habit, once established, is broken with difficulty. The patient regurgitates food before peptonization has occurred, and remasticates like a ruminant. It is, at times, a purely hysteric manifestation, and subsides under appropriate treatment. It requires a psychic treatment as well as measures addressed to the improvement of the general health.

Nervous eructation, or the upward discharge of gas from the stomach, and regurgitation—that is, discharge of the ingesta through the esophagus—may result from great irritability of the gastric mucosa, from disturbance in structure, or from purely nervous causes. It is at times difficult to determine to what extent the matter is to be attributed to the violence of the contractions of the stomach, and to what extent to weakness in the sphincter-like power of the cardia. When it is owing to a relaxed cardia, the disturbance is, of course, one of depression rather than of excitement.

Nervous Vomiting.—One of the most common, and at times unmanageable, of this class of affections is nervous vomiting. It is usually seen in neurotic women, and occasionally occurs with almost cyclic regularity. It is excited by mental disturbances, and often depends, at least partly, upon exaggerated eye-strain. As a rule, the gastric chemistry is without special fault, although at times hypochlorhydria or hyperchlorhydria is present. Gastric juice, with fragments of food or drugs, mucus (sometimes blood-stained), and at times bile, are discharged after exhaustive efforts. It is sometimes difficult to differentiate between this affection and the vomiting of pregnancy, disease of the pancreas, certain forms of uremia, and gastric crises dependent upon disease of the cord. The diagnosis is reached by the process of exclusion. Much judgment is required in the treatment of this condition. When it depends upon eye-strain, prompt relief sometimes follows the paralysis of the accommodation by a mydriatic. All substances should be withheld from the stomach, and rectal alimentation practised. The nervous system should be kept at rest, which is usually possible by chloral or chloralamid by the rectum. When there is an hysteric element, mistura asafœtidæ should be added. Occasionally the only relief obtainable is by keeping the patient temporarily under the moderate influence of morphin used hypodermically. Often gastric lavage with very hot water, and local treatment through the tube by sprays of menthol, chloroform water, and other substances having a soothing action, prove effectual.

Motor Disturbances Depending upon Depression

Relaxation of the Cardia.—This weakness shows itself sometimes intermittently, sometimes almost continuously, and the chief symptoms are the upward discharge of food and gas from the stomach as soon as that viscus begins its peristalsis. Various degrees of relaxation may exist. Recognizing that belching accompanies the distention of acute indigestion, the patient erroneously attributes the eructations to flatulence. Many instances of so-called water-brash and belching depend upon relaxation of the cardia. Occasionally, in nervous belching the air is swallowed as fast as it escapes, a condition somewhat different from cardiac relaxation.

Relaxation of the pylorus is a common condition, often associated with achylia gastrica, and sometimes seen when the secretion of the stomach is normal. As a result of pyloric incompetence the ingesta are pressed on into the duodenum without being properly changed by gastric juice. A sensation of emptiness and hunger is frequently present.

Atonic dyspepsia, or myasthenia gastrica, is commonly the result of degeneration of the gastric muscle or of lowered innervation of the stomach. Like relaxation of the cardia and pylorus, it may also occur as a neurosis. It may or may not be associated with the last-mentioned conditions. As a rule, not without exception, the gastric secretions are diminished. As a result of the weakened gastric movements the stomach-content is too long retained, so that some food will be found present from 7 to 12 hours after a meal, when the stomach should be empty in from 4 to 7 hours after eating. This laziness of the stomach leads to anorexia and gastric distress, sometimes nausea, the accumulation of gas, and the whole group of symptoms usually called dyspeptic. There is loss of flesh and strength; it is often associated with neurasthenia; it responds to treatment more quickly than those instances of myasthenia dependent upon disease of the walls of the stomach. For this, as well as for the preceding conditions, the most useful therapeutic measures are gastric faradization, douching of the stomach with alternating hot and cold water, and the external application of hydrotherapy, electricity, and massage, and life in the open air. Strychnin is the most valuable drug, and may be employed in large doses. Physostigma, the carminatives, and simple bitters are useful adjuvants. The relief of an accompanying neurasthenic state is indispensable.

Secretory Neuroses

Hyperchlorhydria is an important disturbance of secretion depending upon a neurosis. The quantity of gastric juice need not be greater than normal, but the percentage of hydrochloric acid, free as well as combined, is in excess of physiologic requirements. The amount of free hydrochloric acid present in pure stomach-content is the criterion upon which, by chemic methods, the diagnosis is made. Just what the standard should be is a matter of discussion. The physiologic limit has

been called 0.24, and when the free acid occurs in greater abundance, hyperchlorhydria is said to exist. Recently a number of clinicians have felt that this standard is too high, and they believe that many persons develop the symptoms of hyperacidity when the total free acid rises above 0.14 or thereabouts. The exciting causes of hyperchlorhydria, aside from local irritation, such as gastric ulcer, are lodged in the vagaries of the nervous system. It is usually assignable to nervous strain, and is not infrequently accompanied by ocular errors. Hayem and his followers believe that hyperchlorhydria is a symptom of parenchymatous gastritis, basing this belief upon postmortem studies and upon microscopic examinations of fragments of the mucosa vomited or withdrawn by aspiration. This view has not met with uniform acceptance, but may be true in a comparatively limited number of cases. Hyperchlorhydria is a frequent manifestation, and produces a train of suggestive symptoms. From 1 to 3 hours after meals there occurs a gnawing, burning sensation in the epigastrium, which is often accompanied by eructations of gas or by water-brash. When regurgitation or vomiting occurs, the fluid is intensely acid. The symptoms are usually relieved by eating, but are aggravated by acids, condiments, and all substances that excite gastric secretion. The one symptom—that of distress some hours after eating, which is relieved by taking bland food—is indicative of this disorder. However, the diagnosis must rest upon a chemic examination of the STOMACH-CONTENTS (*q. v.*) withdrawn 1 hour after Ewald's[1] test-breakfast or 3 hours after a test-dinner.[2]

If it is found that more than 6 c.c. of decinormal sodium hydrate solution are required of the gastric filtrate, and that the total free hydrochloric acid is above 0.20, and particularly if free hydrochloric acid is found during fasting, the existence of hyperchlorhydria is established. Usually starch digestion is suspended. This neurosis is sometimes confounded with ulcer, from which it may be distinguished by the absence of localized tenderness and pain, gastrorrhagia, and also by the fact that pain and distress are relieved, rather than exaggerated, by eating.

Hyperchlorhydria is occasionally accompanied by dilatation of the stomach. When true, it probably results from spasm of the pylorus following hyperacidity. Excess of free hydrochloric acid occurs in stenosis from the retention and concentration of gastric juice, but under such circumstances there is found more or less food stagnation. This troublesome affection is fortunately amenable to treatment. The exciting causes should be sought for and removed, the diet should be bland, and the meals frequent; the patient should have mental and physical rest. A milk diet alone is sometimes sufficient to effect a cure. In most cases remedies are needed, and the most important are alkalies and sedatives. A combination of cerium oxalate, bismuth subcarbonate, and light magnesium carbonate, whipped up in a little water, or in the form of the hydrate, is most serviceable. Sodium or potassium bicarbonate assures prompt but temporary relief. It must be given in large doses, from 1/2 dram to 2 drams, and frequently repeated. Its effects are transient. It is well to dilute the stomach-contents with an abundance of water not too cold. Nitrate of silver in 1/4-grain doses, three times a day, may be given for short periods. As the patient improves, the milk may be omitted during a portion of the day, when a meal of albuminoids, preferably beef or mutton, may be allowed. Patients do best upon an amylaceous and milk diet, provided the excess of acid is controlled.

[1] An ordinary sized breakfast roll and eight or ten ounces of water.

[2] From four to six ounces of beef finely minced. a roll, and eight ounces of water.

Reichmann's disease, or **gastrosuccorrhea periodica,** and also **gastrosuccorrhea chronica,** are functional disturbances in which there is either periodic or continued flow of gastric juice in excess. The so-called Reichmann's disease is characterized by the profuse secretion of gastric juice, occasionally highly acid, most likely to occur between meals and with an empty stomach. The attacks are accompanied by distress or pain, often with headache and vomiting. The vomitus is usually transparent, abundant, and acid, and examination shows it to be practically pure stomach secretion. The patient is usually found to have suffered from mental exhaustion. The French believe that the accumulation of gastric juice follows temporary pyloric obstruction. Relief follows the emptying of the stomach (lavage), the administration of antacids and alkalies, as in hyperchlorhydria, the taking of frequent and unstimulating meals (milk diet), and improvement of the general tone of the patient. Rest of the nervous system is of the utmost importance.

Hypochlorhydria is one of the most interesting of the gastric neuroses, and may be said to exist when the total free HCl is habitually below 0.04 at a time when it should be 0.10 or 0.15. In nature hypochlorhydria is closely associated with achlorhydria, in which there is complete disappearance of free hydrochloric acid, and is also nearly related to achylia gastrica, in which occurs the disappearance of digestive gastric juice. Many cases beginning as hyperchlorhydria descend through the scale until a condition of chronic achylia gastrica has developed. In not a few cases it has been shown that the lowered secretion is preceded by a period in which there are gastric excitement and hyperchlorhydria. In some cases there will at times be an absence of free hydrochloric acid, and at others, under precisely the same conditions, it will be present in excess. See ACHYLIA GASTRICA.

Hypochlorhydria depends upon depression of the nervous system, and there appears to be a special exhaustion of the secretory nerves of the stomach. The stomach often empties itself prematurely, and may be found without contents in from 1/2 to 1 hour after eating. The rapid gastric peristalsis is, in certain cases, followed by an equally marked intestinal peristalsis, and, as a result, lienteric diarrhea develops. While it is true that hydrochloric acid disappears from the stomach as a

result of gastritis and other diseases of structure, it has been shown that the condition exists as a true neurosis, but is accompanied by depression or exhaustion. The condition yields to treatment if applied sufficiently early. The most useful local measure is the application of electricity by the gastric electrode, using either the faradic current or the continuous current with slow interruptions. Besides this, the needle bath, massage, and medical gymnastics are of great use. The alternate hot and cold intragastric spray is serviceable. One c.c. of the dilute hydrochloric acid should be given, and repeated at intervals of a half hour for 2 or 3 doses. Preceding the meals, nux vomica, capsicum, and the carminatives are of service. Although such patients often retain their weight, they do not when diarrhea occurs; therefore, the disease should be combated, and astringents are often necessary.

Sensory Neuroses

Hyperesthesia is a common condition, depending upon excitement. It is often present in hysteria and neurasthenia, in which the symptoms may very from discomfort to unbearable distress; it is made worse by taking food, either solid or liquid. The diagnosis is reached by excluding organic disease of the stomach, and the treatment should be directed to the improvement of the nervous system, the local application of electricity, the administration of sedatives and analgesics, and a bland, unstimulating diet.

By the term GASTRALGIA (*q. v.*) is meant extremely severe pain in the epigastric region, usually paroxysmal in character, and, as a rule, accompanying a neurotic state. The pain somewhat resembles that of peptic ulcer, but is more diffuse, not necessarily related to the time of eating, lacks the point of local tenderness, and is often relieved by electricity and stimulating local treatment. It is often a most intractable affection, particularly when connected with disease of the central nervous system. It is sometimes mistaken for angina pectoris, and for hepatic, pancreatic, or appendicular colic. The best treatment is the application of the continued electric current by the gastric electrode, the anode applied internally; douching with water at a temperature of 105° F.; spraying with a solution of menthol, oil of cinnamon, or chloroform water; and by the administration of bismuth subcarbonate, cerium, and other gastric sedatives. In severe cases anodynes are necessary for the relief of pain.

Hyperorexia signifies an exaggerated appetite, which is not satisfied by eating. It differs from bulimia, in which not only is the appetite voracious, but in which the patient eats enormously. The latter condition is sometimes based upon a disturbed mentality.

Among the functional disturbances depending upon depression may be mentioned **parorexia**, in which the patient has a desire—sometimes almost uncontrollable—for unusual and, occasionally, disgusting articles of diet. The condition is occasionally a real psychosis.

A more common affection is that known as **anorexia**, in which appetite diminishes, and, as a result, the patient loses flesh and strength; it is occasionally a very trying condition, and its relief is procured by forced feeding, sometimes by the practice of gavage.

Another condition belonging to this class is **nausea without vomiting.** It is undoubtedly a neurotic state, and may occur when the digestion is undisturbed. Real relief may be had only by improvement of the disturbed nervous system. Measures otherwise directed may produce temporary relief, and are useful in occupying the patient's attention.

GASTRITIS, ACUTE. Synonyms.—Acute catarrhal gastritis; acute gastric catarrh; acute dyspepsia; gastric fever.

Definition.—Acute inflammation of the stomach.

Etiology.—(1) Indigestible food; (2) insufficient mastication of food; (3) alcoholism; (4) certain diseases, as scarlet fever, yellow fever, etc.; (5) some drugs, as quinin in large doses, arsenic, antimony, etc.; (6) pregnancy.

Pathology.—The mucous membrane is swollen, often showing minute hemorrhages. The surface of mucosa is covered with a tough, clear-colored or reddish secretion. When the epithelium remains intact, bacteria are absent in the mucosa; but if detached, the organisms soon invade the deeper tissues.

Symptoms and Clinical Course.—There is fulness or tightness across the epigastric region, with a sense of discomfort until relieved by eructation of gas. In the later stages the gas may not all be expelled, causing a general restlessness. Often there is eructation of a bitter, sweet, or sour fluid, and with it particles of undigested food, especially observed in the morning.

The tongue usually has a thick whitish coating and the breath is offensive. The appetite is lost, and there is often loathing of all varieties of food placed before the patient. The pulse is small and rapid.

The nervous symptoms are: Headache, indisposition to exertion, palpitation of the heart, excessive sweating, and, in children, delirium and loss of consciousness. In a large proportion of cases fever may be entirely absent, but when the process is progressive, the temperature may remain elevated for several days, often simulating typhoid fever during the onset.

The duration of an attack of acute gastric catarrh is usually from 4 to 5 days. Analysis of the gastric contents after a test-breakfast shows a deficiency of hydrochloric acid and pepsin, with retarded motor power of the stomach. See STOMACH-CONTENTS.

Diagnosis.—After the fourth or fifth day typhoid fever may be excluded. In malignant diseases, such as carcinoma, there is usually a cachectic appearance and more pain, with deficiency of hydrochloric acid in the gastric contents. In gastric ulcer pain is pronounced, especially after eating, and there are frequent attacks of hematemesis.

The prognosis is favorable.

Prophylactic Treatment.—Avoid trauma from

constant pressure, such as tight lacing. Guard against sudden chilling of the body, especially after a hearty meal.

Dietetic Treatment.—In acute attacks, when everything is rejected, it is a good policy not to introduce anything to increase the irritation. Both solids and fluids are often quickly ejected.

In many cases a total abstinence from all solids for a period of 24 hours will give relief.

Administration of liquids should be so regulated that the intervals may be of sufficient length to allow the disabled organ to perform its proper functions.

During the first day or two milk, soup, or beef-juice should be given, and when the stomach becomes more tolerant, a small amount of solids may be allowed.

Medicinal Treatment.—At the time of onset an emetic should be given, as recommended by Ewald and Boas:

℞.	Powdered ipecac,	gr. xxiij
	Antimony and potassium tartrate,	gr. 5/6.

Take at once.

In children the syrup of ipecac (1 dram) is advised. Apomorphin (1/6 grain) hypodermically acts quicker than other emetics, and is valuable.

Locally, hot applications to the epigastrium are comforting. When there is much fever, cold applications are best. After from 24 to 36 hours have elapsed from the onset of the symptoms, the following may be given:

℞.	Calomel,	gr. jss
	Cerium oxalate,	gr. xx
	Bismuth subnitrate,	gr. xl.

Make 6 powders; 1 every hour.

When there is hyperacidity of the stomach, alkalies are useful, such as magnesium carbonate (5 to 10 grains) or sodium carbonate (4 to 7 grains), repeated every 3 or 4 hours. In some cases Hemmeter recommends evacuating the stomach by means of a rubber tube, and subsequently introducing:

℞.	Thymol,	gr. viij
	Boric acid,	ʒ iv
	Warm water,	Oj.

Lavage fluid.

When the vomiting is so severe as to produce symptoms of collapse, morphin (1/4 of a grain) with atropin (1/125 of a grain) should be given hypodermically. See Lavage.

GASTRITIS, CHRONIC.—A chronic inflammation of the stomach that may be parenchymatous or interstitial.

Etiology.—Chronic gastritis occurs most commonly in men, owing partly to the fact that their stomachs are greatly abused. It is a disease that is present usually after middle life, because diseases to which it is secondary more frequently exist at that age. The affection sometimes follows acute gastritis, or may result from frequent attacks of subacute inflammation depending upon infections, dietetic errors, or alcohol. Excessive use of tobacco, especially when the juice or the leaves are swallowed, is likely to cause it. Large quantities of tobacco-leaf have been washed from the stomach of a man who had a habit of carrying an unlighted cigar between his teeth and slowly chewing it. Excessive use of alcoholic drinks or of highly seasoned or coarse, irritating foods or condiments sometimes induces the disease.

As chronic gastritis is essentially a secondary affection, the primary or predisposing causes, aside from those mentioned, may be classified as: (1) Unhealthy state of the mouth, nose, or throat, such as dental caries or ozena; (2) chronic heart-, lung-, or liver-disease, causing passive congestion of the stomach; (3) chronic toxemia or wasting disease, such as gout, diabetes, tuberculosis, grave anemia, nephritis, syphilis; and (4) organic diseases of the stomach: for instance, carcinoma or gastrectasia. Gastritis may also result from long-continued functional disturbance, as has been emphasized by Stockton, who considers that obstinate functional failure frequently leads to structural change; in this connection the question of the trophic nerve supply is interesting.

Morbid Anatomy.—The macroscopic appearance of the mucous membrane shows a large amount of mucus lying upon its surface, though some cases lack the mucus, owing to the total obliteration of the muciparous glands. The lining of the stomach is pale or dark bluish-red, or grayish and pigmented, according to the extent of congestion and capillary dilatation, or of the opposite condition, connective-tissue increase and obliteration of minute blood-vessels. The most marked congestion and thickening are seen at and near the pylorus. The gastric wall is thick in some cases and thin in others, while the organ is small in some and dilated in other instances. Occasionally, the pyloric orifice is considerably narrowed by inflammatory hyperplasia and thickening of the coats of the stomach at that point; this may be so extensive as to cause stenosis and gastrectasia. The surface of the stomach is smooth and shining in some cases, but in other instances there are numerous elevations (teat-like, "état mamelonné"), giving rise to a marked irregularity and roughening. Minute ulcers or erosions of the mucous membrane are sometimes seen.

Microscopically, in the catarrhal form the glands appear dilated and cyst-like, and show an irregular distribution. The glandular cells are swollen and in a state of fatty degeneration, and the parietal and principal cells are not distinguishable. Some of the glands have narrowed necks, and the mouths of the ducts are filled with desquamated cells and mucus. The interglandular structure is the seat of round-cell infiltration. In some places a mucoid degeneration of the glandular cells takes place (Ewald, Einhorn, and others).

If the process continues long enough, the secreting portion of the stomach is entirely obliterated. This occurs in two ways: In one the morbid change

begins in the glands (parenchymatous), and their cells disappear by fatty degeneration, their places being usurped by interstitial tissue, until, finally, the stomach lining is thin, smooth, and shining. This process extends from the upper part downward to the submucosa. The other process is fibrous, proliferation beginning in the deeper layers and extending upward, constricting and destroying the glandular structure. In the latter form the gastric wall is often very thick and the capacity of the stomach is small (cirrhosis ventriculi).

Symptoms.—The disease may exist for a considerable period of time without symptoms, and when these supervene, they are likely to be indefinite and changeable; indeed, almost any symptom of the various gastric neuroses may, at times, be present in chronic gastritis. It is impossible to diagnose the disease by symptoms alone. Usually the patients are poorly nourished, pale, sallow, and thin; the weight may, however, be maintained at a certain point for many years. Fatigue is easily induced, and the muscles are small and flabby. Anorexia is marked and persistent in some cases, but parorexia, or excessive appetite, may be present in others. The tongue is usually coated brownish-gray from tip to base, especially in the morning on rising. Cankered mouth is of common occurrence. A sweetish, unpleasant taste is often complained of, and the throat feels irritable and husky. Hemmeter emphasizes the point that pharyngitis, glossitis and gingivitis not infrequently exist; thus the breath may be offensive. The gastric symptoms usually consist of a feeling of weight, distention, and distress after meals, especially when too much food has been taken. Pain is not common; if present, it is usually dull, and is aggravated by food, especially when this is of an irritating character. Vomiting in the morning is likely to occur, especially in those who use alcohol to excess. Vomiting also takes place after meals in some cases. Nausea may be frequent and persistent; eructation and regurgitation are not uncommon. In some instances the ingestion of food is followed by dull headache and a feeling of general nervous distress. Constipation is usually quite marked. In cases with greatly impaired gastric digestion diarrhea, from secondary over-taxation, irritation, and catharrhal inflammation of the intestines, is likely to occur (Allen Jones, Joseph Wiczkowski, and others). Constipation often alternates with diarrhea. Insomnia and depression of spirits are common. The urine will probably be superacid, scanty, and hyperlithic. The skin is loaded and sluggish.

Examination of the Stomach.—In thin women more or less gastroptosis and nephroptosis are often found, and the stomach may be somewhat enlarged, owing to the atony of its walls or to hypertrophic pyloric stenosis. As a rule, however, there is not gastrectasia or ischochymia.

One hour after an Ewald test-breakfast, consisting of a roll and water, or 3 hours after a test-meal of broiled, finely scraped meat-ball, bread, and water, the gastric contents contain no free HCl, but combined HCl is present; lactic acid is usually absent; butyric and acetic acids are seldom found. The proteoses are present, showing digestion of albumin. Rennet ferment and rennet zymogen are much diminished, as has been specially pointed out by Boas, and also by Friedenwald. Achroodextrin and sugar are usually found. See STOMACH-CONTENTS.

At the first examination of the stomach-contents there is usually an excessive quantity of mucus holding food elements in its meshes. The amount of mucus varies, being large in some cases and quite small in others. In the form described as "chronic mucous gastritis" there is an abundance of mucus, whereas in many cases of glandular gastritis, and also of the sclerotic form, there is very little. The total acidity of the gastric contents is subnormal. Microscopically, epithelia, leukocytes, mucus, food elements, and ordinary bacteria are found, with the addition of red blood-cells and minute fragments of tissue in case there is ulceration or erosion. Boas describes a form of chronic gastritis in which a copious secretion of mucus and HCl exists. In this acid gastritis the problem is much the same as that presented by hyperchlorhydria, and treatment for the latter usually relieves the former. In these cases a secretory neurosis probably exists, accompanied by an inflammatory element. From simple chronic gastritis, with only moderate impairment of the secretory function, there are all gradations to complete atrophy, in which stage and form the food is washed from the stomach wholly undigested, appearing as though merely water-soaked. Crust of bread floats on the wash-water, and there is, as a rule, but little mucus. Hydrochloric acid, free or combined, is absent, lactic acid and lactates are present if taken preformed in the food; other organic acids are absent; pepsin and rennet, also their zymogens, are absent; starch digestion is carried on, provided mastication is thorough, and saliva is plentiful and active.

As will be readily seen, there can be no hemialbumose or peptone in such contents, and the total acidity is from 2 to 5 percent: merely the acidity of the food taken. The gastric contents correspond in this condition, stage, and form of gastritis to the pathologic state, and there is "anadenia gastrica" (Ewald) and "achylia gastrica"—no gastric juice—(Einhorn). Allen Jones has described the condition under the caption "Gastric Anacidity." Reichmann, of Warsaw, in discussing the diagnosis of gastritis atrophicans, speaks of the occurrence of painful sensations in the abdomen, nausea, and regurgitation of 50 to 100 c.c. of an alkaline fluid containing serum, albumin, and mucus.

Diagnosis.

CHRONIC GASTRITIS.	ULCER OF THE STOMACH.	CARCINOMA OF THE STOMACH.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*
1. Due to indiscretion in diet and to mental anxiety.	1. Often due to mechanic injury or to bacterial invasion.	1. Tendency inherited.
2. Any period of life.	2. Most cases occur between ages of 20 to 40.	2. Usually after fortieth year.

Chronic Gastritis.	Ulcer of the Stomach.	Carcinoma of the Stomach.
3. Onset slow; gradual loss of flesh and strength.	3. Onset slow; gradual loss of flesh and strength.	3. Frequently develops rapidly after metastasis has occurred; rapid cachexia and emaciation.
4. Pain diffused over epigastric area, generally occurring after eating.	4. Localized pain in stomach after eating.	4. Localized pain at all times.
5. Morning nausea and vomiting of a fluid containing particles of undigested food, alkaline in reaction.	5. Vomiting occurs soon after eating.	5. Copious vomiting of material a long period after eating; vomitus has a "coffee-ground" appearance.
6. Hemorrhage rare.	6. Hemorrhage is common.	6. Hemorrhage is common.
7. Normal temperature.	7. Temperature slightly elevated.	7. Temperature elevated.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*
1. Inspection negative; palpation often detects enlarged stomach; percussion yields increased area of dulness.	1. Inspection negative; palpation determines position of localized tenderness; percussion confirms palpation.	1. Inspection often detects an enlargement or tumor; palpation confirms inspection; percussion confirms inspection and palpation.
2. Examination of contents of stomach 1 hour after a test-breakfast shows free HCl normal or absent.	2. Examination of contents of stomach 1 hour after a test-breakfast shows free HCl in excess.	2. Examination of contents of stomach 1 hour after a test-breakfast shows free HCl absent.
3. Examination of blood shows slight reduction in red cells, hemoglobin, and leukocytes.	3. Examination of blood shows moderate reduction in red cells, hemoglobin, and leukocytes.	3. Examination of blood shows severe anemia with leukocytosis.
4. Absence of cancerous fragments in vomitus.	4. Absence of cancerous fragments in vomitus, unless due to cancer.	4. Cancerous fragments sometimes present in vomitus.

Prognosis.—The prognosis of chronic gastritis depends upon the stage the affection has reached. If treatment is commenced early, the outlook is very good, though a considerable time is usually required to restore the integrity of the stomach. If atrophy has taken place, the prognosis is grave so far as restoration of structure is concerned, though treatment may improve the function both of the stomach and intestines. The outlook often depends upon the primary cause of the disease.

Treatment.—The treatment of the cause should receive first attention. If there is cardiac incompetence, the Nauheim treatment or digitalis and strychnin will be useful; if there is gout, rheumatism, or syphilis, salines, alkalies, mercury, or the iodids should be employed. The diet should be restricted to the tender meats delicately cooked, tender chicken, turkey, or other fowl, fresh fish (not too fat), sweetbreads and animal jellies, very soft-boiled or poached eggs, thoroughly cooked white bread, rolls, zwieback and wafers, vegetables (well cooked, and, preferably, rubbed through a colander), avoiding cabbage and those that are indigestible. Soups, consommé, bouillon, and purées are advisable, provided they are not rich, greasy, acid, or highly seasoned. Milk agrees in some cases and positively disagrees in others. Bulkley, of New York, urges taking the milk warm and fresh an hour before meals on a supposedly empty stomach, with the hope that it will be absorbed directly as an alkaline fluid, and not be precipitated by rennet and go through the stages of gastric digestion. In chronic gastritis this should be tried, and soda may be given with the milk to render it distinctly alkaline. Peptonized milk should be employed in some cases. Pickles, sauces, salads, condiments, pastries, cakes, excessive amounts of alcoholic drinks, nuts, raisins, ices, etc., should be avoided.

Hemmeter allows a small quantity of whisky or brandy, because of Chittenden's and Mendel's observations in regard to their stimulant action on gastric digestion, but most clinicians interdict the use of alcohol in any form; it should rarely be allowed. Mastication should be very thorough; the teeth should be regularly cleaned with antiseptic tooth-washes, and should receive a dentist's attention regularly every few months. Meals should be regular, and should be preceded and followed by a quarter or a half hour's rest, if possible. The stomach is to be favored, and it is better that 4 to 5 small meals be eaten each day than that the organ should be overtaxed at any one meal.

Hygienic living is extremely important. It is necessary that the patient should take the proper exercise out-of-doors, not, however, inducing fatigue. Cold spinal douches, cold affusion, shower bath, salt-water bathing, and other tonic hydrotherapy will be beneficial. In gouty or nephritic cases thermal or Turkish baths are indicated.

Massage and gymnastics are useful, and general faradization improves innervation. An ocean voyage, travel, or a stay at the seashore or in the mountains is usually beneficial, provided the dietetic regimen is not seriously interfered with. The bowels should receive proper attention, and a desire to evacuate them should not be disregarded. Regularity in going to stool at a certain hour daily should be observed. By these measures alone much good may be accomplished, but it is usually advisable to employ local treatment and judicious medication.

Lavage is the most important of all measures. It should be practised 3 or 4 hours after a meal or before breakfast, and a normal salt solution should be used. After thoroughly cleansing the stomach, a weak silver nitrate, argonin, or protargol solution (2 grains to 8 ounces), or the aqueous fluidextract of hydrastis, or tannic acid solution, may be employed. Boric acid, borax, or Carlsbad salts make excellent solutions for the purpose of lavage; plain warm water is commonly used. The intragastric spray of menthol in albolene is often of benefit, especially in cases with gastric hyperesthesia or pain. Lavage should not be employed too often or too long: usually 2 or 3

times a week, unless practised before breakfast, in which case it may be done every day. Intragastric galvanism and faradism are useful.

Few drugs should be given, beyond nux vomica and strychnin, with, perhaps, quinin or cinchonidin and capsicum before meals, and hydrochloric acid after meals. Pepsin is indicated if there is serious impairment of gastric secretion. See Lavage.

℞. Dilute hydrochloric acid, ℥ j
Compound tincture of gentian, Aromatic elixir, each, ℥ iv
Water, enough to make ℥ iij.
Two teaspoonfuls after meals.

The compound tincture of cardamom or the simple tincture of calumba may be substituted for the gentian in the foregoing prescription.

℞. Tincture of nux vomica, ℥ ij
Fluidextract of cascara, ℥ jss
Glycerin, enough to make. ℥ iij.
Teaspoonful at bedtime.

℞. Pepsin, ℥ j
Dilute hydrochloric acid, ℥ jss
Simple syrup, ℥ iv
Water, enough to make ℥ ij.
Teaspoonful during or just after meals.

Neither hydrochloric acid, pepsin, nor the other remedies just mentioned should be given in cases of acid gastritis in which there are present a proliferation of the glandular cells, an increased secretion of HCl, with symptoms of hypochlorhydria; nor should the intragastric application of electricity be practised in these cases. On the contrary, the treatment in such instances should be sedative, including the exhibition of bismuth subcarbonate or subnitrate, cerium oxalate, and light carbonate of magnesia, preferably in the following formula:

℞. Oxalate of cerium, ℥ ijss
Subcarbonate of bismuth, ℥ ij
Carbonate of magnesium (light), ℥ iv.
Even teaspoonful stirred in water, between meals and at bedtime; more frequently if in pain.

Lavage with warm soda solution is excellent in these cases, and the diet should be nitrogenous.

The general management of chronic gastritis always demands careful attention, and the relations of morbid renal, hepatic, and intestinal conditions to the affection of the stomach should always be borne in mind. Thus, an occasional dose of blue mass or calomel, followed next morning by hot Carlsbad solution, is beneficial, and many patients are much improved by drinking mineral waters, both alkaline and saline. For the acid and in recent cases when the stomach shows no late serious changes, alkaline waters may be chosen; whereas in the cases showing depression of secretion, saline waters are, perhaps, to be preferred.

GASTRITIS, TOXIC.—An acute inflammation of the stomach due to corrosive poisons, such as caustic potash, sulphuric or nitric acid, arsenic, or corrosive sublimate.

Pathology.—The mucous membrane in many areas is detached, and localized spots occur in which a black eschar forms. If the case progresses to a sufficient degree, there may be fatty degeneration of the peptic glands, hemorrhagic spots, and subsequent ulceration.

Symptoms and Clinical Course.—There are intense thirst, nausea, and vomiting, the material often containing red blood-corpuscles. The pulse is small and rapid, the skin cold and clammy, and there are evident symptoms of collapse.

The prognosis is guardedly favorable.

Treatment.—If the nature of the poison is known, a chemic antidote should be given at once. In case of poisoning by arsenic the freshly prepared precipitate of ferric hydrate may be administered immediately. This antidote may be quickly prepared by the addition of magnesium carbonate (in fine powder) to the tincture of ferric chlorid. This precipitate requires no subsequent treatment before administration. If more time is permitted, it can also be prepared by the addition of ammonia water, collecting the precipitate on a filtering-paper and washing with water until the odor of ammonia is no longer detected. A tablespoonful of this precipitate, made in either manner, may be given every hour or two for 4 or 5 doses. If the poison is due to one of the corrosive acids, weak alkalies, such as lime-water, combined with olive oil, may be given. If it is due to alkalies, dilute acids (vinegar) will be indicated. In case of poisoning by mercuric chlorid the stomach-tube should be introduced and the contents removed at once. It is then well to give the whites of several eggs; allow to remain a few moments, then irrigate thoroughly. In the absence of white of egg a thick paste made of flour and water should be introduced and subsequently withdrawn in a few moments with the stomach-tube. After all the poison has been removed, a thick emulsion of gum arabic may be introduced.

Collapse will call for hot blankets, hot-water bottles, inhalations of nitrite of amyl, and hypodermic injections of strychnin, atropin, and tincture of digitalis. See Poisoning.

GASTRODIAPHANY.—A method of exploration of the stomach by means of the gastrodiaphane. This consists of a soft stomach-tube, at the gastric extremity of which is placed an Edison's hard-glass lamp, from which conducting wires, containing a current-interrupter, run to a portable storage battery. The stomach should be free from food and moderately distended with water. The gastric extremity of the gastrodiaphane, after being lubricated with oil or glycerin, is introduced into that viscus, and the circuit is closed. If no pronounced thickening of the anterior stomach-wall exists, transillumination in a dark room, with the patient erect, permits the outlines of the stomach to be seen as a zone of reddish hue on the abdominal wall.

GASTRODYNIA.—A mild pain in the stomach. See Gastralgia.

GASTROPTOSIS.—See VISCEROPTOSIS.

GASTROTOMY.—See STOMACH. (Surgery).

GAULTHERIA (Wintergreen).—The leaf of an American evergreen plant, *G. procumbens*, of which the oil and the spirit are official. The oil contains about 90 percent of methyl salicylate, and its physiologic action is almost identical with that of salicylic acid. It is volatile, of peculiar and aromatic odor, and sweetish and warm taste. It is successfully used as a substitute for salicylic acid; especially in rheumatic and gouty disorders, and does not so commonly disturb the digestion. It is best given in capsule or emulsion or dropped on a teaspoonful of sugar. Death has been caused by a 1-ounce dose. Dose, 3 to 10 minims.

The spirit of gaultheria is given in the dose of 1/2 to 2 drams. It contains 5 percent of the oil, and is used for flavoring.

℞. Ether,
Alcohol,
Oil of wintergreen, } each, ℥j
Soap liniment, enough for Oj.

Use as a liniment.

GAUZE.—Gauze is usually a sheer material, commercially known as cheese-cloth or tobacco cloth. Having a very open mesh, it absorbs well the materials with which it is impregnated, or the discharges from a wound when applied as a dressing. It can be easily obtained, is cheap, pliable, and forms a pleasant dressing when in contact with wounds. It is readily impregnated with various materials to render it antiseptic. Almost any variety of gauze may be obtained from dealers in surgical supplies.

The most common and generally employed is the **mercuric chlorid gauze,** which is prepared by soaking clean cheese-cloth, freed from all oily matter, in a solution of corrosive sublimate of the strength of 1:1000 for 24 hours. It is then cut into pieces of the desired sizes and packed in closely covered glass jars. If gauze has been kept long and exposed to the air, it is well to resoak it in a 1:2000 solution of mercuric chlorid before using Corrosive sublimate gauze, when applied in contact with a wound and covered with waxed paper or mackintosh, will sometimes irritate the skin. It should be anointed, therefore, with boric acid ointment or vaselin. In wound treatment two dressings are employed, the superficial and the deep, each usually composed of 8 layers of the gauze. Often the deep dressing is applied moist, and is much smaller than the superficial, which is preferably used dry.

Iodoform gauze is prepared by incorporating powdered iodoform into the meshes of sterilized gauze; it should then be carefully rolled up and packed in a glass jar. A mixture (5:50 percent) of iodoform and glycerin may be made, in which strips of gauze are immersed. This preparation is convenient for packing bone cavities, fistulous tracts, etc.

Carbolized gauze, the variety that was first introduced by Lister as a surgical dressing, is made by soaking clean gauze for a few hours in a mixture composed of: Resin, 1 pound; alcohol, 5 pints; castor oil, 24 ounces; carbolic acid, 12 ounces. The excess is removed by passing the cloth through a clothes-wringer and then packing away for future use in glass jars.

The double cyanid of mercury and zinc gauze is more difficult to prepare than the other varieties, requiring the following: Potassium cyanid, 130 grains; mercuric cyanid, 251.7 grains; zinc sulphate, 268.9 grains; hematoxylin, 1.3 grains; solution of ammonia, 6 minims; gauze (prepared, cleansed), 10 ounces; mercuric chlorid solution, 7.6 pints; distilled water, q. s. In charging gauze with this substance 100 grains of the salt are dissolved in 4 pints of a 1:4000 bichlorid solution, which will give from 2 to 3 percent of the cyanid to the dry gauze. It should be freshly prepared and used moist. The advantages claimed for it are that it is unirritating to the skin, and, as the antiseptic is insoluble, it is not soaked out by the wound discharges. A rubber dam should always overlay the dressing made of gauze, in order to diffuse the discharge and prevent its coming to the surface; the dressings should be changed as soon as soaking is apparent. See DRESSINGS.

GAVAGE (Forced Feeding).—Gavage consists of the forcible introduction of food into the stomach through a tube; it is a very simple procedure, and one that a nurse can easily be taught. It has a wide application among infants and young children, and the indications for forced feeding are many. It is of great value in the rearing of premature infants and of young infants or other children who are so weak that the effort of sucking and swallowing exhausts them, and who refuse to take the breast or bottle. It is extremely useful in persistent vomiting in infants, and in these cases, when they are unable to retain any food swallowed, they will frequently retain it when it is given through the tube.

This method of feeding is also useful when swallowing is interfered with by pain due to sore mouth or throat, in cerebral diseases, narcotic poisoning, and tetanus, in diphtheritic paralysis affecting the pharynx, and is frequently very useful in many of the acute diseases, as diphtheria, scarlet fever, or typhoid fever.

Apparatus and Method.—A soft-rubber catheter (18 to 24, French) is connected by a short glass tube and about 18 inches of rubber tubing to a glass funnel holding from 4 to 5 ounces. The child should be placed flat upon its back and the head steadied by an assistant. While the tongue is depressed by the forefinger of the left hand, the catheter is passed rapidly back into the pharynx and down the esophagus. About 10 inches of the catheter should be passed beyond the lips. The funnel is then raised for a few moments, to allow the escape of gas from the stomach, and the food is then poured into it, and, when the funnel empties, the tube is tightly compressed and quickly withdrawn. When withdrawn slowly or clumsily, it is likely to excite vomiting. In children who have teeth it is necessary to use a gag, to prevent the tube from being bitten, but in older children the

process is not so easy as in young infants, and not so generally useful.

Sometimes when there is great resistance to the introduction of the tube through the mouth, it may be passed through the nose. After feeding, the child should be placed upon its back, absolutely quiet.

The food should be partially or wholly peptonized, and the intervals of feeding should be considerably longer than when feeding is conducted in the ordinary way. The stomach should be washed before the first feeding, and thereafter at least once a day.

Gavage is also used in adults when, for any reason, food is not accepted by the mouth and rectal feeding is insufficient. See MEDICINES (Administration).

GELATIN.—An albuminoid substance of jelly-like consistence, obtained by boiling skin, connective tissue, and bones of animals in water. The glue of commerce is an impure variety.

Isinglass, or ichthyocolla, is the purest form of gelatin known. It occurs in horny sheets, is semi-transparent, iridescent, soluble in 24 parts of boiling water, and forms, on cooling, a transparent jelly. It is slightly nutritious, is used for clarifying liquids, and, in solution, as a test for tannin. The plaster is used as a protective. Gelatin is of especial value in the treatment of poisoning by iodin, bromin, and the alums, but requires too much time for its preparation, as it should be broken up, soaked in water for half an hour, and reduced to the consistence of honey.

Gelatin capsules are made in various sizes from 0 to 10, and are a convenient means for administering oils, balsams, or nauseous solids, and, when filled, may be swallowed as easily as a large pill. Castor oil, cod-liver oil, etc., are put into soluble elastic gelatin capsules, making a bolus that may be swallowed with little effort, as they are compressible and change their shape to suit the size and caliber of the passage. Ordinary capsules are filled by the aid of a paper funnel, with the end of a penholder used as a packer.

Gelatin culture medium, a jelly made by a solution of the best commercial food-gelatin in the proportion of 6, 8, or 10 parts to 100 water, with 1 or 2 parts of dried peptones or glucose (the latter not to be used if the culture is to be made on slides) for increased nutritive value. Bicarbonate of sodium is used to neutralize the acid reaction. This, in bacteriology, is known as *gelatin*.

Liquid gelatin is a substance for fastening paper to glass, wood, or paper; its formula is:

Gelatin or clear glue,	75 to 100 grams
Commercial acetic acid (No. 8),	100 c.c.
Water,	100 c.c.
Ninety-five percent alcohol,	100 c.c.
Glycerin,	15 to 30 c.c.

Crush the glue and put it into a bottle with the acid; set in a warm place and shake occasionally. After three or more days add the other ingredients.

Medicated gelatin is a soft basis consisting of gelatin 3, zinc oxid 3, glycerin 5, water 9 parts, to which antiseptic or other medicaments may be added. It is preferable to greasy ointments.

GELSEMIUM (Yellow Jasmine).—The rhizome and roots of *G. sempervirens*, a climbing plant with showy yellow flowers that grows in the forests of the southern United States, forming festoons from one tree to another. It contains a volatile oil, a resin, and two alkaloids, *gelsemin*, which forms crystalline salts and is only slightly active, and *gelseminin*, which is amorphous and highly toxic. Dose, 1/2 to 2 grains.

The preparations are the **fluidextract** (dose, 1/2 to 2 minims) and the **tincture** (strength 10 percent; dose, 5 to 15 minims). **Gelsemin** is an amorphous, colorless, inodorous, nearly insoluble solid, of intensely bitter taste and strong basic properties, neutralizing the strongest acids, and with them forming soluble salts. Dose, 1/60 to 1/20 grain. **Gelsemin hydrochlorid.** Dose, 1/134 to 1/33 grain.

Therapeutics.—Gelsemium is a powerful depressant to the circulation, acting particularly on the heart. It is a mydriatic of considerable power, causing wide dilatation of the pupil from paralysis of the oculomotor nerve. The drug is used in nervous headache and migraine, malarial fever, the early stages of pneumonia and pleurisy, asthma, whooping-cough, laryngismus stridulus and nervous cough, torticollis, and spasmodic dysmenorrhea. Eight grains of gelsemin to the ounce of water, instilled drop by drop into the eye every 15 minutes for 1 hour, and then every half hour, is an effective mydriatic, but more transient than atropin.

In facial neuralgia:

℞.	Tincture of gelsemium,	♏ xv
	Anise water,	ʒ j.

To be taken every 6 hours.

Poisoning.—The most prominent symptoms of gelsemium poisoning are ptosis and dropping of the jaw. Languor, relaxation, and muscular weakness precede. Temporary internal squint is sometimes present, and is caused by the paralyzant action on the sixth pair of cranial nerves. Sensation is impaired very late in poisoning, the pulse is rapid and feeble, the voice is lost, and death ensues from centric respiratory failure. The treatment of the poisoning consists in the administration of cardiac stimulants—as ammonia, atropin, and digitalis—the application of external heat, and the employment of atropin and strychnin hypodermically to stimulate the respiratory center. Emetics are to be given when the heat is not too much depressed, in which case the stomach-tube must be used.

GENERAL PARALYSIS OF THE INSANE.—See PARALYSIS (General).

GENTIAN.—The root of the yellow gentian, *G. lutea*, containing an active bitter glucosid that is crystalline and soluble in water; also an inert, amorphous body, gum, sugar, and a trace of volatile oil, but no tannin.

Gentian is a simple bitter, without astringency or aroma, its action corresponding to that of calumba, but it is more likely to disagree with the stomach. It is very serviceable in atonic dyspepsia, or in that connected with a gouty diathesis, in malaria, in hysteria, in jaundice, and

in ordinary convalescences. It makes an excellent vehicle for cod-liver oil. On account of the gentesic acid it is discolored by the addition of iron salts.

In hypochondriasis:

℞. Gold chlorid, gr. j to jss
Extract of gentian, gr. xv.
Make 30 pills. One thrice daily.

Preparations.—**G., Ext.** Dose, 1 to 5 grains; **G., Fluidextract.** Dose, 10 to 30 minims. **G., Infusum, Comp.**, unof., gentian 10, bitter orange-peel 2 1/2, coriander 2 1/2, alcohol 40, water to make 320. Dose, 1 to 2 ounces. **G., Mist., Alkalin.**, unof., diluted hydrocyanic acid 3 minims, sodium bicarbonate 15 grains, compound infusion of gentian to make 1 ounce. Dose, 1 ounce. **G. et Sennæ, Mist.**, unof., infusion of senna 3 drams, compound tincture of cardamom 1 dram, compound infusion of gentian 6 drams. Dose, 10 drams. **G., Tinct., Comp.**, contains gentian 10, bitter orange-peel 4, cardamom 1, diluted alcohol to make 100. Dose, 1/2 to 2 drams.

GENU RECURVATUM.—See **Genu Varum.**

GENU VALGUM (Knock-knee).—Knock-knee, or genu valgum, is the result of over-growth of the internal condyle of the femur or of the internal half of the head of the tibia or of absorption of the outer portions of these articulating bones and curving inward of the shaft of the femur at its lower part, or of the tibia at its upper portion. In this condition three bony deformities are found: the condyles of the femur differ in size; the articular facets of the tibia are unequal; the shafts of the bones may curve.

It is a deformity that manifests itself in infancy or at adolescence, and it is most frequent between the ages of 2 and 4, when it is usually due to rickets. In adults it is seen as the result of occupation. Attention is generally called to it when the child begins to walk. Flat-foot sometimes accompanies this deformity and stands in a causative relation to it. Knock-knee may affect one or both legs. Exceptionally, it occurs as the result of late muscular paralysis. Sometimes this deformity may be seen in one leg, while bow-leg occurs in the other.

The simplest and most reliable method to measure the amount of deformity is for the patient to sit upon a large sheet of paper, with the legs extended and the feet pointing upward; and then, with a pencil held perpendicularly to the paper, to trace the outline of the legs. From time to time similar tracings may be made, and in this way the patient's progress noted. Many cases of mild type undergo spontaneous cure, and under proper treatment the prognosis in all cases is good.

The diagnosis is easily made by inspection; however, it is always advisable for the patient to sit on a table or any flat surface, keeping the internal condyles together, and then to note the distance between the internal malleoli.

Expectant treatment depends largely on nature. Gratifying results are obtained in children who live in the country. Strict attention to diet and hygiene, and gymnastics that strengthen the leg-muscles are very essential. In rachitic knock-knee the child should receive the constitutional treatment for rickets. Daily manipulation of the legs, properly applied, is an important adjuvant not only of expectant, but also of mechanic treatment.

Mechanic treatment is called for in cases in which the expectant plan fails and when the deformity is pronounced. It is usually most efficient between the ages of 2 and 5, and the most brilliant results are attained in rachitic children whose bones are still somewhat soft, a condition which is quite satisfactorily determined by corrective manipulations. Beyond the age of 5 little or nothing can be accomplished by mechanic treatment. Many methods have been devised in order to correct the deformity by mechanic means. One method that is quite commonly used is for the child to sleep with pads between the knees, the feet being bound together. In mild cases building up the shoes from 1/8 to 1/4 of an inch on the inner side, so as to throw the weight toward the outer part of the foot, has proved itself to be an efficient method. Many forms of apparatus have been suggested, but the one most commonly used consists of outside steel uprights extending from the sole of the shoe to the crest of the ilium, with joints at the hip and ankle, or, if desired, only a joint at the hip. Perpendicular to the upright is a small bar, which is inserted into a steel plate just in front of the heel. At the upper end of the uprights is a steel waist-band, to hold the brace in place. A posterior bar from the popliteal space to the lower portion of the calf is joined to the side bar by means of cross-bands at each end. At a point opposite the knee is a leather pad, which is attached to the outside bar by straps, so that traction may be made in order to overcome the deformity. As the child becomes accustomed to the apparatus, the outside bar may be bent out so as to admit of greater force in drawing the knee toward this bar. A very convenient way is simply to bandage the knees daily to the outside and posterior bar. No motion must be allowed at the knee. When the child goes to bed, the shoes are removed and the apparatus is kept on. Mikulicz has reported some excellent results from the use of plaster-of-Paris; however, beyond the age of 5 years there is rarely any elasticity of the bones, or much, if any, yielding to lateral pressure at the knee; and, unless the bones yield to manipulation, but little, as a rule, can be accomplished by this means. In all cases in which apparatus is used the correction must be made gradually and gently.

Operative Treatment.—In the order of simplicity the operations are: (1) Manual correction under an anesthetic; (2) subcutaneous division of ligaments and tendons; (3) osteoclasis; (4) osteotomy.

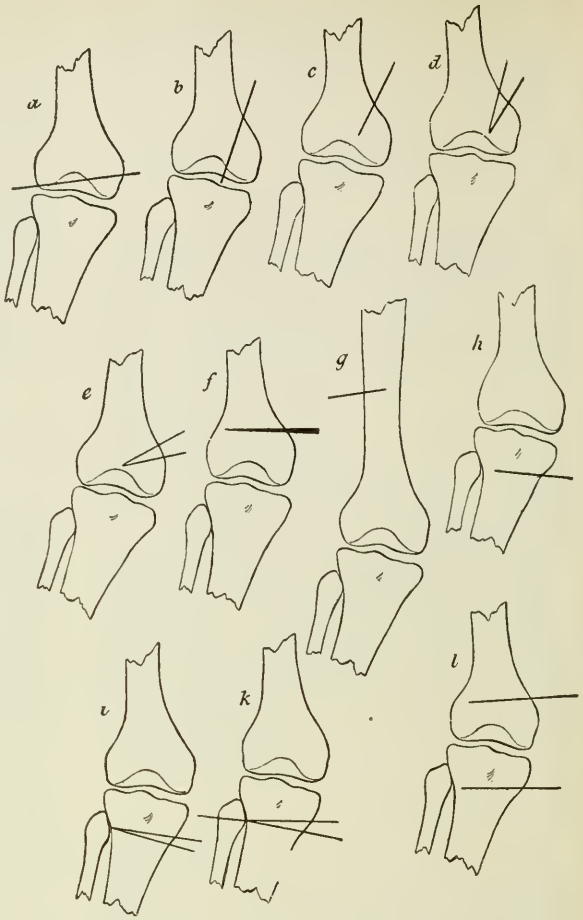
Forcible reduction of the deformity by manual pressure may be of value in children under 6 years, but after this age little can be accomplished. The operation is performed as follows: The patient lies on the back and the leg is rotated outward. The surgeon then bears his weight on the inner side of the knee until the deformity yields and can be rectified. The leg is then encased in plaster-of-

Paris, and at the end of two weeks this is changed; at the same time further correction is made without an anesthetic.

When the child is able to walk, mechanic support must be applied for at least two months. In performing this operation great care must be exercised in order not to injure the knee-joint, and cases have been reported in which the periosteum has been severely injured, and at times necrosis, superficial or deep, has resulted.

At the present day **subcutaneous myotomy and tenotomy** are rarely performed for the correction of the deformity in knock-knee, except possibly in cases that occur as the result of tumor albus and infantile paralysis, when it may be desirable to divide the biceps tendon, at the same time resorting to some straightening operation.

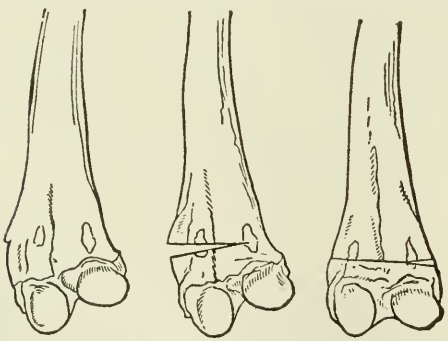
Osteoclasis is a method very frequently employed in these cases. It may be accomplished by the hands over a firm, hard object, such as a Koenig's block, or by the use of an osteoclast, such as Grattan's, Little's, etc. If manual correction is used, the limb is inverted and the point of resistance made above or below the knee on the inner aspect. The ankle and thigh are firmly grasped and downward pressure exerted sufficient to break the bone at the desired part. If the osteoclast is used, the leg is adjusted upon the two rests and the breaking lever applied over the point where fracture is desired. The force is then quickly applied by screw or lever (according to the type of osteoclast) and the part broken. It is then fixed in plaster-of-Paris and treated as an ordinary fracture.



Operations for Knock-knee.—(*Hoffa*).

a, Anuandale; *b*, Ogston; *c*, Reeves; *d*, Macewen's cuneiform osteotomy; *e*, Chiene; *f*, Mac wen's supracondyloid; *g*, Reeves; *h*, Billroth; *i*, Mayer; *k*, Schede; *l*, Barwell.

Osteotomy stands foremost among the operative procedures, particularly in the older cases. When done subcutaneously, it is practically devoid of any danger. The best osteotome



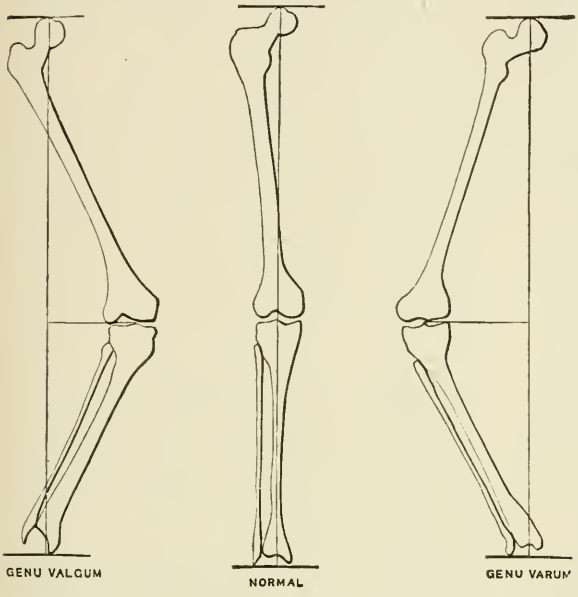
Macewen's Operation.

is one that has a sharp cutting-edge with square corners. Macewen's operation is performed as follows: The leg is rendered aseptic; the patient lies on his left side with the leg extended, the outer side of the knee resting on a sand-bag. An incision is made in the skin, and the osteotome is gradually forced into the bone on the inner side of the thigh, at a point 1/2 of an inch above the adductor tubercle; it is then turned at a right angle to the long axis of the femur, and successive blows are made with the mallet until the bone is divided through two-thirds of its thickness, when the osteotome should be gradually withdrawn, a piece of antiseptic gauze placed over the opening, and the fracture completed by manual force. An antiseptic dressing is then applied, and a plaster-of-Paris spica put on while the leg is held in a corrected position. Union takes place in about 4 weeks, and in 6 weeks the patient may be allowed to walk. If, however, the incision is made on the outer side of the femur, a green-stick fracture may be produced with less danger of displacement.

In some cases it may be found advisable for the patient to wear a brace for a few months following the operation, although this is rarely necessary.

When knock-knee occurs in adults, as the result of the patient being obliged to stand in a peculiar position for a certain number of hours each day—for example, in bakers—the treatment consists of confinement in bed with side splints applied to the leg, and subsequently a walking apparatus. This failing, osteotomy is indicated with probable tenotomy of the external hamstrings.

GENU VARUM (Bow-legs).—Genu varum, or bow-legs, is the name applied to the deformity that is the opposite of knock-knee. In general it is the result of an outward yielding of the long bones of the leg, especially of the tibia, and the anatomic changes found are those of rickets. **Anterior bow-leg** is forward curve of the tibia, generally associated with some lateral deviation. **Posterior bow-leg, or genu recurvatum,** is the reverse of anterior bow-legs. The greater part of the deformity will usually be found at the junction of the knee with the middle third of the tibia, but the exact location of the curvature can only be determined by placing the patient upon the edge of a table or chair, with the legs flexed at right angle and the knees and ankles in contact. If the curve is in the femurs, the thighs will be separated by a varying space and a like condition will be found between the tibias, but if both thighs and legs are in contact the change is in the knee-joints. It may begin before the child walks or stands, and is due to the tonic action of the muscles on the bones softened by disease. Early walking rarely causes bow-legs; as a rule, children in this condition learn to walk late. The symptoms of rickets are usually present, as bow-legs is essentially a rachitic deformity.



(Thomson and Miles' *Manual of Surgery.*)

The presence of the deformity is sufficient to establish the **diagnosis,** and it is much more conspicuous in the standing position. Its existence is further indicated by the turning-in of the feet and the rolling walk, and in well-marked cases of bow-legs the feet are in a condition of flat-foot. The only condition with which bow-legs is likely to be confounded is double congenital dislocation of the hip in young children, but there are many points of distinction that enable one to discriminate between them. In some cases of rickets an anterior bowing of the tibia occurs, angular in deformity, and usual at the lower third. Bow-leg is rarely observed on one side and knock-knee on the other.

The prognosis in bow-legs is favorable. Spontaneous correction sometimes occurs; much more frequently than in genu valgum. Children under 4 years of age, presenting even a marked degree of bow-legs, may be completely cured by the use of apparatus. When the deformity occurs in older children and is extreme, operative measures will entirely rectify it.

The treatment is governed by the same general rules as in genu valgum.

A reference to the remarks on the expectant treatment of knock-knee will enable one to judge equally well about the indications in bow-legs; however, its range of applicability is much greater in bow-legs. Tracings of the legs should be taken frequently, and the child kept under close observation.

The patient should be given constitutional treatment for rickets. If after several months no improvement is evident, or if any increase of deformity is noticed while the patient is being treated expectantly, then the indication for mechanic apparatus is imperative.

The form of apparatus used in the mechanic treatment is of little consequence, so long as it answers the indications and holds the knee extended. One very commonly used consists of a steel upright, which is attached below to a foot-plate. It runs to a point just a little below the origin of the adductor muscles, and ends with a semicircular pad-plate, which is applied against the inner part of the thigh. Just below the knee is a band that serves to attack the brace to the leg. On the outer side another upright runs from the foot-plate to this band. The foot fits snugly into the heel-cup, and is held on the foot-plate by means of the ankle-pad, triangular in shape. A piece of stiff leather attached to the inner upright, when laced, will serve to draw the deformed tibia toward the inner bar, and by degrees the amount of traction may be increased. At a point 1 1/2 inches above the attachment of the uprights to the foot-plate there is a joint, thus permitting the patient to walk with ease. When the curve is wholly in the tibia, it is sufficient to carry the upright just above the knee; if, however, the thighs are decidedly bowed, or the tibias twisted on their long axes, the upright must extend to a pelvic band. The latter applies also to cases in which the child shows a tendency to "toe in."

Repeated attempts at correction by manual force, supplemented with plaster-of-Paris, are sufficient to cure a large number of cases. After the age of 3 or 4 mechanic treatment becomes ineffectual and operative precedures are indicated.

The operations are: (1) Osteoclasis; (2) osteotomy. **Osteoclasis** may be either manual or by the aid of mechanical appliances as described under genu valgum, and the technic is entirely similar.

Osteotomy for bow-legs is an operation similar to that which has been fully described under knock-knee. It is usually performed subcutaneously, with brilliant results, the osteotome being inserted, and the limb fractured at the point of greatest angularity. The after-treatment is the same as in osteoclasis, the fractured leg being held in a retaining apparatus until union is complete.

No precise rules can be laid down as to the choice between osteoclasis and osteotomy, but in general it may be said that the latter is preferable in adult life, as it can be done with much less risk to the patient.

Cuneiform osteotomy should be performed for extreme degrees of anterior tibial curvature, but never for bow-legs; an exception may be made, however, when the articular surfaces of the joint are defective. In performing this operation it is necessary to make a free skin incision; then carefully incise and scrape away the periosteum and remove a wedge-shaped piece of bone from the tibia. The periosteum should then be stitched together, the wound dressed antiseptically, and the leg encased in plaster-of-Paris. The result of this operation is usually complete removal of the deformity, and it is unattended by any risk.

GERANIUM.—Cranesbill-root. The root of *G. maculatum*, with properties due to tannic and gallic acids. It is useful in diarrhea, infantile colic, etc. **G. Fluidextract**, dose, 5 to 30 minims.

GERMAN MEASLES.—See Rubella.

GERMICIDES.—See Antiseptics, Disinfection.

GESTATION.—See Pregnancy, Extrauterine Pregnancy.

GIDDINESS.—See Vertigo.

GIGANTISM.—An excessive overgrowth, resulting in an individual of enormous size as compared with that of the average person of the same period of development.

Etiology.—Gigantism in its perfect condition is believed to be due to a normal hypertrophy of the pituitary body, rather than to an enlargement of the sella turcica. There is slight evidence that it may be a manifestation of late hereditary syphilis. The thymus is not concerned in its etiology.

Morbid Anatomy.—There is found a symmetric enlargement of all organs and members and an increase in bulk of all tissues. Histologically, the tissue elements are increased in number rather than enlarged, individually considered.

Pathology.—In the perfect form of gigantism there should be no pathology, death occurring as in normal individuals. Inasmuch as in about one-half of the instances of this condition akromegaly supervenes, the pathology of the latter is likely to impress itself upon the picture.

Symptoms.—While gigantism itself gives rise to no symptoms save those attributable to mere bulk, it is nevertheless true that most giants are easily fatigued on muscular exertion, suffer from intellectual torpor, and are prone to reticence and melancholy, and that in men diminished sexual power, in women amenorrhea, are quite constant symptoms. The functions of the skin may be perverted.

Diagnosis.—This must be made after consideration of the period of life and normal development of persons in similar conditions. Absolute diagnosis is reached only after akromegaly is excluded. The writers on this subject frequently confound the two conditions, even claiming that akromegaly is an anomaly of gigantism. Only about one-half of the examples are those of essential gigantism. This manifests itself during the period of growth, while akromegaly is observed after stature is obtained. Infantile akromegaly is cretinism. The distinction as to period of life suffices, but in detail the following are important: (1) Symmetry—the hypertrophy of bones means increased growth of shaft in length and diameter, and not of ends, as in akromegaly. The face and cranium are well proportioned. The body, head, and limbs are enlarged in proportion; the foot may be small. (2) Nervous and trophic phenomena are absent, as well as eye and ear symptoms, unless the giant becomes the subject of akromegaly.

Prognosis.—There seems to be a greater increase of liability to intercurrent disease than in individuals of normal stature. The feebleness, both bodily and mental, would indicate lessened resistance to disease. For the prognosis of the akromegaly that supervenes reference should be made to that subject.

Treatment.—Attempts to lessen growth by limiting the amount of food ingested or by interference with digestion or absorption would be likely to increase the few symptoms that are associated with gigantism. Since excess of normal secretion of the pituitary body gives rise to gigantism, direct therapeutic measures should be those that will tend to check this secretion. At present none are known. Varices, which are frequently encountered, and nutritive changes in the skin should be treated as such.

GIN.—Common grain spirit distilled and aromatized with juniper berries. The finest gin, known as "Holland," is made in the distilleries of Schiedam, whence arises the name "Schiedam Schnapps."

Pure gin and the compound spirit of Juniper (*q. v.*) are therapeutically identical. When diuresis is needed in atony of the kidney without inflammation, gin is a useful medicament. Cirrhosis of the liver is most likely to follow the ingestion of gin as an alcoholic drink.

In England gin is often flavored with hops, and also with the oil of turpentine, various cheap aromatics, lead acetate, zinc sulphate, cayenne pepper, etc.

GINGER.—(Zingiber).—The rhizome of *Z. officinale*. *Green ginger* is the fresh rhizome; *black ginger* is the dried rhizome with its epidermis on; *white* or *Jamaica ginger* is the dried rhizome

deprived of its epidermis. It is most active when fresh, becoming inert by the action of age and exposure. Its active principles are a soft, acrid and aromatic *resin*, and a yellow, pungent *volatile oil*. Dose, 10 to 30 grains.

Ginger is sialogogue when chewed, sternutatory when inhaled, and externally a rubefacient. Internally it is a grateful stimulant and carminative, produces a sensation of warmth at the epigastrium, promotes the expulsion of flatus, and reflexly stimulates the heart and the central nervous system. In large doses it is a gastrointestinal irritant. It is used in domestic medicine as a stimulant carminative in colic, also in hot water for the cramps of suppressed menstruation due to exposure to cold. It may be employed with advantage in flatulence and atonic dyspepsia, in the latter being usually combined with other remedies. Though decidedly constipating by itself the oleoresin is frequently used in purgative pills, to prevent griping; also as a stimulant ingredient of tonic pills. The troches are employed to increase the secretion of saliva, also in relaxed conditions of the throat; and the syrup is a favorite flavoring ingredient for prescriptions. Preserved ginger is a favorite condiment, and carbonated water flavored with ginger is a common beverage under the name "ginger ale."

Preparations.—**Fluidextractum Z.** Dose, 10 to 30 minims. *Essence of ginger* is an unofficial preparation of various strengths, generally about 1 in 2, sometimes 1 in 1 as the fluidextract. **Tinctura Z.**, 20 percent. Dose, 10 to 60 minims. **Syrupus Z.** Fluidextract 3 percent in sugar and water. Dose, 1 to 8 drams. **Oleoresina Z.** Dose, 1/2 to 1 grain. **Trochisci Z.** (Unofficial). Each troche contains about 2 minims of the tincture, also tragacanth, sugar, and syrup of ginger. Dose, 1 to 5 troches.

Ginger is a constituent of Pulvis Aromaticus, and Pulvis Rhei Compositus; also through the former it is an ingredient of Pilulæ Aloes et Ferri, and Pilulæ Aloes et Myrrhæ. The tincture is used in preparing aromatic sulphuric acid.

GINGIVITIS.—See GUMS.

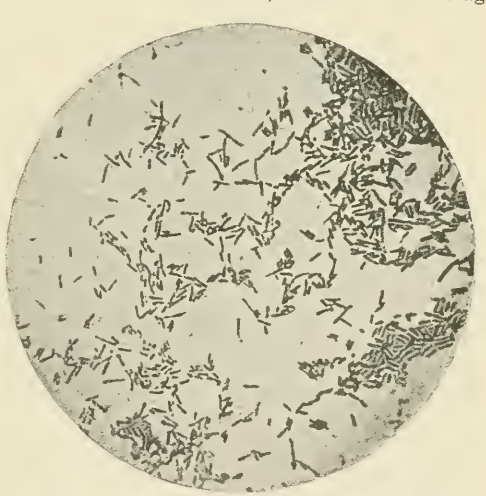
GIRDLE-PAIN.—The sensation of a band tightly encircling the trunk, or a "drawing-together" pressure on the lateral portions of the trunk. The girdle feeling is due to irritative processes in the region of the lower dorsal or upper lumbar nerves. It is comparatively frequent, and often appears quite early in tabes dorsalis or LOCOMOTOR ATAXIA (*q. v.*).

Antipyrin and acetanilid are the best drugs for the relief of these pains. When they fail, acetphenetidin, exalgin, cocain, chloralamid, or cannabis indica may be resorted to. A recurrence of the paroxysms may be prevented by a course of aluminium chlorid, 3 grains 3 times daily, but sometimes hypodermic injections of morphin are necessary. The application of the ether spray, chloroform, or menthol to the parts often relieves the pain. Galvanism and potassium iodid may give marked improvement, and the latter is indicated when there is a history of syphilis.

GLANDERS (Farcy; Equinia).—Glanders is a contagious specific disease derived from horses, characterized by constitutional disturbance and by lesions of the respiratory and cutaneous systems. The site of inoculation is marked by an inflammatory papule or pustule, which soon degenerates into a ragged, undermined, spreading ulcer, with accompanying lymphangitis and glandular swelling. Later, numerous cutaneous and subcutaneous nodules develop, which break down and discharge (farcy buds). There is usually nasal ulceration, with a foul-smelling discharge. Most cases run an acute course, ending in death. Those that last several months have a better chance to recover. The constitutional symptoms are fever, prostration, joint pains, and the typhoid state.

The disease is due to the **glanders bacillus** (*bacillus mallei*), discovered by Lœffler and Schütz in 1882. It is shorter and slightly broader than the tubercle bacillus. It has rounded ends, and usually remains isolated. Long threads are not formed. It is nonmotile, and up to the present time no spores have been found within the organism and no flagella have been demonstrated. Many animals, such as the goat, hog, field-mouse, cat, and guinea-pig are susceptible to the infection; while cattle, white-mice, house mice, and rats are immune.

The glanders bacillus is aerobic, and is grown upon agar-agar, bouillon, glycerin agar, blood-serum, and potato. A substance called *mallein* is prepared from this bacillus, and is used for diag-



BACILLUS OF GLANDERS, FROM A PURE CULTURE.—(*Fränkel and Pfeiffer.*)

nostic purposes in the same manner in which tuberculin is used in tuberculosis. A febrile reaction of more than 1.5° C. indicates that the animal is suffering from glanders. The nasal discharges from the noses of horses contain few bacilli. For the purpose of isolating the bacillus the nasal secretion should be injected into the abdominal cavity of a guinea-pig, and studied postmortem in tissues.

Method of Staining in Tissues (*Kühne*):

Methylene-blue,	1.5
Alcohol,	10.0
5 percent aqueous solution of phenol,	100.0

Place the section in the stain for half an hour, wash in water, decolorize in hydrochloric acid (10 drops to 500 c.c. of water); immerse at once in a solution of lithium carbonate (8 drops of a saturated solution of lithium carbonate in 10 c.c. of water); place in a bath of distilled water for a few minutes; dip into absolute alcohol colored with a little methylene-blue; dehydrate in anilin oil containing a little methylene-blue solution; wash in pure anilin oil, not colored, then in a light ethereal oil; clear in xylol and mount in Canada balsam.

The treatment of glanders consists in the destruction of the lesion by curet or caustic. In chronic cases large doses of quinin and stimulants are indicated.

Mallein is a glycerin extract of the culture products of the bacillus mallei, the micro-organisms of glanders. When this toxin is injected into animals affected with that disease, it produces a strongly marked febrile reaction, similar to that caused by tuberculin in tuberculous subjects. It is extensively employed in veterinary practice for the purpose of testing horses suspected of being infected with glanders. An antitoxic serum, obtained in the usual manner, has been used in a few cases of human glanders; one of which, reported by Dupuy, recovered under its administration from a severe attack of the disease.

GLANDULAR FEVER.—Glandular fever is an acute infectious disease generally occurring in childhood, and characterized by sudden onset, moderate fever, swelling of the cervical lymphatic glands, and constipation; but there is no rash. It is probably contagious.

Etiology.—The cause is unknown. The infectious agent, whatever it may be, is said to enter: (1) Through the tonsils or pharynx, or (2) by way of the intestines. Predisposing causes are: winter months, previous illness, lowered vitality, and general malnutrition.

Symptoms.—The incubation period is about five to eight or ten days, and is without symptoms. The acute symptoms appear suddenly; there are pain and tenderness in the neck, and these are made worse by movement of head or neck and by swallowing; fever occurs early, it is remittent, and not severe, running to about 101° or 103° F. The face may be flushed, but there is no rash. There may be nausea, anorexia, vomiting, and abdominal pain. The throat and pharynx show inflammation, and there is some dysphagia. The lymphatic glands are enlarged, and some of them can be palpated, particularly those in the cervical and carotid regions, just below and near the anterior border of the sternomastoid. The posterior cervical, axillary and inguinal glands may also be affected; and abdominal tenderness with enlarged liver and spleen will then be noticed. The fever abates as the gland involvement reaches its height, and the latter may last twelve or fourteen days, while the fever remains only three or four days.

Complications.—The most serious complication is nephritis; suppuration of the glands is not very common; otitis media and retropharyngeal abscess may also occur. In severe cases the beginning of convalescence is often marked by the passage of thin greenish stools, containing mucus.

Diagnosis.—This is to be made from the symptoms, particularly the cervical adenitis; the diseases to be excluded are pharyngitis, tonsillitis, parotitis, and leukemia.

Prognosis is favorable, except when the case is complicated by nephritis.

Treatment.—This is almost entirely symptomatic. Isolation should be insisted on so as to prevent the spread of the disease. Rest is necessary; the pain may be relieved by hot applications; iron, cod-liver oil, light but nutritious food, and general hygienic precaution are all indicated. Calomel in small doses has been recommended, and also condemned. For the adenitis, applications of belladonna should be made; and when the fever is high (in the early stage of the disease) or the pain is severe, sodium salicylate may be given. If the glands suppurate, incision and drainage will be in order.

GLAUBER'S SALT.—See Sodium.

GLAUCOMA.—Glaucoma is a disease in many respects not thoroughly understood, but characterized by the essential sign of increase of intraocular tension. However, every case of simple increase in intraocular tension is not glaucoma, and in some cases of *simple glaucoma* no increase of tension exists.

The direct cause is increase of the contents within the eye, either from *hypersecretion*, due to ciliary engorgement and disturbances of the nervous mechanism controlling secretion, or to *retention* of the intraocular fluids by obstruction or obliteration of the drainage-passages at the periphery of the anterior chamber. Conditions causing changes in the composition of the aqueous also interfere with filtration: as, for instance, serous iritis and cyclitis. There is much discussion and difference of opinion among equally erudite oculists about the cause of glaucoma.

Among the predisposing causes are mentioned old age (with normal diminution of the circumlenticular space), gout, rheumatism, nephritis, certain cardiac diseases—in fact, any condition leading to circulatory and vascular changes. The general tendency to waste-tissue accumulation—the so-called uric acid diathesis—is a fundamental cause in these cases. The opinion is entertained by some that long-continued eye-strain, from uncorrected or improperly corrected ametropia, is a potent factor in the etiology of many cases of glaucoma.

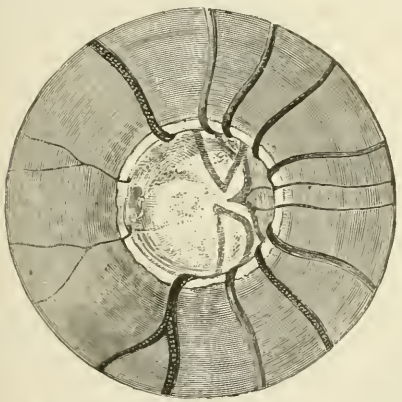
Pathologic Changes.—If there is a rapid rise in tension, the lens is pressed forward—a fact proved by the shallowness of the anterior chamber—and the suspensory ligament is stretched beyond the power of the ciliary muscle to relax it, as is shown in the lessening in the range of accommodation. There are marked circulatory changes in the eye. Pulsation is noticed in the retinal arteries, and the retinal veins are tortuous and swollen from the increased pressure. As the venæ vorticosæ are also squeezed by the intraocular pressure, an extra amount of blood is discharged through the anterior ciliary veins, which, in consequence, become

dilated and tortuous. The cornea becomes cloudy from pressure, and even the aqueous and vitreous participate in this change. From pressure on the ciliary nerves neuralgia is produced, and paralysis of the sphincter pupillæ and anesthesia of the cornea result. By increase in the vitreous the intraocular pressure is raised. The most important diagnostic change is the excavation or cupping of the disc and atrophy of the nerve-fibers. The final result of intraocular tension is active inflammation and swelling of both the internal and external coats of the eye. Naturally, vision is very much impaired.

Subjective Symptoms.—The patient complains of dimness of vision, diminution of the visual field, and pain about the eye, the intensity of which varies with the acuteness of the attack and the inflammatory symptoms accompanying. The appearance of colored rings or halos about any source of light, so often noticed in glaucoma, is a phenomenon due to the corneal disturbance, and is not confined especially to glaucoma.

Objective Symptoms.—The tension of the affected eyeball is abnormally high. If the rise in tension has been abrupt, the cornea is hazy and less sensitive to the touch than usual. The pupil is sluggish and often widely dilated, and has a greenish hue; the anterior chamber is shallow. In the inflammatory form there is considerable superficial and deep pericorneal injection.

With the **ophthalmoscope** the most characteristic symptom is excavation or cupping of the optic disc,



Ophthalmoscopic View of Glaucomatous Excavation.

which is to be distinguished from the physiologic cupping in extending the whole surface of the disc, and in having abrupt or overhanging sides; and from atrophic excavation of the disc by the depth and peculiar "broken-off" appearance at the edge of the disc, so that no continuity can be discovered between the arteries at the bottom of the cup and the vessels on the edge of the disc. Arterial pulsation of the retinal arteries is noticed, especially where the artery bends over the edge of the cup; it may be made particularly distinct by slight pressure on the eyeball. The degree of cupping may be estimated by the parallax test or by comparison of the refractions of the edge and bottom of the cup.

Diagnosis.—In inflammatory glaucoma, on hasty inspection, the disease may be confounded with keratitis, iritis, cyclitis, etc. In such cases it is well to discard the injection, and to rely on the *dilated pupil* and *shallow anterior chamber*, the *increase of tension*, the *visual disturbance*, the *peculiar ciliary neuralgia*, and the characteristic *cupping of the disc.*

For the differential diagnosis between acute glaucoma and the ordinary inflammatory conditions of the eye, see Eye Diseases (Diagnosis).

Prognosis.—Unless treated, glaucoma is almost certain to result, sooner or later, in complete and incurable blindness. It is of the utmost importance to make an early and absolute diagnosis of this condition, especially in the simple variety, in order to prevent a fatal termination. Glaucoma has been repeatedly mistaken for iritis, notwithstanding the dilatation of the pupil in the former disease and contraction in the latter; and, to the detriment of the patient, atropin has been repeatedly instilled, soon aggravating the condition to blindness. Generally speaking, if promptly and properly treated, the prognosis of acute glaucoma is favorable; it is doubtful in simple and infantile glaucoma, and unfavorable in the other varieties.

Treatment consists of 3 methods: (1) *Miotics*, as eserin and pilocarpin, to contract the pupil; (2) *operation* by paracentesis, iridectomy, sclerotomy, and incision of the ligamentum pectinatum; (3) *massage.*

Miotics are the first resort, and often cut short single attacks of glaucoma, and they are also valuable before and after operation. Pilocarpin and eserin are commonly employed, and are long continued.

Paracentesis relieves tension only for a short time. **Iridectomy** is of great value, and has some remarkable curative influence, both in dissipating the increased tension and in relieving the visual disturbances, and, eventually, curing the process. It should be broad and done upward, for cosmetic reasons and to prevent subsequent dazzling. The earlier the iridectomy, the better the result. Restoration of vision cannot be expected if there is much excavation and atrophy of the nerve-head. **Sclerotomy** has been advocated in cases of simple glaucoma in which the visual disturbance depends on the changes of the optic nerve, and in infantile and hemorrhagic glaucoma. A Graefe's cataract knife is introduced into the anterior chamber at a point corresponding to the puncture in cataract extraction, but 1 mm. removed from the corneal margin. The counterpuncture is made at a point corresponding to this at the other side of the anterior chamber. With a sawing motion of the knife the section is enlarged upward until only a bridge of tissue, about 3 mm. broad above, remains undivided. The knife is then slowly withdrawn from the eye, care being taken that the aqueous humor is gently evacuated through the lips of the wound. A drop of eserin is applied and the eye bandaged. Prolapse of the iris must be met on general principles. **Incision of the ligamentum pectinatum** is performed by cutting through the filtration angle, or spaces of Fontana,

with the point of the knife as it is withdrawn in sclerotomy. The good effects of sclerotomy have not been definitely established. **Cyclodialysis**, suggested by Heine, 1905, is a substitute for the more radical operation of iridectomy when the latter is contraindicated or is unsuccessful in reducing the tension. The object is to establish an artificial communication between the anterior chamber and the suprachoroidal space by separation of the fibres of the ligamentum pectinatum.

Massage of the eyeball, systematically pursued, is of undoubted value. The result of massage is almost instantaneous: immediately the eyeball grows softer, but the effect is not lasting. However, 5 minutes' massage, exerting considerable pressure together with simple palpation of the eyeball, practised several times daily, is an important aid in the treatment of glaucoma. Pure vaselin, a very weak yellow ointment, or a salve containing eserin and cocain, may be used in conjunction with massage.

Correcting lenses, both for distance and for near, should be applied if vision is still serviceable.

Excision of the superior cervical ganglion has been performed in very severe cases.

GLEET.—See GONORRHEA, URETHRA (Stricture).

GLENARD'S DISEASE.—See VISCEROPTOSIS.

GLIOMA.—A variety of round-celled sarcoma, consisting of a tumor of neuroglia cells, occurring in the central mass of the brain or of the spinal cord. Glioma of the retina (encephaloid of the retina) is a glioma springing from the connective tissue of the retina, usually occurring in the young, and involving the choroid, optic nerve, and extending finally into the brain. Pseudoglioma of the retina is a metastatic purulent choroiditis, simulating the appearance of retinal glioma. See RETINA, TUMORS, CHOROIDITIS.

GLOBUS HYSTERICUS.—A term for a choking sensation, as of a lump in the throat, felt by hysteric persons. It usually begins in the epigastric region or lower abdomen, and gradually rises into the throat. It is most likely caused by irregular spasmodic contractions of the esophageal or pharyngeal muscles. It is one of the warnings or auras of a hysteric fit. See HYSTERIA.

GLONOIN.—See NITRITES (Nitroglycerin).

GLOSSITIS.—See TONGUE.

GLOSSOLABIOLARYNGEAL PARALYSIS.—See PARALYSIS (Bulbar).

GLOTTIS, EDEMA.—See LARYNGITIS (Edematous).

GLUTEAL ANEURYSM.—This term is applied to aneurysms of the gluteal artery itself, of the sciatic, or of the pudic where it winds over the spine of the ischium. Aneurysms in this location may be the result of a wound or other injury, or may occur spontaneously. They are frequently attended with pain and interference with the movements of the hip-joint. The pulsation and bruit will generally serve to distinguish them, but there may be no pulsation, as when the aneurysm has burst, or when blood has been effused into the tissues as the result of a wound of the artery; a tumor of bone, moreover, may also pulsate. Under such circumstances exploration with a grooved needle will be necessary.

Treatment.—When of traumatic origin, an incision should be made over the tumor and the clot turned out. Hemorrhage is controlled by pressure on the common iliac artery through the rectum. When spontaneous, if the various measures of the aorta or common iliac have failed, ligation of the internal iliac may be necessary. Galvanopuncture and the introduction of coagulants have been employed successfully.

GLUTEN.—A substance resembling albumen; it occurs abundantly in the seed of cereals, in the form of cubic cells surrounding the starchy fecula of the seed. It consists mainly of gluten fibrin, gluten casein, gliadin, and mucedin. Gluten is of value as an antidote in mercuric chlorid poisoning, but it is of less use than albumen (the whites of eggs), and is not so easily obtained. Gluten bread is a variety of nonstarch-containing bread for use by diabetics. It is made as follows: Take 1 quart of sweet milk, or milk and water, 1 heaping teaspoonful of good butter, 1/5 of a cake of compressed yeast beaten up with a little water, and 2 eggs well beaten. Stir in the gluten flour until a soft dough is formed, knead as in making ordinary bread, put in pans to raise, and when light, bake in a hot oven.

GLYCERIN (Glycerol).—A triatomic alcohol existing in fats and fixed oils in combination with fatty acids. A viscous, syrupy, colorless substance, derived from certain fats—mainly palm oil—by decomposing them with superheated steam.

Glycerin is hygroscopic, nondrying, odorless, of warm and very sweet taste, neutral reaction, specific gravity 1.250, soluble in water and alcohol, but insoluble in ether, chloroform, and fixed oils. It dissolves tannin, gallic acid, carbolic acid, salicylic acid, bromin, iodin, etc., and, with the aid of heat, metallic salts and oxids, alkaloids, etc. With strong nitric acid it forms nitroglycerin, and it reduces potassium permanganate, chromic acid, and chlorinated lime with great violence. An impurity frequently present in it is *acrolein*, formed by the use of too high a heat in its manufacture, and which is very acrid and poisonous. Glycerin is a constituent of the six glycerites, pilulæ phosphori, mucilago tragacanthæ, massa hydrargyri, and several fluidextracts. Dose, 1 to 2 drams, diluted.

Therapeutics.—Glycerin is highly antiseptic, abstracts water from tissues with which it comes in contact, and, unless pure, is often very irritating to the skin. It is freely absorbed by all surfaces, cutaneous and mucous, and is decomposed in the system, passing out as formic and other acids. It has no particular action on the stomach, but in large quantities it is laxative and is said to cause the solution of the red blood-corpuscles and hemoglobinuria. Glycerin is a good emollient, and is considered nutritive by many authorities.

In chronic constipation excellent results are obtained from rectal enemata of glycerin or from the official suppositories. It is used as a vehicle for many drugs, and is a good ingredient of solutions for hypodermic use, promoting the

solubility of many alkaloids and acting as an antiseptic. It is also employed to preserve and aid the action of the digestive ferments, as well as to prevent the decomposition of vaccine lymph. Locally, it is valuable in many cutaneous affections as an emollient and softening agent. In acute coryza it gives great relief if applied with a brush or as a spray to the nasal mucous membrane. It is applied on cotton to the cervix uteri as a depleting agent, and mixed with an infusion of flaxseed as an enema to relieve tenesmus in acute dysentery. With tincture of benzoin it is an excellent application to chapped hands or lips and to fissured nipples. In the external auditory canal it will soften cerumen, diminish the secretion of pus, deplete the tissues, and keep the surface moist.

Preparation.—**Glycerini, Suppos.,** each contains 3/4 grain of sodium carbonate, 3 grains of stearic acid, and 46 grains of glycerin.

GLYCERITES.—Mixtures of medicinal substances with glycerin. There are six official glycerites:

Title.	Constituents.	Properties and Dose.
Glyceritum.		
G. Acidi Tannici.	Tannic acid, 20 gm.; Glycerin, 80 gm.	Astringent, 30 minims.
G. Amyli. (*Glycerite of Starch*).	Starch, 10 gm.; glycerin, 80 gm.; water, 10 c.c.	Emollient, base, and excipient.
G. Boroglycerini.	Boric acid, 310 gm.; glycerin, to make 1000 gm.	Antiseptic.
G. Ferri et quininæ et Strychninæ Phosphatum,	Soluble ferric phosphate, 80 gm.; quinin, 104 gm.; strychnin, 0.8 gm.; phosphoric acid, 200 c.c.; glycer., 500 c.c.; water to 1000 c.c.	For making syrup, etc., 15 minims.
G. Hydrastis.	Hydrastis, 1000 gm.; glycerin, 500 c.c.; alcohol and water, to make 1000 c.c.	30 minims.
G. Phenolis (Glycerite of Carbolic Acid).	Liquefied phenol, 20 c.c.; glycerin, 80 c.c.	5 minims.

GLYCERO-PHOSPHORIC ACID.—The acid and its salts have been used with benefit as tonics in neurasthenia, lithemia, phosphaturia, etc. Dose, of the acid, 1 to 5 minims; of the calcium, iron, lithium, magnesium, and manganese salts, 3 to 10 grains; of the sodium and potassium salts, 7 to 10 grains; of the quinin salt, 5 grains; of the strychnin salt, 1/60 to 1/20 of a grain.

GLYCOSURIA.—The occurrence of glucose in the urine.

Physiologic.—(1) During pregnancy and lactation; (2) often in infants under 2 months old, and in old age (70 to 80); (3) in persons who live upon starchy or saccharine food.

Pathologic.—(1) Diabetes mellitus; (2) exceptionally in diabetes insipidus; (3) organic and functional diseases of the liver; (4) diseases of brain (tumors around fourth ventricle, abscesses of brain, epilepsy, dementia); (5) la grippe; (6) chloroform narcosis. See Diabetes, Urine (Examination).

GLYCYRRHIZA (Licorice-root).—The root of *G. glabra*, a demulcent and mild laxative of sweet taste. In combination with other medicaments it is an excellent expectorant, and is much used as an excipient in pills, troches, etc. **G., Ext.,** the licorice of commerce, occurring in black rolls. Dose, 10 to 30 grains. **G., Ext., Purum,** made with ammonia water and water by percolation and evaporation. **G., Fluidextract,** prepared with glycerin, ammonia water and alcohol. Dose, 10 to 60 minims. **G., Mist., Comp.,** brown mixture, pure extract, acacia, each 3 parts, syrup 5, camphorated tincture of opium 12, wine of antimony 6, spirit of nitrous ether 3, water to 100 parts. Dose, 1 to 8 drams. **G. et Opii, Trochisci,** each contains extract of glycyrrhiza, 2 grains; powdered opium, 1/12 grain; acacia, sugar, oil of anise q. s. Dose, 1 to 2. **G., Pulv., Comp.,** compound licorice powder, composed of senna 18, glycyrrhiza 23, oil of fennel 4, washed sulphur 8, sugar 50. Dose, 1/2 to 2 drams. **G., Ammoniatum.** Dose, 1 to 6 grains.

GOITER.—See Thyroid Gland, Exophthalmic Goiter.

GOLD (Aurum).—Au = 196.7; quantivalence, 111. One of the metals characterized as "noble" by the ancients, because of its weight and luster. It has a brilliant yellow color, and will not tarnish. The metal is sometimes used as a plate on which artificial teeth are set. The chlorid locally is an escharotic. Internally its action resembles that of mercuric chlorid. In small doses it promotes digestion and stimulates the functions of the brain; in large doses it is a violent poison. It is useful in certain forms of dyspepsia, hypochondriasis, amenorrhea, and functional impotence. Poisoning is treated by egg-albumen or flour and by evacuation of the stomach. **A. et Sodii Chlor.,** soluble in water. Dose, 1/30 to 1/5 of a grain. Gold chlorid is also valued as a stain for sections of brain tissue and of nerve ganglia; it has been vaunted as a cure for the alcohol habit.

GOLDEN SEAL.—See Hydrastis.

GONORRHEA (Urethritis; Clap).

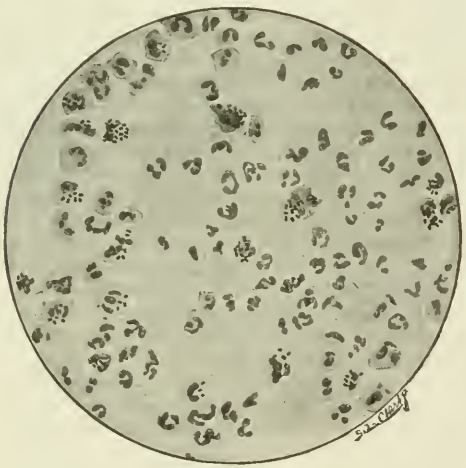
Definition.—Gonorrhea is a contagious, purulent inflammation affecting the mucous membrane of the genitals of both sexes. Some authorities claim that the disease may attack any of the mucous membranes, but this has not been demonstrated.

The male urethra is divided into anterior and posterior by the compressor urethræ muscle. The anterior section of the canal extends from the meatus to the compressor urethræ muscle, and is generally called the penile portion of the urethra. The posterior portion embraces the membranous and prostatic urethra. When the disease is confined to the portion of the urethra situated in front of the compressor urethræ muscle, it is denominated anterior urethritis; when the inflammation affects the membranous and prostatic portion of the canal, it is known as posterior urethritis. When the entire canal is affected by gonorrheal inflammation, the term anteroposterior urethritis is used. If the urethra and bladder are implicated, the disease is known as urethrocystitis.

Gonorrheal inflammation may be acute, subacute, or chronic; the acute stage may pass gradually into either of the other conditions. It is not unusual to meet with instances in which the disease has been subacute from the onset. When this condition pertains, the case, as a rule, follows essentially a chronic course, the discharge usually continuing for many weeks.

Etiology.—Urethritis may be either nonspecific or specific. The causes which give rise to **nonspecific urethritis** are injection of chemicals, traumatism, gout, rheumatism, syphilis, herpes, chancroids, tuberculosis, prolonged use of cathartics, employment of infected instruments, cohabitation during the menstrual discharge, or when discharges exist incident to a chronic inflammatory disease of the uterus or its appendages.

The nonspecific variety of urethritis is probably due to an infection by the staphylococcus or a small streptococcus, the gonococcus being absent. It may also be caused by the pneumococcus and the colon bacillus. Cases continually arise in which the urethritis is sufficiently severe to be called virulent, usually followed by complications involving the posterior urethra; these pursue a chronic course and are very difficult to cure. As a rule, nonspecific urethritis pursues a benign course, yielding readily to treatment; but this is not invariably the case.



Gonococcus.
Film from urethral pus.—(*Coplin.*)

Specific urethritis is a typical, virulent, inflammatory process, due to a specific microorganism known as the **gonococcus** of Neisser. This organism is of hemispheric shape and is found in pairs, the inner surfaces separated from each other by an interval. Sometimes groups of 4 are seen. The gonococcus is not motile, like other cocci, is not provided with flagella, and does not have spores. It stains readily with all the aqueous anilin dyes—best with rather weak solutions—but not by Gram's method. The gonococci are not easily killed, but withstand drying very well. See SUPPURATION.

Specific gonorrhea is produced by direct infection through the transference of gonorrheal pus from the genitals of one person to those of another during coitus. By mediate infection it takes place when instruments, syringes, towels, dressings, or hands that have been contaminated with gonorrheal pus are brought into contact with the meatus or urethral mucous membrane.

Symptoms of Acute Anterior Urethritis.—The period of incubation varies from 24 hours to 14 days. The disease usually makes its appearance from 3 to 4 days after contamination, the symptoms appearing within 24 hours after intercourse, especially if there is a history of previous attacks, in which case a latent chronic disease patch that has lain dormant in the urethra from some antecedent attack is brought into activity, and is not a fresh infection. An attack of gonorrhea does not render the patient immune from a fresh invasion of the disease. Reinfection can take place immediately on the patient's recovery from the malady. An attack of gonorrhea apparently leaves the patient in a condition of greater liability to recontract the disease; this is probably due to the lowering of the normal resisting power of the urethra to microbic invasion.

The symptoms vary with the progress of the disease, which is ordinarily divided into three stages: The *prodromal*, the *acute*, and the *stage of decline*.

The prodromal stage, as a rule, begins, especially in a first attack, with a tickling or an itching sensation in the vicinity of the fossa navicularis. The meatus is red, glazed, and often coated with a film of grayish, opaline mucus. At first the discharge is very scanty, gradually increasing in quantity, and at times causing the lips of the meatus to adhere to each other, or, on pressure, it may be expressed from the canal as a mucoid drop. Under the microscope the discharge is seen to be composed of flat epithelium, containing the gonococci; later there is an admixture of pus-cells. At this period the urine is clear, with a few flakes of gray infected epithelium floating about, sometimes resembling rice in appearance.

Acute Stage.—The redness and congestion about the meatus increase, frequently extending over the whole glans, producing edema of the prepuce, with phimosis, or, should the foreskin become retracted, paraphimosis. The inflammation may involve the body of the penis, giving rise to a condition known as penitis. The lymphatic vessels on the dorsum of the penis enlarge, and are frequently tender to the touch; in some instances the glands in the groin swell and are sensitive. The discharge becomes thick and purulent, the pus having a greenish hue; if the inflammatory symptoms are severe, it is not unusual for the secretion to be tinged with blood. When the inflammation extends to the submucous tissue, causing contraction of the caliber of the urethra, a burning, scalding pain is experienced whenever an attempt is made at urination, the stream being lessened and often twisted or forked. The symptoms are commonly reached by the end of the second or the beginning of the third week, when the disease

has extended as far as the bulbous portion of the urethra, resulting in a feeling of weight and pain in the testicles. Painful erections and chordee, with occasional nocturnal pollutions, are not uncommon at this stage of the disease, adding greatly to the discomfort of the patient. Hematuria, ordinarily occurring after urination, takes place in a small proportion of cases as a complication. The amount of blood lost is small; beyond giving rise to mental anxiety on the part of the individual, it is generally harmless. When the disease is at its height, a microscopic examination of the secretion will disclose an abundance of pus-cells, a large number of which will be filled with the gonococci. Both pus-cells and gonococci diminish in numbers as the disease declines, epithelia taking their place. Gradually the pus-cells decrease in number and the epithelia become more copious, until finally the pus-cells entirely disappear, the epithelia cease to proliferate, the discharge is arrested, the urine becomes clear, and a cure is effected.

The *two-glass urine test* is most valuable in differentiating acute anterior from acute posterior gonorrhea, and should always be employed. The patient should be instructed to void his urine into two glass vessels: that in the first glass will be cloudy and that in the second clear; this is due to the fact that the urine that first flows through the urethra washes the secretion out of the canal; while the urine that is discharged into the second glass passes through a cleansed canal, from which the morbid secretions have been washed away, and hence the urine in the second glass will be found clear.

Stage of Decline.—The inflammatory symptoms abate usually about the fourth week. The discharge becomes less copious, loses its greenish color, and becomes mucopurulent, slowly diminishing until only a slight drop of mucus can be detected, generally present in the morning, often gluing together the lips of the meatus. In favorable cases this condition may exist for a few days and gradually disappear; but owing to some indiscretion on the part of the patient, a relapse may, and frequently does, occur, producing an acute exacerbation, so that when the stage of decline is again reached, it may be prolonged until a chronic condition pertains.

The local complications of acute anterior urethritis are phimosis, paraphimosis, chordee, painful erections, penitis, lymphangitis, adenitis, balanitis, periurethral abscess, cowperitis, hemorrhage, and preputial folliculitis.

Symptoms of Acute Posterior Urethritis.—As a rule, when acute posterior urethritis sets in there is a very marked and sudden decrease, and in many instances entire disappearance, of the discharge, with an increased frequency of micturition, which may be slight in amount, requiring the patient to discharge the contents of his bladder at intervals of about every 2 hours; or there may be violent vesical tenesmus, making it necessary for the individual to attempt to void his urine every 10 or 15 minutes. This is attended by a great deal of pain. In some instances there is inability to retain the urine, which dribbles away continually. When the desire seizes the patient, the contents of the bladder must be evacuated at once. It is observed that the desire for urination is frequently produced by the sound of running water. As a rule, especially when there is great increase in frequency of urination, each act is followed by the emission of a few drops of blood; great pain is experienced in the glans penis, prostate, and rectum. Nocturnal pollutions are not uncommon; they are frequently stained with blood and are attended by great pain. Retention of urine may occur at any time if the inflammation of the prostatic portion of the canal is severe. Albumin in greater or less quantity is always present in the urine in this condition; it is due to spasm, and usually disappears after the administration of an anodyne.

In inflammation of the posterior urethra the pus passes backward into the bladder, so that when the patient urinates into the two beakers, both specimens will be cloudy; this is owing to the fact that the first portion of the urine contains the pus that was in the urethra, while the second glass contains the secretion that had passed back and settled at the base of the bladder. When the intervals between urination are very short, the second glass may be either clear or cloudy, as frequent micturition renders it impossible for the pus to accumulate in the posterior urethra and flow back into the bladder. If the test is made with the urine first voided in the morning after the individual has had a period of repose, it will be found that both specimens will be cloudy. An alternating clear and cloudy second glass always indicates posterior urethritis.

The intensity of an attack of posterior urethritis varies greatly in different individuals, being so slight in some instances as to give the patients but little discomfort, while in others the symptoms are very marked, and are attended by great suffering. The attack lasts from a few days to several weeks, sometimes ending in a chronic condition.

The local complications of posterior urethritis are prostatitis, seminal vesiculitis, inflammation of the cord, epididymitis, orchitis, cystitis, nephritis, pyelitis, abscess of the prostate, abscess of the kidney, and retention of urine. **The extragenital complications** are ophthalmia, arthritis, endocarditis, tendovaginitis, bursitis, myositis, achillodynia, phlebitis, and transverse myelitis. They may occur in either the anterior or the posterior form of the disease. The **sequels** are hypochondriasis, sexual neurasthenia, stricture, impotence, sterility, hyperesthesia, spermatorrhea, and melancholia.

Treatment of acute anterior urethritis may be divided into hygienic, local, and constitutional.

Hygienic Treatment.—Absolute cleanliness is essential. The clothing of the patient should be protected from the discharge by appropriate dressing. Frequent ablution with very hot water should be enjoined. Highly seasoned foods, condiments, salads, rich gravies, salt meat, cheese, salt fish, asparagus, and strawberries should be eschewed. Malt, spirituous, and vinous liquors

and carbonated waters should be prohibited. The digestion should be watched and the bowels kept regular. The patient should be warned of the danger incurred by the gonorrheal discharge reaching the eye, and instructed to be especially careful in cleaning his hands after handling the penis. During the acute stage absolute rest, as nearly as possible, must be prescribed; no exercise that has a tendency to congest the pelvic viscera should be allowed. It is well to direct the use of a properly fitting suspensory bandage.

Local Treatment.—**Abortive** treatment may be attempted, provided the individual is seen within 24 hours after the onset of the disease, and a microscopic examination shows that the discharge contains epithelium and gonococci only, *pus-cells being absent.*

There are several methods employed when attempting to abort gonorrhea. The most satisfactory method, after telling the patient to urinate, is to place him in a recumbent posture on a couch; a No. 12 (French) soft catheter, which has been thoroughly lubricated with glycerin, is then to be passed into the urethra, when the canal is to be irrigated with a hot solution of boric acid, after which the catheter is to be removed; a meatus endoscope is next inserted, whereby an application of a solution of nitrate of silver, not stronger than 15 grains to the ounce of water, is made by means of an applicator to the walls of the urethra as the endoscope is withdrawn. The patient should then be put to bed, receive soft diet, and cold sedative applications made to the penis. This treatment will be followed by an acute virulent discharge, with great pain in the urethra, blood being mixed at times with the secretion or following the last drops of urine. If the treatment is about to prove successful, the inflammatory symptoms subside within two days, when the discharge becomes mucopurulent in character and can be arrested by means of any of the astringent injections usually employed in the treatment of gonorrhea. If the abortive treatment is successful, the case is brought to the stage of decline in a few days.

Before resorting to this method of cutting short the disease, the consent of the individual should first be obtained. He must be made to understand that it frequently fails, when the pain and discomfort will be incurred without any benefit accruing; that it is not free from danger: periurethral abscess, posterior urethritis, prostatocystitis, and epididymitis have frequently been known to follow its use. Many authorities agree that this method of treatment is productive of stricture.

A method largely practised at the present time is one suggested by Prof. Jules Janet, of Paris. It consists in **irrigation of the urethra** with hot solutions of potassium permanganate, varying in strength from 1:4000 to 1:1000; the irrigation is to be employed twice daily by means of hydrostatic pressure, no instruments being inserted into the urethra. The advocates of this treatment claim that if the disease is taken in its incipiency, it will be aborted within the course of a few days, a cure being effected in about 18 days.

There is ground for doubt as to the results claimed by Prof. Janet and his followers. It is true that the stage of decline will commence within a short period; but, unfortunately, this is often prolonged for a great length of time before a cure is effected, which would not have occurred if the ordinary method of treatment had been followed. Irrigation of the urethra with solutions of potassium permanganate in the acute stage of the disease superinduces an inflammatory condition of the periurethral structures, accompanied by a congested irritable condition of the canal, attended by a most intractable watery discharge, mucoid in character, which often proves most rebellious to treatment. Relapse after the cessation of irrigations is quite common. The employment of irrigation in acute urethritis is not recommended.

Since the introduction of the organic silver salts the local treatment of acute urethritis has been more generally resorted to than it was a few years ago. It has been demonstrated that these preparations are destructive to the gonococcus and that they are only slightly irritating to the urethra. Many genito-urinary surgeons of large experience recommend them highly, and use them either in the form of injections or irrigations from the very beginning of the attack. Chief among these preparations are argonin, which is used in 1 to 2 percent solution; albargin, 0.1 to 0.2 percent; argyrol, 3 to 10 percent and protargol, 0.25 to 2 percent. A very efficient method is to employ one of these solutions alternately with weak permanganate of potassium solution or a 1 percent solution of thallin sulphate or resorcin as recommended by Casper, Christian and others.

The strength of the permanganate varies according to the degree of inflammation, namely from 1:8000 to 1:4000. In lieu of the organic silver salts, silver nitrate solution 1:10,000 to 1:4000 is sometimes employed after the first stage has subsided. At this time astringent injections may also be used, but they must be weak at first. Many surgeons do not use them until the third week of the disease. They replace one of the previously mentioned antiseptic or germicidal injections, and finally the second one is discontinued when the gonococci are no longer demonstrable in the discharge or the filaments contained in the urine.

The syringe should be of glass, with a conic end, tipped with rubber, or of hard rubber with a blunt point, capable of holding about 4 drams. Care should be taken to see that the piston works smoothly in the barrel of the cylinder. When making an injection, the patient should be instructed to first pass his urine, insert the nozzle of the syringe gently into the meatus, which should be held in contact with the nozzle of the syringe by means of the index-finger and thumb of the left hand; the solution is then slowly and gradually injected into the urethra until it produces a slight feeling of discomfort. If the injections does not give rise to severe pain, the patient should be instructed to retain the fluid from 3 to 5 minutes.

The following formulæ for astringent injections will be found beneficial:

℞. Lead acetate, ℥ ss
Zinc sulphate, gr. xvj
Tincture of opium, ℥ ss
Fluidextract of krameria, ℥ ss
Distilled water, q. s. ad ℥ vj.
Shake and use as an injection.

℞. Zinc acetate, } each, gr. xx
Tannic acid, }
Rose water to make ℥ iv.
Shake and use as an injection.

The injection should be employed until the discharge ceases and the urine becomes clear. It should be discontinued gradually; a syringeful of water is to be added to the contents of the bottle containing the injection every time that quantity of the injection is abstracted; so that the strength of the injection is rendered weaker as often as it is used, until the treatment is finally discontinued.

When the discharge has become mucoid in character and is present only in the morning, the urine being clear, containing only some threads of epithelium, irrigation with weak solution of potassium permanganate, nitrate of silver, or alum (of a strength of 1:500) will often complete the cure.

Attention is called to **Ballenger's treatment of incipient gonorrhea** by sealing argyrol in the anterior urethra with collodion, thus causing it to be retained in contact with the infected mucosa until the patient urinates. The prolonged action of a 4 or 5 percent solution of argyrol has a most satisfactory effect, and if the organisms have not extended more deeply than the part so medicated, the patient will be cured in 4 or 5 days. Little irritation is produced by the treatment, and the discharge often is not seen after the first treatment. If such remedial measure be employed it is of the utmost importance that it be applied within 24 to 48 hours of the appearance of the discharge. Failure to obtain a rapid cure is likely when coitus has occurred during the incubation period of a previous infection. During the past 5 years Ballenger has cured more than 700 cases, with an average of 5 days or less for each patient. A careful study of Ballenger's technic is advised: The patient empties his bladder and reclines upon an operating table; the penis is well cleansed and surrounded with a clean towel; a small blunt-pointed urethral syringe, so gauged that exactly 25 minims may be injected, is now used to place this amount of a 5 percent solution of argyrol in the canal. The meatus is pressed from side to side as the syringe is removed and the towel is then used to dry well the glans penis. The lips of the meatus are pressed closely and smoothly together and are lightly brushed twice with collodion on a camel's-hair brush. The collodion may be made to dry more rapidly by fanning, and it is of great importance to hold the argyrol solution back until the collodion has thoroughly dried and feels firm to the touch. The collodion may be removed by applying a pledget of cotton wet with acetone which readily dissolves it. The meatus should be compressed by the patient at the time that he applies the acetone (to prevent the soiling of his linen with the argyrol). After the collodion has been removed the patient should drink at least a half gallon of lithia water before he retires so as to flush well the canal and overcome the slight chemical and mechanical irritation produced by the solution of argyrol. He should also be instructed to take very little of water and liquid food on the following morning in order that the next treatment be not interfered with by a free flow of urine. He should also report early for treatment so that it may be repeated later in case the sealing should not hold satisfactorily. It is better not to bind up the penis in cotton to protect the clothing, as it may prevent his detecting it when the medicine escapes in case the collodion breaks, and thus he may lose valuable time. The solution of argyrol should be freshly prepared each day, as a stale solution is less potent and is more irritating.

Internal Treatment.—Many authorities prefer to employ sedatives at the outset of the disease, combined with such remedies as may render the urine alkaline, leaving those that have a tendency to relieve the blennorrhea until the inflammatory stage is on the decline.

The employment of the balsamic remedies from the outset is the method of treatment commended. Blennorrhagic medicines should not be continued for a long period. When the discharge is very slight, mucoid in character, and the urine clear, containing but a few threads, internal treatment should be suspended and the cure completed by local measures. Various drugs are in vogue, each having its advocates. Those in general use are cubebs, copaiba, sandalwood, methylene-blue, salol, alum, matico, and turpentine; with the exception of turpentine they are best administered in capsules, and may be given either separately or combined. Turpentine is usually given in emulsion or by being dropped on lump sugar; it is often efficacious, but its employment is frequently followed by unpleasant symptoms, and it has a tendency to derange the digestive organs; it is not much resorted to at the present time. Methylene-blue is of great value at the beginning when the microscope has demonstrated the presence of gonococci. It will not abort the disease, but will cause prompt disappearance of gonococci, tend to shorten the inflammatory period, and hasten the stage of decline and lessen the tendency to complications. When prescribed, the patient should be informed that the remedy will tinge the urine of a deep blue color, and thus avoid unnecessary apprehension.

The following formulæ are most commonly employed:

℞. Salol, ℥ ij
Oleoresin of cubebs, ℥ j
Balsam of copaiba, ℥ ij
Pepsin, gr. xij.
Make 12 capsules; take 1 capsule 3 times daily.

℞. Oleoresin of cubebs, gr. ij
Oleoresin of copaiba, gr. iij
Oleoresin of matico, gr. j
Oil of sandalwood, } each, gr. ij
Salol, }
Taka-diastase, gr. j.
Make 1 capsule; one 3 times daily.

℞. Methylene-blue, gr. xx.
Make 20 pills; take one 3 times daily.

℞. Salol, ʒ j
Oil of sandalwood, ʒ ij.
Make 12 capsules; one 3 times daily.

℞. Methylene-blue, }
Oil of sandalwood, } each, gr. iij
Oleoresin of copaiba, }
Oil of cinnamon, gt. j.
Make 1 capsule.

℞. Balsam of copaiba, ʒ j
Liquor potassæ, ʒ ij
Extract of glycyrrhiza, ʒ ss
Spirit of nitrous ether, ʒ j
Syrup of acacia, ʒ vj
Oil of gaultheria, gtt. xvj.
From 1 to 2 teaspoonfuls as a dose 3 times a day.

Treatment of Acute Posterior Urethritis.—If the symptoms are severe, the patient should be placed in a recumbent posture, a light diet should be ordered, the bowels should be kept free, and either a hypodermic injection of 1/3 of a grain of morphin or a suppository containing opium and belladonna administered. Great relief will be found to follow the administration of a capsule containing cubebs, copaiba, and salol before meals, with a tablespoonful of the following mixture after meals:

℞. Tincture of belladonna, ʒ ss
Sodium bromid, ʒ iv
Liquor potassæ, ʒ ij
Syrup of ginger, ʒ iij
Water, q. s. ʒ vj.
Tablespoonful in water after meals.

A suppository may be used, if preferred, composed of:

℞. Extract of belladonna, gr. iij
Pulverized opium, gr. xij
Ichthyol, ʒ j
Oil of theobroma, q. s.
Make 12 suppositories; 1 to be used daily.

Should the individual suffer from violent tenesmus, benefit will often result from the instillation by means of the Keyes-Ultzman syringe, of a few drops of silver nitrate solution, not stronger than 1:1000 or 1:500. All injections and irrigations should be discontinued during the acute stage of the disease. Retention of urine must be treated in accordance with the recognized methods pursued in such cases.

Alkaline mineral waters and lemonade may be allowed; but an alkaline condition of the urine must be guarded against, as it is likely to be productive of cystitis.

Chronic Anteroposterior Urethritis.—This condition, commonly known as **gleet**, is due to the fixation of the malady at one or more points in the urethra. The favorite sites at which the disease becomes established are the fossa navicularis, bulb, prostatic urethra, glands of Littré, and crypts of Morgagni.

Examination of the urethra by means of the endoscope will reveal one or more of the following conditions: Chronic congested patches, usually in the vicinity of the bulb; granular patches, which may be found in any portion of the canal, but more commonly in the neighborhood of the meatus; erosions and ulcerations, the former usually occurring in the deep urethra and the latter in the vicinity of the meatus; nacreous patches, looking as if the urethra had been touched with nitrate of silver, generally situated in the vicinity of the bulbous portion of the canal (they are always connected with cell infiltration in the submucous structure, and are the forerunners of the formation of strictures); edematous folds, which occur either immediately inside of the meatus or at the junction of the bulbous and membranous portions of the urethra.

In about 50 percent of cases of chronic urethritis, stricture will be found to be the cause of their production. When the glands of Littré, on the floor of the urethra, are involved, they can readily be detected by passing a steel bougie into the canal and running the finger along the under surface of the urethra, when a number of small nodules about the size of a pin's head can be distinctly felt. By means of the endoscope the mouths of the ducts of these glands, when inflamed, can be plainly seen on the floor and roof of the urethra, presenting the appearance of tiny red spots, which are adherent to small tenacious plugs of mucus.

Symptoms of Chronic Anterior Urethritis.—In most instances there are no symptoms apparent beyond a mucopurulent or mucoid discharge, usually showing itself in the morning when the patient awakens, frequently gluing together the lips of the meatus. In some cases the urethra is unusually moist, with a slight watery discharge, the urine containing a few threads of epithelium, called *Tripperfaden*, or clap-threads. Should these threads be heavy and sink to the bottom of the glass, it is probable that they contain either pus-cells or gonococci, or both; they are formed at the site of the location of the chronic lesion in the urethra, and are made up of pus and epithelium held together by fibrin or mucus. Their peculiar thread-like shape is caused by the impinging of the urine against the edges of the moist scales, rolling them up into the characteristic shape. As the patient advances toward recovery the pus-cells disappear, the thread consisting of epithelium only. When the cure is finally effected, the epithelia likewise disappear, the urine becoming clear and transparent.

Symptoms of Chronic Posterior Urethritis.—There is an increased frequency of micturition,

with a feeling of discomfort either with the beginning or termination of the act, accompanied by a feeling of weight and pain in the perineum, often extending to the testicles. Nocturnal pollutions are common; occasionally the semen is tinged with blood, the ejaculations frequently being painful. As a rule, there is little or no discharge seen at the meatus. The severity of these symptoms is increased by alcoholic stimulation or sexual indulgence. Atonic impotence is not uncommon if the disease is persistent for any length of time, the patients frequently developing neurasthenia.

Treatment of Chronic Anterior Urethritis.—Primarily, the cause and position of the chronic lesion that has given rise to the discharge should be ascertained. If, on examination, the urine is found to be cloudy and full of threads, capsules containing the oil of sandalwood and salol will be found serviceable, together with a daily irrigation with a solution of 1:2000 potassium permanganate, or silver nitrate, beginning with a strength of 1:1000 and gradually reducing it to the strength of 1:7000. If congested patches exist, an irrigation with a hot solution of alum, 1:500, will often prove beneficial. An injection highly recommended at this stage of the disease consists of:

℞.	Mercuric chlorid,	gr. $\frac{1}{8}$
	Zinc phenolsulphonate,	ʒ ss
	Boric acid,	ʒ ij
	Carbolic acid,	gr. xv
	Boroglycerid (25 percent),	ʒ ij
	Water,	℥ vj.

Dilute if painful.

Should superficial ulcerations or erosions exist, the employment of the following powder by means of the urethral applicator will prove of great benefit:

℞.	Hydrastinin hydrochlorid,	gr. vj
	Bismuth subgallate, Boric acid, each,	ʒ ss.
℞.	Zinc stearate,	ʒ iij
	Boric acid,	℥ ij.

When the urine is clear, containing but a few threads, a mucoid drop alone being present in the morning, it becomes necessary to employ the steel bougie, which may be medicated with a salve composed of:

℞.	Iodin,		gr. v
	Olive oil,		ʒ j
	Potassium iodid,		ʒ ss
	Lanolin,	q. s.	ʒ j.

Or:

℞.	Silver nitrate,		gr. v
	Lanolin, Olive oil,	each,	ʒ ss.

When beginning this method of treatment, a small-sized bougie should be first employed and the instruments gradually increased in dimension until pain or slight hemorrhage, which is likely to follow their use, presents itself. This method is to be pursued until a full-sized instrument is reached. Blue ointment will frequently be found to be very serviceable.

Treatment of Chronic Posterior Urethritis.—In the more acute stages of the inflammation instillation is not to be repeated more frequently than every third day; it should be made with a silver nitrate solution, beginning with a strength of 1:8000 and gradually increasing until 1:500 is reached. When the desire for frequent urination begins to disappear, and the urine becomes less cloudy, a Jacques catheter (No. 18 F.) should be passed as far as the membranous urethra, and the bladder injected with a hot solution of potassium permanganate 1:2000, or of silver nitrate 1:10,000; the instrument should then be removed and the patient instructed to empty his bladder in the usual manner, thus flushing the entire canal with the medicament.

In congested and irritable conditions of the prostatic urethra, associated with pain and discomfort, with little or no frequency in passing urine, the urine being clear except for a few threads, benefit will be derived from the employment either of a bougie or the cooling sound.

Should the urine contain much pus, the desire to urinate being frequent, any of the antiblennorrhagic remedies may be employed. Often relief will be experienced from the administration of a capsule containing $\frac{1}{4}$ of a grain of codein sulphate combined with 5 grains of salol.

The following formula will be found serviceable:

℞.	Liquor potassæ,		ʒ v
	Tincture of nux vomica,		ʒ ij
	Fluidextract of pichi,		℥ ij
	Mixture of calisaya,	q. s.	ʒ iv.

A tablespoonful in hot water every 4 hours.

Or:

℞.	Fluidextract of pichi,	℥ ij
	Fluidextract hyoscyamus,	ʒ ij
	Syrup of ginger,	℥ ij.

A teaspoonful before each meal and at bedtime.

When the urine is alkaline and very cloudy, a combination that is frequently beneficial is:

℞.	Ammonium benzoate,		ʒ iij
	Fluidextract of cubebs, Tincture of eucalyptus,	each,	ʒ ij
	Fluidextract of glycyrrhiza,		℥ j
	Water, to make		℥ vj.

A tablespoonful in water after meals.

When the irritability of the bladder disappears to a great extent, the urine becoming clear, containing *Tripperfaden* alone, the balsamic remedies should be discontinued and a strong tonic administered.

When neurasthenia is impending, great benefit will be derived from Fowler's solution administered in water 3 times daily after meals. Patients should abstain from active exercise, alcoholic stimulation, and sexual excitement. The diet should be plain and nutritious; condiments and highly seasoned foods should be eschewed.

Vaccine Therapy.—"There is a considerable dif-

ference of opinion as regards the efficacy of *vaccines* in the treatment of acute and chronic urethritis of gonorrheal origin. A polyvalent stock vaccine of gonococci of proved immunizing powers may be even more efficient than an autogenous one, especially if the latter must be prepared from a strain that has been repeatedly subcultured in order to obtain the vaccine in a pure state, or from one that has lost its virulence from long residence in the infected urethra. Owing, therefore, to the difficulty of isolating and cultivating gonococci, stock vaccines have been generally employed. In subacute urethritis the initial dose may be 25,000,000; if complications threaten, less than this, and if no local reaction has followed more than this is given, the object being to secure a slight increase of the secretion, which should become more purulent, and a little constitutional disturbance, followed by lessening of local pain and tenderness" (Kolmer).

For **treatment of the complications** of gonorrhea see the various headings, BALANITIS, CHORDEE, CONJUNCTIVITIS, TESTICLE, URETHRA (Stricture), PENIS, etc.

For **gonorrhea in the female**, see VAGINITIS.

GONORRHEAL ARTHRITIS.—See JOINTS (Diseases).

GONORRHEAL CONJUNCTIVITIS.—See CONJUNCTIVITIS.

GOSSYPIUM PURIFICATUM (Purified Cotton).—Cotton. The hairs of the seed of *G. herbaceum*. Freed from impurities and deprived of fatty matter, it becomes the absorbent cotton of surgery. It is soluble in an ammoniacal solution of cupric oxid. The root is believed to possess emmenagog properties.

Preparation.—**G. Cortex.** Dose, 10 to 60 grains. **Oleum G. Seminis**, the fixed oil expressed from the seeds and purified. Is yellow, odorless, of bland taste and neutral reaction, soluble in ether, but slightly soluble in alcohol. Is introduced into the Pharmacopœia for the reason that it constitutes most of the "Olive Oil" sold in foreign-shaped bottles and under foreign-appearing labels. It is used in the official liniments of ammonia and camphor. Dose, 1 to 8 drams. **Pyroxylinum**, *Soluble Guncotton, Colloxylin*)—is official for the purpose of making collodium. It is prepared by macerating cotton in a mixture of sulphuric and nitric acids, washing, draining and drying. **Collodium**, made by dissolving pyroxylin 4, in ether 75 and alcohol 25. **Collodium Flexile**, collodion 92, canada turpentine 5, castor oil 3, mixed thoroughly. **Collodium Stypticum**, ether 25, alcohol 5, tannic acid 20, collodion to 100. **Collodium Cantharidatum** (*Blistering Collodion*), cantharides 60, flexible collodion 85, chloroform, q. s. to 100. See COTTON.

GOUT (Podagra). Definition.—A constitutional disease characterized by an excess of uric acid or alkaline urates, especially sodium urate, in the fluids of the body. Sodium urate is first deposited about the articular surfaces of the small joints, but in time the arteries, cardiac valves, and connective tissue of the kidneys may be involved. The metatarso-phalangeal joint of the great toe is, curiously, the favorite point of attack, and the helix of the ear is another favorite seat. Tophi form about the affected part. To diminished solubility of the urates, due to increased acidity of the blood; to increased formation of uric acid and failure in function of the kidneys; to persistent plethora of the digestive organs, is variously ascribed the cause of gout.

Varieties.—(1) Acute; (2) chronic; (3) irregular gout.

Etiology.—Heredity, male sex, middle or advanced life, excessive indulgence in wines or malt liquors, rich foods, and inactive life are the principal causes of gout.

Pathology.—An excess of uric acid is found in the blood, and around the fibrous structures of the small joints, especially the great toe, there occurs a deposition of sodium urate. The ankles, knees, and joints may be affected later in the progress of the disease. The deposit of urates may affect the fibrous structures or the cartilages, and may be seen in small opaque areas forming "chalk stones" (tophi), or the deposit may be distributed uniformly throughout the joint, causing immobility of the parts. Often in the matrix and cell capsule of the cartilages may be seen the needle-shaped crystals of sodium urate. The kidneys often show evidences of interstitial nephritis, the pyramids containing urates.

Symptoms and Clinical Course.—The onset may arise after attacks of inactivity of the liver or of indigestion, and is ushered in with sharp pains shooting through the joints, should an attempt be made to flex them. The patient suffers such agony that the temper becomes irritable, made so by the pain and discomfort set up by the inflammatory process. These symptoms seem to be worse in the early morning hours, and there is no position that would seem to be the most comfortable. The affected parts soon become reddened, swollen, edematous, and excessively tender to the touch. Toward the afternoon the symptoms may gradually improve, but recur the following morning. The temperature gradually rises to 101° to 103° F., and the pulse is increased in proportion.

The urine contains an excess of the "cayenne-pepper" crystals of uric acid and urates. The cuticle over the affected areas generally desquamates. These symptoms gradually improve, the inflammation subsides, with less tenderness on pressure, the joints grow more supple, the cuticle desquamates, the uric acid disappears from the urine, and convalescence ensues. Should the disease persist, the joints become filled with the chalky deposits; and the concretions become so excessive that the joints are deformed with immobility, this constitutes **chronic gout.** Irregular gout is more allied to LITHEMIA (*q. v.*).

Diagnosis.—Gout is sometimes mistaken for rheumatism:

GOUT.	RHEUMATISM.
1. Chiefly affects small joints, as of foot.	1. Affects larger joints as knee, elbow, shoulder.
2. More pain, redness, and edema.	2. Parts swollen but less painful.

Gout.	Rheumatism.
3. Moderate fever, 101° to 102°.	3. High fever, 104°.
4. Sweats not profuse.	4. Profuse sweats, acid in reaction.
5. Pain more periodic.	5. Pain continuous.
6. Cuticle desquamates.	6. Cuticle usually intact.
7. Often recurs at regular intervals.	7. Time of recurrence indefinite.

See Garrod's Thread Test.

Prognosis.—In the acute form the prognosis is good. The chronic form often gives rise to nephritis and to deformity of the joints affected.

Prophylactic Treatment.—The logical treatment is to remove those causes that bring on the attacks. The hereditary tendency may be strong, yet if alcoholic and malt liquors are omitted, the attacks will usually be neither so protracted nor so liable to return. Gout is a disease in which the emunctories of the body are inactive; therefore treatment should be eliminative, by stimulating the skin, the kidneys and the bowels. The stomach should never be overloaded with indigestible food.

Treatment of the Acute Attack.—*Colchicum* has long been recognized as a specific, to abort a paroxysm or to lessen severity of the symptoms when the attack has developed; ʒj of the wine often removes the severest pain in an hour or two, and soon the swelling and heat subside; it is especially useful in acute and rheumatic gout. *Colchicine Salicylate* is highly efficient in chronic gout.

Elimination is distinctly indicated, as may be learned by the etiology and pathology. If neglected, the irritants in the blood may cause such inflammation of the kidneys as to give rise to serious disease of these organs. Diuretics are therefore valuable. The stomach and bowels should be unloaded of all material, as far as possible, so as to restore the inactivity of the liver, and the following be given:

℞. Mild mercuric chlorid, gr. ij
Sodium bicarbonate, gr. xx.
Divide into 6 powders. One powder every hour and a half.

Should the bowels not move by the following morning, a half ounce of Rochelle or Epsom salts may be given.

Saline diuretics are beneficial, and should be used early:

℞. Lithium citrate, ʒ jss
Potassium citrate, ʒ j
Aromatic elixir, ʒ iij
Water, q. s.
Two teaspoonfuls every 3 or 4 hours.

Or:

℞. Lithium citrate, ʒ jss
Wine of colchicum seed, ʒ ijss
Simple elixir, ʒ iij
Water, q. s. ad ʒ iij.
Two teaspoonfuls every 3 or 4 hours.

℞. Lithium citrate, ʒ jss
Wine of colchicum seed, ʒ ijss
Sweet spirit of niter, ʒ jv
Elixir of curacoa, ʒ iij
Water enough to make ʒ iij.
Two teaspoonfuls every 3 or 4 hours.

The most recent "remedy" is atophan (phenyequinolin-carboxylic acid). It is said to lessen the pain in the acute attack, and to increase the amount of uric acid which is excreted. See Atophan.

Local Treatment.—The parts must be placed at absolute rest, and should be on the same level with the body. Local applications are very soothing and often mitigate the inflammatory process. Probably for this purpose there is nothing better than lead-water and laudanum.

℞. Tincture of opium, ʒ iv
Solution of lead subacetate, ʒ iijss.
One teaspoonful to a pint of water, and keep constantly applied on flannel.

For the first few days this application may be made almost constantly while the patient is in bed. The whole foot may be enveloped in flannel and kept moist with lead-water and laudanum. Afterward the parts may be enveloped in lamb's-wool and a light bandage. A mixture of equal parts of ichthyol and vaselin may be rubbed over the inflamed area to keep the skin in a lax condition.

The Diet.—Futcher states that "the regulation of the food is undoubtedly the most important factor in the treatment. Meat is the article supposed to possess the most baneful influence, and over which there has been the most discussion. The red meats have for a long time been considered much more injurious than the white meats and fish. But there is very little difference between the two so far as the purin content is concerned. The protein foods considered particularly injurious, are those rich in cell nuclei and, consequently, containing an abundance of purin bodies. These comprise the thymus, pancreas, liver, kidney, and brain. The meat extracts are to be avoided, owing to their richness in nitrogenous extractives and salt. Fresh fish may be permitted in moderation. Salt fish should be avoided. Fish roe and caviar should be forbidden, owing to their richness in nuclein, although in the latter it is in the form of paranuclein. Eggs constitute the most valuable protein food for gout patients, in that they are free from purin bodies. Milk, for the same reason, is also most useful. Starchy foods may be freely allowed. An exclusive starch and vegetable diet has its advocates still, but their number is gradually diminishing. Bread, rice, potatoes and other garden vegetables, may form a liberal portion of the dietary. Cucumbers and tomatoes had better be avoided. Until recent years the prevailing belief has been that fruits were harmful. The best opinion at the present day favors the free use of fruits. The experience in any individual case is the best teacher in this regard, for certain fruits, such as bananas and strawberries, particularly the latter, may excite joint pains, and cause pharyngeal

symptoms. Fats, in the form of butter particularly, may be allowed with freedom; and butter in large quantities was advocated by Ebstein. All highly seasoned foods should be forbidden. Pepper, paprika, and mustard should not be permitted in dressings. Their only injurious effect is through impairment of the digestive functions. The majority of gout patients are better off without any alcoholic beverages. The general advice is that tea and coffee should be eliminated from the diet owing to the methylxanthins they contain. The gout patient should be induced to drink freely of water, particularly on an empty stomach early in the morning and before the various meals."

Treatment of Chronic and Irregular Gout.—The diet should be corrected; and alcoholic drinks, tea, coffee, and tobacco interdicted. The condition of the skin should be active, and hot baths 2 or 3 times a week may be advised. It is perhaps best to have the baths given in the middle of the day, followed by thorough massage.

Bier's Method in Gout.—Marked benefit has been derived from the induction of passive hyperemia both in acute and chronic gout, the pain being relieved almost immediately.

GRAFTING.—See Plastic Surgery.

GRANATUM.—Pomegranate. The bark of the stem and root of *Punica granatum* contains a mixture of alkaloids, *pelletierin*, one of the most efficient anthelmintics against tape-worm, rarely failing to bring away the whole worm. **Fluidextractum G.** Dose, 10 to 60 minims.

Pelletierinæ Tannas is a mixture of the tannates of four alkaloids (punicin, iso-punicin, methyl-punicin, and pseudo-punicin), obtained from *Punica granatum.* Dose, 3 to 8 grains, in powder, taken fasting and followed after 20 minutes by a full dose of castor oil.

GRANULAR LIDS.—See Trachoma.

GRANULOMA.—A term used by Virchow to include a neoplasm that does not advance beyond the stage of granulation tissue. See Tumors.

GRAVEL.—See Bladder (Stone), Kidney, Cystitis, Urine, etc.

GRAVES' DISEASE.—See Exophthalmic Goiter.

GRINDELIA.—The leaves and flowering tops of *G. robusta*, or *G. squarrosa*, wild sunflower, or gum-plant, found in California; an antispasmodic and motor depressant, in large doses producing mydriasis. It is valuable in asthma, bronchitis, and whooping cough. Dose of the fluidextract, 10 minims to 1 dram; of the alcoholic extract, 3 grains. Locally, it is used with advantage as a lotion for the dressing of burns and blisters, in vaginitis and uterine catarrh, and to allay the pain of herpes zoster. In the proportion of 1 part of the fluidextract to 9 of water, as a sedative lotion, it is a very efficient application for the cutaneous irritation due to poison-oak or ivy, also in skin diseases attended with itching and burning sensations.

GRIP.—See Influenza.

GRIPE.—See Colic.

GROWING PAINS.—A term applied to neuralgic or rheumatic pains in the limbs occurring during youth, and apparently of varied origin and character. The condition is sometimes known as "growing fever," and occurs usually in children from 7 to 15 years of age. It is characterized by pain in the regions of the epiphyseal lines, rapid growth, and sometimes fever, with considerable constitutional disturbance. The symptoms usually pass off without any bad results, although osteomyelitis is sometimes set up, and exostoses are developed along the epiphyseal lines.

GRUTUM.—See Milium.

GUAIAC (Guaiacum).—The resin of the wood of *Guaiacum officinale.* It is diaphoretic, expectorant and alterative; also laxative and purgative, according to the dose administered. Its taste is acrid and very disagreeable. Internally it is a local stimulant, producing salivation, an acrid sensation in the throat, warmth in the epigastrium, increase of the gastric and intestinal secretions and the flow of bile, and reflex stimulation of the heart. Its continued use causes gastric catarrh, and in large doses it is a gastrointestinal irritant, causing vomiting, purging and severe congestive headache. It has considerable reputatation in tonsillitis, neuralgic dysmenorrhea, amenorrhea, chronic rheumatism, gout, lumbago and sciatica. The ammoniated tincture in water makes a cleanly and not very disagreeable gargle. The reputation of guaiac in many chronic and obscure complaints is due, partly to its purgative property and partly to its nastiness, a quality which is highly appreciated by many patients.

Tinctura G.—20 percent. Dose, 30 to 90 minims, in mucilage or syrups, as the resin is precipitated by water. **Tinctura G. Ammoniata,** has of guaiac 20, aromatic spirit of ammonia to 100. Dose, 10 to 60 minims.

GUAIACOL.—One of the chief constituents of creosote, is prepared synthetically from catechol. It occurs as a colorless solid or liquid, of agreeable and aromatic odor, soluble in alcohol, ether, acetic acid and glycerin. Dose, 5 to 15 minims in capsule, pill, or whisky.

G. Carbonas (Duotal),—occurs as an almost tasteless and odorless, white, crystalline powder insoluble in water. Dose, 5 to 20 grains or more, gradually increased to a maximum of 90 grains per day. It is said to be a powerful local anesthetic.

Guaiacol, applied to the skin, appears in the urine 15 minutes after. In the treatment of phthisis, fetid bronchitis, or bronchiectasis, while diminishing the cough, perspiration, and fever, guaiacol rarely effects a cure. It is often better borne by the stomach than creosote. The drug may also be given by inhalation or subcutaneously. In the form of **guaiacol carbonate** (Duotal) it is still more acceptable.

℞. Guaiacol, ℥ j
Glycerin, ℥ ss
Spirit of orange, q. s. ℥ iij.
A teaspoonful to a dessertspoonful in water after meals.

Guaiacol Salve.—Salicylate of guaiacol. It has the same actions as its constituents. Dose, 15

grains. Inunctions are highly extolled, especially for children, in pulmonary tuberculosis and tuberculous glands and nontuberculous glandular enlargement.

GUARANA.—A dried paste consisting chiefly of the crushed seeds of *Paullinia cupana*. It occurs in brown cakes or sticks, having an odor of chocolate, and a bitter, astringent taste: partly soluble in water and in alcohol. It contains caffein and theobromin, also tannic acid, gum, albumin, starch, and a fixed oil. The specimens found in commerce are untrustworthy, unequal in quality and expensive (Squibb). Dose, 15 to 45 grains. **Fluidextractum G.**, made with diluted alcohol. Dose, 15 to 45 minims. Guarana is chiefly employed in the treatment of nervous sick-headache (migraine) administered in half-dram doses of the fluidextract when the attack is developing. It has been used in the diarrhea of phthisis, in convalescence from acute diseases, and generally in conditions requiring tonic treatment.

GUINEA-WORM DISEASE (Dracontiasis, Dranunculosis, Medina Worm Disease).—Infection with the *filaria* or *dranunculus medinensis*, the Guinea-worm, a parasite common in tropical and subtropical Asia and Africa. It has reached South America. It is believed to enter man free or enclosed in certain minute arthropods (cyclops) through drinking of infected water. It is suggested that probably a male and female larva enter the host, the male dying later and being absorbed while the female continues to develop. The adult worm is about 30 inches long and 1/10 of an inch thick. Whether the embryo enters ordinarily through drinking water; or through the bites of mosquitoes, flies, or other insects; or whether it penetrates the skin is a moot question. The fact that its usual habitat is the subcutaneous tissue of the lower extremities lends support to the transdermal theory. Usually but one worm is found in one host, though frequently the infection is multiple. Maturation of the embryo requires about a year. Locomotion may be impossible.

The symptoms are inflammatory, localized at the place where the matured worm attempts to reach the surface of the body in order to discharge her embryos and leave the host. If the worm be broken during its exit, suppuration and symptoms of sepsis may appear. After removal of the worm, symptoms vanish.

Prophylaxis consists in boiling all water used in preparing food or for drinking, refraining from bathing in infected water, and the wearing of shoes.

Treatment is directed to the safe extraction of the worm and antiseptic dressing of the lesion. The natives generally moisten the ulcerated surface, and when the head projects fasten it round a stick which is gradually twisted from day to day until the entire worm is extruded. Surgeons now inject with a hypodermic needle into the head of the worm or into the adjacent tissue a solution of mercury bichlorid. This kills the worm and its embryos and the dead worm is readily removed the next day.

GUM-BOIL.—An inflammation about the apex of a tooth-root, usually developing into an abscess, inclosed in a sac a little distance from the end of the root. There is always some inflammation of the neighboring periosteum or bone. Pus often evacuates through the pulp-canals or eats through the alveolar plate, and appears on the surface of the gum. The cause is usually the escape of the products of decomposition of the pulp. The pain is proportionate to the degree of confinement of the inflammatory products.

The tooth should be opened freely and syringed out, so as to enable the pus to escape. The gum should be lanced freely, to allay inflammation; and healing ensues most rapidly when there are exits through the gum as well as through the root-canals. Creosote or other powerful antiseptic may be pumped through the tooth. The root-canals and the cavity of decay should be solidly filled after the inflammation has passed off, or the abscess will recur. Left to itself, relief is afforded in time by the escape of the pus, but a permanent fistula results, and the tooth eventually loosens. When the roots reach beyond the reflection of the mucous membrane of the gum, the abscess may burst on the cheek. When this threatens, a free opening through the tooth and support of the cheek by collodion should be attempted. A poultice should never be applied externally. Tincture of iodin may be used to paint the gums. Tincture of aconite may be mixed with the iodin, or used alone, when the inflammation is slight.

GUMMA.—A soft, elastic tumor resulting from a peculiar kind of caseation of tertiary syphilitic inflammatory deposits. See SYPHILIS.

GUMS, AFFECTIONS.—The chief ailments of the gums are gingivitis or acute inflammation, sponginess, tendency to bleed, tumors, and the associated conditions of mercurialization and plumbism.

Gingivitis is very common in teething infants, and is discussed under DENTITION (*q. v.*).

A spongy condition of the gums is seen in those who neglect the care of the teeth, or who are in feeble health, or under such constitutional drains as lactation. The excessive administration of mercury causes a well-defined red line along the margin of the gum before sponginess appears, while a blue line along the gums just below the teeth results from plumbism. In true scurvy the gums are swollen and livid from submucous extravasations of blood, and bleeding occurs from the slightest touch. In advanced cases the gums are black and extremely offensive. Bleeding from healthy gums is a common symptom of the hemorrhagic diathesis.

The tumors of the gums are epulis, papilloma, epithelioma, and polypus myeloid growths. Hypertrophy of the gums and a nevoid condition may occur as a congenital affection. A vascular, noncongenital tumor of the gums may originate from irritation of the teeth, especially in the region of the incisors. It may be treated with caustics, but if large, it should be removed, and the surface from which it grows touched with the actual cautery.

Treatment.—When a spongy condition of the gums exists, the general health must be improved,

and the tooth-brush used carefully with some astringent mouth-wash. In scurvy the most severe cases yield to the administration of vegetables and fresh fruit. Lime-juice is useful. Bleeding from the gums may be checked by pressure or astringent washes or by the administration of various preparations of iron and the mineral acids. Nothing less than cutting away the portion of the alveolus from which it springs or inducing its exfoliation by the application of the actual cautery can be relied on for the cure of epulis. A tooth on each side must usually be sacrificed for this, and the whole growth occasionally comes away in the removal of the teeth. Tumors are usually completely removed. For ulceration of the gums, 20 grains of silver nitrate in solution may be applied upon a swab, followed by an antiseptic and astringent mouth-wash.

In the treatment of polypus of the gums the removal of the tartar or decayed teeth and the use of astringent washes is sufficient for most cases; or the growth may be snipped off with scissors, or, if sessile, cut off and cauterized with the Paquelin cautery. Vascular outgrowths may be treated with caustics when small, but when large, they should be removed and the surface touched with the actual cautery. The only successful treatment for epithelioma of the gums is removal of the whole thickness of the jaw well beyond the disease, and excision of glands in the neighborhood and in the neck connecting with the site of the disease.

Tincture of myrrh, 2 to 4 drams, in 4 ounces of water, or the infusion of cinchona, is highly serviceable as a gargle or mouth-wash for spongy and ulcerated gums; alum is also useful. A piece of catechu, dissolved slowly in the mouth, is often of service in similar conditions. In teething, 2 grains of potassium chlorate may be given every 4 hours to a child of 1 year. The glycerite of tannin is serviceable for spongy and bleeding gums. The carbolate of iodin, or the tincture of benzoin, or the bark of pomegranate in solution is an efficient application when fetor exists. Carbolic acid, 3 grains to 1 ounce of water, is useful as a lotion. Potassium iodid in 10-grain doses, given thrice daily, is indicated in periostitis of the alveolar process, when looseness of the teeth and pain and swelling of the gums exist. Powdered rhatany is used as a dentifrice. See JAWS, MOUTH, PYORRHEA ALVEOLARIS.

The following is a useful mouth-wash:

℞.	Alum,	ʒ ss
	Tincture of myrrh,	ʒ j
	Tincture of cinchona,	ʒ iv
	Honey of rose,	ʒ j
	Alcohol,	ʒ viij.

GUNPOWDER STAINS, REMOVAL.—Gunpowder stains are best removed by picking out each grain with a sharp-pointed tenotome. Irritating ointments followed by poulticing may be used with the hope that the grains will be discharged by suppuration. The application of equal parts of ammonium iodid and distilled water has been recommended; the spots gradually turn red, and the red marks are faded by the application of dilute hydrochloric acid. Electrolysis and caustics cause permanent scarring. When the stains are quite superficial, the upper layer of the skin may be shaved off, and the raw surface covered with a Thiersch graft (Stewart). (See PLASTIC SURGERY.)

GUNSHOT WOUNDS.—Two important causes are destined to bring about a radical change in the treatment of gunshot wounds as practised in the past, and as will be taught and advised in the future: (1) The modifications which the weapon and projectile have undergone; (2) the introduction into general practice of aseptic and antiseptic surgery. The diminution in the caliber of the bullet, the metallic jacket, the substitution of smokeless for black powder, the greater velocity and power of penetration of the missile, are conditions and influences which must necessarily modify the character of wounds inflicted with the modern weapon. From a practical standpoint there remains no doubt as to the following facts, which will be confirmed by experience in the treatment of gunshot injuries inflicted with the small-caliber bullet: (1) Few bullets will be found lodged in the body; (2) wounds will be incised rather than contused; (3) range will have more influence in changing the character of the wound; (4) diminished risk of infection; (5) dangerous primary hemorrhage will be more, secondary hemorrhage less, frequent; (6) more difficult extraction of the bullet. As to the relative number of dead and wounded, and the tendency of the jacketed bullet to become encysted—these are subjects on which it is only possible to theorize and conjecture; subjects which can only be definitely settled by an extensive experience. It is less difficult to predict the influence wrought by the recent discoveries and advancements in surgery on the treatment of gunshot wounds and on the fate of the wounded. The antiseptic treatment of wounds and asepsis are destined to minimize the remote dangers of gunshot wounds and other open injuries inflicted on the battle-field. We may safely repeat with the late Professor von Nussbaum, "The fate of the wounded rests in the hands of the one who applies the first dressing." This is the motto that every military surgeon must adopt and carry into effect. To this may be added, "Never probe a bullet wound on the battle-field." The experience of the past has taught the wisdom of adopting such a universal rule.

First-aid Dressing.—The idea of rendering first aid to the wounded immediately upon receipt of injury in modern warfare must be abandoned. Alarming hemorrhage from a large vessel of any of the extremities will in many instances be arrested by the patient himself or his nearest comrade by the use of some sort of circular constriction, but the legitimate function of the hospital corps men will begin after the engagement. Desirable as it may appear, attempts at disinfection of the wound or wounds will prove impracticable and useless on the battle-field. Time alone is an important element in contraindicating such a course. Hundreds and thousands may demand attention, to say nothing of the limited facilities

for procuring for the wound and its vicinity an aseptic condition. The wisest and safest course to pursue under such circumstances is to make an intelligent use of the first-aid dressing package, which should be found upon the person of every soldier—officers and men. The average first-aid package—the one devised by von Esmarch included—is too cumbersome. A first-aid package, to meet the indications for which it is employed, should include: (1) An efficient antiseptic powder; (2) a sufficient quantity of a hygroscopic material to absorb the primary wound secretions and to serve as a filter for the wound; (3) a handkerchief or bandage with which to retain the dressing; and, in case of necessity, to be used in constructing a Spanish windlass; (4) safety-pins.

Senn's package contains about a teaspoonful of a powder composed of 4 parts of boric acid and 1 part of salicylic acid; about 1 dram of absorbent cotton; a piece of sterile gauze 40 inches square; and a number of safety-pins. The powder is lodged in the center of the cotton compress, and is to be applied directly to the wound when the package is used. The package, when compressed, is small and is wrapped in gutta-percha. The piece of gauze can be readily transformed into a Mayor triangular bandage, and serves as an excellent substitute for Esmarch's bandage, which is heavier and requires much more space. The figures printed on Esmarch's bandage are useful for instruction, but absolutely without value on the battle-field. In rendering first aid the injured part should be divested of clothing with as little disturbance of the wound as possible. Instead of removing the clothing, it is much better to make free use of scissors and knife in gaining access to the wound. If two wounds are found, both must receive the same attention and care in protecting them against infection. In the absence of grave symptoms, such as hemorrhage, the dressing should not be disturbed until the patient reaches the field-hospital, and in many cases healing of the wound will take place without further interference. The immobilization of the injured part, particularly in cases of compound fracture of the extremities, constitutes an important part of the manifest duties of those who render first aid to the wounded. In all large engagements the supply of mechanic supports carried by the men of the hospital corps will be exhausted long before all the wounded have received attention. Splints must be improvised. Rifles, sabers, bayonets, bark, branches of trees, shrubs, etc., the chest, in fractures of the upper extremity, the opposite limb, in fractures of the thigh or leg, will have to be utilized in procuring rest for the injured limb in transporting patients from the line of battle to the first dressing station. It is here that the surgeons will supplement or improve the work done by the litter-bearers and hospital corps. It is for the purpose of doing away with the necessity of using splints that a German military surgeon has recently devised a litter on the plan of a double inclined plane for the lower extremities. In the absence of a litter of such special construction the same object is attained by securing the same position for the injured limb by a roll made of a blanket, clothing, knapsack, drum, straw, etc. The transportation of a wounded man suffering from a fracture of the lower extremity can be done with less pain and with greater security against additional injuries if the fractured limb is placed in a flexed position.

Arrest of Hemorrhage on the Field.—Lives are placed in jeopardy and deaths occur more frequently from internal than from external hemorrhage; in the treatment of the former little can be done on the field. Ligation of arteries on the field proves impracticable in most instances. The company-bearers and hospital corps men should be fully instructed in the details of the various hemostatic resources applicable in emergency work. Elevation of the injured part, hyperflexion, digital compression, and antiseptic tamponade are some of the measures employed that may be intrusted to intelligent and well-instructed laymen for arresting hemorrhage. Some form of circular constriction is, however, most frequently relied upon in arresting hemorrhage complicating gunshot wounds of the extremities. The advantages and dangers attending this method of arresting hemorrhage must be made a prominent feature in giving instructions on first aid. The technic of the procedure, whether it consists in the use of the typical Esmarch's elastic constrictor, a pair of suspenders, or the Spanish windlass, should be fully explained and demonstrated on the living subject. The fact must be impressed that it is of great importance to render the limb that is to be constricted comparatively bloodless by elevation before the constrictor is applied. The next most important step to be carried into effect in the use of circular constriction is to constrict quickly and with sufficient firmness to interrupt at once and completely both the arterial and the venous circulation. A question of immense and far-reaching importance, and one that has not as yet been definitely answered, is: How long is it safe to continue the constriction? There must be, and there is, a limit as to the length of time it is safe to exclude blood supply from living tissues. Although cases have been reported in which elastic constriction was continued for from 3 to 12 hours without any serious immediate or remote consequences, yet the consensus of opinion among surgeons at the present time is opposed to excluding the blood supply from an entire limb, the seat of a gunshot injury, for a longer time than 3 or 4 hours. The danger of gangrene is always greater in constricting an injured than a healthy limb.

Locating, Finding, and Extracting Bullets.—The new rifles minimize the surgeon's work in locating, finding, and removing bullets. In the vast majority of cases requiring surgical treatment two wounds will be found—the wound of entrance and that of exit—marking the location and direction of the tubular wound made by the bullet. The cases in which the jacketed bullet will be found in the body, indicated by the existence of only one wound, will be exceptional. The search for bullets should be reserved until the patient has reached the field-hospital, when the surgeons have at their disposal the necessary instruments for making an accurate diagnosis and the essential facilities

for performing operations under the strictest aseptic and antiseptic precautions. Before using the finger or probe in exploration for a bullet, the wound and the surface for a considerable distance around it should be thoroughly disinfected, to guard against all possibility of infecting the wound during the examination or during attempts at removal of the bullet, should such a course be deemed advisable after the completion of the examination. One of the most important rules to be followed in locating a bullet in the body is to place the patient and the part injured as nearly as possible in the same position as at the moment the injury was received.

The metal-clad bullet has, to a certain extent, rendered the famous Nélaton probe obsolete. However, leaden bullets will be used to a greater or less extent by certain branches of the military force, and the porcelain tip will occasionally prove of service. The great objection to Nélaton's bullet-probe is the size of the porcelain tip. The end of the probe should correspond approximately in size to the caliber of the tubular wound. By using an instrument constructed on this principle the danger of making false passages is greatly reduced. In parts of the body composed of deep muscular planes and layers of fascia it is often found impossible to follow the track of the bullet with any kind of probe. It is in such cases, when it is deemed prudent, from the symptoms presented and the probable location of the bullet, to explore the track, that the surgeon should take advantage of the use of the knife in dilating the track, using the probe, step for step, as a guide. The use of the X-ray will prove of the greatest value in all attempts to locate bullets. In order to locate the bullet with sufficient accuracy to enable the surgeon to determine the propriety of an operation for its removal, and to guide him safely in his work, photographs from at least two directions must be taken. Every field- and general hospital should be supplied with an X-ray apparatus, and in all difficult cases this should be made use of before undertaking an operation, and in preference to repeated recourse to the probe. The famous old-fashioned American bullet forceps has lost its distinction in military surgery through the introduction of the metal-clad bullet.

Gunshot Wounds of the Extremities.—Besides the ordinary treatment of gunshot wounds, regardless of the anatomic location of the injury, bullet wounds of the extremities, when complicated by fracture or joint injury, present to the surgeon special clinical features of great importance. Under modern treatment injuries of soft tissues not implicating important vessels and nerves should heal in a short time under the first dressing, with little or no functional impairment. The existence of a gunshot fracture, regardless of the extent of bone injury, no longer furnishes a legitimate indication for a primary amputation. Such injuries, under appropriate aseptic and mechanic treatment, heal satisfactorily in the course of time. The ingenuity of the surgeon is taxed in applying and maintaining the necessary mechanic support until the fracture heals by bony consolidation, with the limb in a satisfactory useful position. In gunshot fractures of the femur extension and immobilization constitute the generally accepted treatment. A determined, strong protest must be made against the unnecessary removal of detached and partly detached fragments of bone. If the wound remains aseptic, the loose fragments of bone will not only retain their vitality, but will take an important part in the restoration of the continuity of the bone, and will add materially to the functional result. *Débridement*, more or less extensive, only becomes necessary, and should be performed, in case the wound becomes infected. In such an event the loose infected fragments of bone should be promptly removed, free tubular drainage established, and the wound throughout subjected to thorough disinfection. If the ordinary measures fail, continued irrigation with a saturated solution of acetate of aluminum will very often bring about the desired results and obviate the necessity for an amputation. Fixation and suspension in such cases will not only procure comfort for the patient, but will serve an excellent purpose in securing and maintaining coaptations and in facilitating drainage and irrigation. As soon as the fracture has united with sufficient firmness to render extension superfluous, the limb should be immobilized in a circular plaster-of-Paris splint, extending from the base of the toes to the groin, and in high fractures including the pelvis, after which the patient may be permitted to walk about with the aid of crutches. In gunshot fractures of the leg early immobilization in a circular plastic splint is to be advised, and yields the most gratifying results. Watchful control of patients suffering from such injuries, and treated by the use of plaster-of-Paris bandage, is essential in guarding against disastrous complications and in obtaining satisfactory functional results. Gunshot injuries of any of the large joints are now within the range of successful conservative treatment. The indications for primary amputation of a limb or part of a limb should be restricted to cases in which the nutrition is suspended or seriously threatened by the coexistence of vascular lesions incompatible with the vitality of the tissues at and below the seat of injury. In doubtful cases the soldier is entitled to the benefit of the doubt, and the conservative treatment should be carried to its ultimate limits until the appearance of complications demonstrates its futility and dictates the propriety of resorting to a mutilating operation. It is always more creditable to the surgeon to save a limb than to remove it, and the plan of the military surgeon of the future should and will be to limit more and more the indications for amputations.

The few cases of penetrating gunshot wounds of the skull that come under the observation of the military surgeon invariably require operative interference, provided it holds out any encouragement whatever of saving life. In case a bullet has passed through the skull and its contents, the entire scalp should be thoroughly shaved and disinfected. The wound of entrance must be enlarged sufficiently to expose the perforation freely, which is then enlarged with chisel, De Vilbiss, or

rongeur forceps sufficiently to enable the surgeon to remove the loose spicules of bone, which are frequently embedded some distance in the brain. With a long-eyed probe a strip of iodoform gauze large enough to pack loosely the tubular visceral wound should be inserted from the wound of entrance to the wound of exit, and the rough gauze drain made to project a few inches beyond the surface of each wound. Thorough capillary drainage of this kind will prevent accumulation of primary wound secretion in the interior of the skull, and will be of value in arresting capillary hemorrhage. A large hygroscopic dressing enveloping the entire scalp, and covering both wounds, should be applied, and held in place by a few turns of a plaster-of-Paris bandage. The drain must be allowed to remain until the danger of infection is passed, when it is to be removed gradually by shortening it every day or two. In case the bullet should be found lodged in the interior of the skull, the wound of entrance must be treated in the same manner, and the bullet located by the careful use of Fluhrer's aluminium probe. A counter-opening may become necessary in removing the bullet if it has reached the opposite side of the skull, or when it has become deflected or arrested in its course near the surface of the brain, in case the locality in which it has become lodged warrants operative intervention. In all visceral injuries of the contents of the skull resulting from gunshot wounds, capillary or tubular drainage or a combination of the two is indicated, and should be continued until there is no further danger of infection, hemorrhage, or accumulation of wound products, when the drain is to be gradually removed. The value of the X-ray in locating bullets in the interior of the cranium has not, as yet, been definitely determined.

Gunshot Wounds of the Chest.—Penetrating gunshot wounds of the chest are attended by an enormous mortality, owing to the physiologic importance of the organs that it contains. Visceral wounds of the heart and large blood-vessels usually result in death in a few moments from acute anemia. Hemorrhage into the pleural cavity and into the large bronchial tubes interferes mechanically with the respiratory functions, and frequently proves fatal in a short time; and if the patient recovers from its immediate effects, life is placed in danger by complications often caused by hemothorax. The accumulation of a large quantity of blood in the pleural cavity is not incompatible with a speedy recovery, as when the blood is aseptic, its removal by absorption is accomplished in a short time.

Experience during the War of the Rebellion proved that in gunshot wounds of the chest the chances for life were much better if the bullet passed through the chest than if it remained lodged in the body. Little progress has been made in the treatment of penetrating wounds of the chest. Direct operative treatment of visceral wounds of the heart and lungs is always attended by imminent risk to life from pulmonary collapse. This source of danger stands in the way of direct treatment of visceral wounds of the chest. Hemorrhage from wounds of the lung is often corrected spontaneously by the accumulation of blood in the cavity of the chest, causing temporary pulmonary collapse, and by tamponade of the tubular visceral wound by the formation of a blood-clot. Free incision of the chest-wall has been strongly advocated by several French surgeons in cases of penetrating gunshot wounds of the chest, with a view to arresting hemorrhage by ligation, tamponade, or the use of the cautery; but the profession on the whole is opposed to such heroic treatment. Unless the source of hemorrhage is one of the intercostal arteries or of the internal mammary artery, it is advisable to rely on nature's resources for arresting the bleeding. Hemorrhage from the intercostal arteries can be effectually checked by tamponade, using for this purpose an hour-glass-shaped tampon of iodoform gauze. Rest in the recumbent position, with the chest slightly elevated, is essential in aiding spontaneous arrest of hemorrhage and in the prevention of complications. A rise in the temperature during the first 48 hours is no indication of the existence of sepsis, as, with few exceptions, it indicates a febrile disturbance caused by the absorption of fibrin ferment—the so-called fermentation fever. Should later symptoms develop, suggestive of septic infection, aspiration should be promptly resorted to; and if not followed by speedy improvement, no time should be lost in subjecting the patient to the same medical treatment as that advised and practised for empyema—that is, rib resection, free incision, and drainage. The production of an artificial pneumothorax or hydrothorax by the introduction into the pleural cavity on the injured side of a nontoxic gas, filtered atmospheric air, sterilized water, or nontoxic antiseptic solutions, has not proved satisfactory in the treatment of intrathoracic traumatic hemorrhage. From what has been said it is clear that the best treatment in penetrating gunshot wounds of the chest consists in hermetically sealing the wound of entrance and that of exit, if such exists, under strict aseptic precautions, and in watching for and treating subsequent complications as they present themselves.

Gunshot Wounds of the Abdomen.—The penetrating wounds of the abdomen that come under the observation of the military surgeon are, with few exceptions, wounds inflicted with the modern small-caliber projectile. The visceral wounds and the wounds of entrance and exit will be small—too small for digital exploration. A penetrating wound of the abdomen should never be probed either for diagnostic or therapeutic purposes. If any doubt exists as to whether or not the bullet has entered the abdominal cavity, it is far better and safer to dilate the track by the use of the knife, relying on the probe as a guide, than to work in the dark with the probe, thus increasing the possibilities of infecting the peritoneal cavity. Quite recently the assertion has been made by several prominent surgeons that celiotomy should be performed in all cases in which it can be shown that penetration has occurred. It must, however, be admitted that, in the absence of serious visceral lesions, penetrating wounds of the abdomen are

injuries from which the patients are very likely to recover without operative treatment, and that when such patients are subjected to celiotomy, death may occur solely in consequence of the operation. It is undoubtedly true that in most cases of spontaneous recovery after penetrating gunshot wound of the abdomen the favorable termination has been due to the absence of serious visceral lesions, which some hold to be invariably present in such cases. During the Græco-Turkish war, several cases of gunshot wound of the abdomen recovered under a conservative plan of treatment. In nearly all these cases the bullet entered the abdomen above the umbilicus—the most favorable location for the escape of intestines from the missile—the patient being in a standing position.

In 2 out of 16 cases of penetrating gunshot wounds of the abdomen observed, the absence of visceral injuries of the gastrointestinal canal was demonstrated by the use of the hydrogen gas-test, and both of these patients recovered without resort to celiotomy. Clinical experience and the result of experiment show conclusively that this operation should not be performed simply because a bullet has entered the abdominal cavity, but that its performance should be limited to the treatment of intraabdominal lesions that, without operative interference, would tend to destroy life. A bullet that passes through the lower part of the abdomen from side to side or obliquely is almost sure to produce from 4 to 14 perforations of the intestines, while absence of dangerous visceral complications may be inferred with some degree of probability if it crosses the abdominal cavity in an anteroposterior direction at, or a little above, the umbilical level.

The general symptoms in cases of penetrating gunshot wounds of the abdomen, with the exception of those due to profuse hemorrhage, furnish very little information in reference to the existence or absence of visceral complications. Severe shock may attend a single nonpenetrating wound, or it may be absent, or at least slight, in cases of multiple perforation of the intestines. It is not an uncommon occurrence for a patient with a number of intestinal perforations to walk several blocks, or even a number of miles, without a great deal of suffering and without showing any symptoms of shock. Vomiting occurs as frequently in parietal wounds and in simple penetrating wounds as when the viscera have been injured. Vomiting of blood points to the existence of a wound of the stomach.

Pallor is present soon after the receipt of the injury in all penetrating wounds of the abdomen, and it is only more pronounced when produced, at least in part, by sudden and severe hemorrhage. Pain is a very unreliable and often a misleading symptom, as it may be moderate or almost completely absent soon after the injury has been inflicted, even when multiple perforations are present. The pulse at first is slow and compressible in all cases, and nothing characteristic in its qualities is observed even when the stomach or intestines have been wounded. Hemorrhage caused by wounds of any of the large organs, as the spleen, liver, or kidneys, gives rise to progressive acute anemia, small rapid pulse, cold clammy perspiration, dilated pupils, yawning, vomiting, and, in extreme cases, syncope and convulsions. The local symptoms are of no more value in determining the existence of visceral injuries in penetrating wounds of the abdomen than are the general symptoms enumerated. External hemorrhage is slight or entirely absent, unless an artery or vein in the abdominal wall has been injured. The bleeding from visceral wounds gives rise to accumulations of blood in the peritoneal cavity—occult or internal hemorrhage; this can be recognized by physical signs denoting the presence of fluid in the free abdominal cavity and by general symptoms indicating progressive anemia—increasing pallor of the face and of the visible mucous membranes, small feeble pulse, superficial sighing, respiration, and dilated pupils. Wounds of the stomach often occasion hemorrhage into this organ and hematemesis. Blood in the stools seldom follows hemorrhage into the bowels from intestinal wounds sufficiently early to be of any diagnostic value.

Circumscribed emphysema in the tissues about the track made by a bullet has been regarded as an important sign of the existence of intestinal perforation. This symptom is misleading and is absolutely devoid of diagnostic value, as this condition has frequently been observed in nonpenetrating wounds of the abdominal wall, resulting from the entrance of air into the loose connective tissue, or later by gas formation as one of the results of putrefactive infection. The accumulation of any considerable quantity of gas in the peritoneal cavity can sometimes be recognized by the disappearance of the normal liver dulness, caused by the presence of gas between the surface of the liver and the chest-wall. This condition has been sought as a diagnostic sign in cases of perforating wounds of the abdomen, and if found, has been taken as a positive indication of the existence of visceral wounds of the gastrointestinal canal. This is not, however, always the case. Adhesions between the surface of the liver and the chest-wall may have existed before the injury was received, or the amount of gas present may be insufficient to give rise to this sign. The escape of the contents of the wounded stomach or intestines through the external wound is a rare occurrence, and is possible only when the external wound is sufficiently large and straight, and when it corresponds with the location of the visceral wound, or in the event of preexisting adhesions between the abdominal wall and the injured portion of the gastrointestinal canal. External extravasation occurs more frequently in wounds of the large than of the small intestine. When this symptom is present, it is conclusive proof of the existence of a visceral wound of the gastrointestinal canal, and the character of the extravasation will furnish reliable information as to the anatomic location of the visceral injury. With the exception of the last-mentioned symptom and the indications pointing to the necessity for arresting internal hemorrhage, there is nothing about the local or general symptoms in cases of penetrating gunshot wounds of the abdomen that would enable the surgeon to decide with any

degree of certainty soon after the injury was received whether or not visceral injuries existed, and, consequently, whether celiotomy should or should not be performed.

Diagnosis.—If a gunshot wound has penetrated the abdominal cavity and the general symptoms and local signs point to the existence of dangerous internal hemorrhage, no time should be lost in further efforts to make an accurate anatomic diagnosis, as sufficient evidence has been obtained to warrant a celiotomy for the purpose of preventing death from hemorrhage by the direct surgical treatment of the visceral injuries. If no such urgent indication presents itself, it is desirable that the existence of visceral lesions demanding surgical treatment should be ascertained before the patient is subjected to the additional risk incident to the operation. Since a simple penetrating wound of the abdomen is an injury from which the majority of patients recover without operative treatment, and since visceral wounds of the gastrointestinal canal are attended by so frightful a mortality without surgical interference, the practical value and importance of a correct diagnosis before deciding upon a definite plan of treatment become obvious. It is apparent that if some reliable diagnostic test could be applied in cases of penetrating wounds of the abdomen that would indicate to the surgeon the presence or absence of visceral lesions of the gastrointestinal canal, the indications for aggressive or conservative treatment would become clear. It has been shown by experiments on animals and clinical experience in the treatment of a number of cases of gunshot wounds of the abdomen, that **rectal insufflations of hydrogen gas** may be relied upon in demonstrating the existence of perforations of the gastrointestinal canal before opening the abdomen. It has been proved that if the abdominal muscles are completely relaxed under the influence of a general anesthetic, hydrogen gas or filtered air can, under safe pressure, be forced from the anus to the mouth if no perforations exist; and if such are present, the gas will escape into the peritoneal cavity, where its presence can be readily detected by the physical signs characteristic of a free tympanites or by its escape through the external opening.

Hydrogen gas is a nontoxic substance, endowed with valuable inhibitory antiseptic properties, and is absorbed from all the larger serous cavities and connective tissues within a few hours. Pure zinc and sulphuric acid should be used in generating the gas, which is collected in a rubber balloon holding at least 4 gallons. The rubber balloon used for this purpose is square in shape and is connected with the rectal tip by means of a rubber tube 6 feet in length and supplied with a stop-cock near its proximal end. In applying the test an assistant presses the margin of the anus against the rectal tip, so as to prevent the escape of the gas, while another assistant forces the gas along the intestinal tube by pressing or sitting on the rubber balloon. The gas passes through the ileocecal valve under a pressure of 2 1/2 pounds to the square inch, and is announced by a distinct gurgling sound, which can always be distinctly heard by applying the ear or stethoscope over that region. If the rectum or colon has been perforated, the gas will not reach the small intestine, but will escape into the peritoneal cavity under less pressure than is required in rendering the ileocecal valve incompetent. As soon as the gas reaches a perforation large enough to permit its escape, it will enter the peritoneal cavity and escape through the external wound, if this has been freely laid open down to the peritoneum. If the external wound is in a location that points to injury of the stomach, this organ should be insufflated through a rubber stomach-tube; and if this test proves negative, it is to be followed by rectal insufflation. It is impossible to inflate the intestines to any extent from the stomach.

Treatment.—The propriety of surgical interference in cases of penetrating gunshot wounds of the abdomen will depend upon one of three things:

1. General condition of the patient.
2. Dangerous internal hemorrhage.
3. Wounds of the stomach or intestines large enough to permit extravasation.

If the patient is pulseless and presents other indications of approaching death, operation is unjustifiable, as it would only hasten the end. Dangerous internal hemorrhage coming to the notice of military surgeons in gunshot wounds of the abdomen will be the cases in which the vascular organs of the abdomen, the liver and spleen, or some of the larger vessels of the mesentery or omentum have been injured. Delay in such cases is dangerous. The abdomen should be opened and the hemorrhage arrested. The symptoms are likely to be unusually severe if the hemorrhage is sudden; progressive, if the loss of blood is gradual. In the latter case it may be prudent to await more pressing indications, as spontaneous arrest of hemorrhage may occur and large quantities of aseptic blood are removed from the peritoneal cavity in a short time. Visceral lesions of the gastrointestinal canal large enough to permit extravasation are, with very few exceptions, mortal wounds, justifying prompt abdominal section as the only chance to save life.

Preparation of Patient.—A patient suffering from a penetrating gunshot wound of the abdomen should be properly prepared before he is subjected to celiotomy. If the stomach is filled with food, a salt-water emetic should be given for the purpose of emptying its contents, or, better still, this can be done by the use of the stomach siphon-tube. The rectum and colon must be emptied by a copious enema of warm water, to which may be added a tablespoonful of common salt. The unloading of the gastrointestinal canal will not only facilitate the operation, but will have a favorable influence in securing rest for the injured part. A hypodermic injection of 1/4 of a grain of morphin and 1/30 of a grain of strychnin should be given shortly before the anesthetic is administered, as these remedies, in the doses specified, assist the action of the anesthetic, secure rest for the intestines, and sustain the action of the heart. If the patient is much prostrated, 2 ounces of whisky diluted with 4 ounces of warm water should be given by the rectum. The whole abdomen should be thor-

oughly disinfected. Before and during the operation the use of external dry heat will do much to prevent shock and to aid the peripheral circulation. Compresses, towels, and several gallons of warm normal solution of salt must be provided. The operator should do the work with as little assistance and as few instruments as possible, as the danger of infection in emergency work is likely to be proportional to the number of assistants employed and the number of instruments used. Hands, instruments, suturing material, in fact everything that is to be brought in contact with the wound, must be sterilized. In military surgery silk has the preference over catgut. A hospital tent with a floor will be an admirable operating-room in all semitropic climates. Anesthesia should be commenced with chloroform until the patient is under its full influence, when it should be continued with ether.

Incision.—In the majority of cases the median incision should be made, as it affords advantages which give it the preference. It should always be selected in cases of gunshot wounds of the stomach, and when the wound of entrance is located near the median line. A median incision affords most ready access in the treatment of wounds of the small intestine. If the insufflation test is used, it will sometimes prove of value in deciding upon the location of the incision. In gunshot wounds of the upper portion of the abdomen, if direct inflation of the stomach through an elastic tube reveals the existence of perforation of this organ, the median incision should be selected. If rectal insufflation yields a positive result before the gas has passed the ileocecal valve, the incision should be made over the wounded portion of the colon, which is usually indicated by the course of the bullet. A wound in the transverse colon can be found and dealt with most effectually through a high median incision; perforation of the cecum or of the ascending colon calls for a lateral incision directly over the wounded organ; while a lateral incision on the left side is indicated if, from the direction of the bullet, it is evident or probable that the colon below the splenic flexure is the seat of the visceral injury. Celiotomy performed for the arrest of hemorrhage should always be done by making a long median incision, which will afford the most direct access to the different sources of hemorrhage. Very often it will be advisable to make the incision in the line of the wound of entrance, especially in those cases where a lateral incision is indicated.

Arrest of Hemorrhage.—In opening the abdomen in the treatment of internal hemorrhage the surgeon undertakes a task of which it is impossible to foretell the result. To do the work quietly and well he must be perfectly familiar with the anatomy of the abdominal organs, their source of blood supply, and must have full knowledge of all hemostatic resources, the indication for their selection and details of application. Profuse intraabdominal hemorrhage resulting from penetrating gunshot wounds of the abdomen is more frequently of parenchymatous and venous than of arterial origin. Wounds of the liver, spleen, kidneys, and mesentery give rise to profuse and often fatal hemorrhage. After opening the peritoneal cavity it is commonly very difficult to find the bleeding points, as the blood accumulates as rapidly as it is sponged out, and it becomes necessary to resort to special means in order to arrest profuse bleeding sufficiently to find the source of hemorrhage. One of two means should be employed: (1) Intraabdominal digital compression of the aorta; (2) packing the abdominal cavity with a number of large sponges or gauze compresses. Intraabdominal compression of the aorta below the diaphragm can readily be made by an assistant introducing his hand through the abdominal incision, which, in such a case, must be larger than under ordinary circumstances. Compression made in this manner will promptly arrest hemorrhage from any of the abdominal organs for a sufficient length of time to enable the surgeon to find the source of hemorrhage and to carry out the necessary treatment for its permanent arrest.

Hemorrhage from a perforated kidney may demand nephrectomy, if it does not yield to tamponade. If the tampon is used, an incision in the lumbar region must be made for the removal of the tampon, and the parietal peritoneum should be sutured, so as to exclude the peritoneal cavity from the renal wounds. Wounds of the liver are sutured with catgut, cauterized with the actual cautery, or tamponaded with a long strip of iodoform or a typical Mikulicz tampon; in any case the gauze is to be brought out of the wound and utilized as a drain.

A wound of the spleen, if the hemorrhage does not yield to ligation, suturing, or tamponade, necessitates splenectomy. Very troublesome hemorrhage occurs in wounds of the mesentery. When multiple wounds of the mesentery and visceral wounds of the stomach or intestines are the cause of hemorrhage, it is a good plan to pack the abdominal cavity with a number of large sponges, napkins, or compresses of gauze, to each of which a long strip of gauze is securely tied; these strips are allowed to hang out of the wound in order that none of the sponges or compresses may be left in the abdominal cavity after the completion of the operation. The sponges or compresses make sufficient pressure to arrest parenchymatous oozing as well as venous hemorrhage, if they are placed at different points against the mesentery and between the intestinal coils. The sponges are removed one by one, from below upward, and the bleeding points secured as fast as they are uncovered. The ligation of mesenteric and omental vessels, both arteries and veins, should be done by applying the ligature *en masse*. A round needle or Thornton's curved hemostatic forceps are the most useful instruments for this purpose. Catgut, as a rule, should not be relied upon in tying a mesenteric vessel, as for this purpose it is inferior to fine silk.

If hemorrhage is profuse, it should be checked before binding and suturing the visceral wounds. Troublesome hemorrhage from a large visceral wound of the stomach or intestines is best controlled by hemming the margin of the wound with

catgut or fine silk. In hemorrhage from localities not accessible to ligation and not amenable to tamponade, pressure forceps are applied and allowed to remain for 24 or 48 hours. When used in this manner, the instrument must be long enough to be brought out of the wound, and is then incorporated in the dressing. For the purpose of facilitating the binding and removal of the instrument, a strip of gauze is tied to the handle.

Search for Perforations.—A number of cases have been recorded in which celiotomy was performed, one or more perforations sutured, and the postmortem showed that a perforation was overlooked, death resulting from extravasation and diffuse septic peritonitis. Such experiences are by no means limited to the practice of novices. The handling of the entire length of the gastrointestinal canal in search for perforations requires time, adds to the shock of the injury and operation, and, even if done by experts and with the utmost care, a perforation may escape the attention of the operator and become the sole cause of death. If the surgeon adopts this plan of detecting the perforations, the work should be done systematically. The ileocecal region is the best landmark in beginning the search. From here the small intestine is traced in an upward direction, examining loop after loop, and returning the intestine as soon as examined so as to avoid extensive eventration, which adds greatly to the danger of the operation. The large intestine is traced from the ileocecal region downward. Perforation of the rectum has been found low down in the pelvis, and would have been overlooked had the inflation test not been used. If the air- or gas-test is employed with a positive result before the abdomen is opened, there will be no difficulty experienced in finding the first opening. If the stomach is inflated directly through an elastic tube, and the test shows the presence of a perforation, a median incision is made from the tip of the ensiform cartilage to the umbilicus, and the stomach is drawn forward into the wound. If no perforation is found in the anterior wall, the insufflation is repeated, and the escaping air or gas will direct the surgeon to the perforation. Through this perforation the stomach should again be inflated in search of a second, and possibly a third, perforation. In searching for intestinal wounds by the aid of inflation, further inflation should be suspended as soon as the lowest perforation has been found. If possible, the perforated portion of the intestine should now be brought forward into the wound, and after emptying the intestine below the perforation of its contents as far as possible, including the gas or air, the bowel is compressed below the perforation by an assistant, and the intestine higher up is inflated through the wound. As a matter of course, a perfectly aseptic glass tube should be inserted into the rubber tube in place of the rectal tip. The inflation is now carried as far as the second opening, when the first perforation is sutured; and after disinfection and emptying the intervening portion of its gas, the intestine is replaced in the abdominal cavity. Further inflation is now made through the second opening, and if a third one is found, the second is sutured, and so on until the entire intestinal canal has been thoroughly subjected to the test. By following this plan extensive eventration is rendered superfluous and the overlooking of a perforation is made impossible.

Suturing the Perforations.—The materials for suturing are an ordinary sewing-needle and fine aseptic silk. Catgut should not be used in intestinal work. Trimming the margins of the visceral wounds is not only superfluous, but absolutely harmful, as it requires a useless expenditure of time and may become an additional source of hemorrhage. The same can be said of the Czerny-Lembert suture. All that is necessary in the treatment of a visceral wound of the stomach and intestines is to turn the margins of the wound inward and bring into apposition healthy serous surfaces by the continuous or by interrupted seromuscular sutures, which should always be made to include fibers of Halsted's submucosa. From 4 to 6 stitches to an inch will suffice. If possible, wounds of the stomach should be sutured in the direction of the blood-vessels, and transverse suturing of the intestine is necessary for the purpose of preventing constriction of the lumen. Defects 1 1/2 inches in length, on the convex side, can be closed in this manner without fear of causing intestinal obstruction, while much smaller wounds on the mesenteric side usually necessitate a resection, not only because the vascular supply in the corresponding portion of the intestine would be inadequate, but also because a sufficiently sharp flexion might be produced at the seat of suturing, to become the immediate mechanic cause of intestinal obstruction.

Enterectomy.—Enterectomy is often indicated in cases of double perforation and in marginal wounds of the mesenteric border. If in cases of multiple perforations it should become necessary to make a double enterectomy, and the intervening portion of the small intestine is not more than 2 or 3 feet in length, it is well to leave it, as the immediate effect of the single operation will be less severe than that of a double resection with a corresponding double enterorrhaphy. After resection the continuity of the intestinal canal should always be restored by a circular enterorrhaphy, using for this purpose the Czerny-Lembert suture. Strips of sterile gauze are preferable to clamps in preventing extravasation during the operation. The gauze strip is passed through a small buttonhole made with hemostatic forceps in the mesentery near the intestine, and tied with sufficient firmness to prevent escape of intestinal contents.

Irrigation of the Abdominal Cavity.—This is necessary only when fecal extravasation or escape of stomach-contents has taken place, an accident that, if it has not occurred before the abdomen was opened, should be carefully avoided during the manipulation of the wounded intestines. Flushing the peritoneal cavity with warm sterilized water or normal salt solution not only clears it of infectious material, but acts at the same time as a stimulant to the flagging circulation. The current must be sufficiently strong not only to fill the peritoneal cavity quickly, but to flush it out.

After completion of the irrigation the patient is placed on his side, and in this position the fluid contents of the abdominal cavity are evacuated. The cavity is then rapidly dried with large sponges wrung out of a weak sublimate solution (1:10,000) or Thiersch's solution. Some surgeons have practically abandoned flushing of the abdominal cavity, and rely almost exclusively on sponging in removing pus and extravasated fecal material; others are partial to leaving the physiologic solutions of salt in the cavity, paying no attention to the peritoneal toilet practised with conscientious care by all surgeons only a few years ago.

Drainage.—Whether or not to drain is the all-absorbing question among surgeons whose time and attention are largely engaged in abdominal work. In gunshot wounds of the abdomen complicated by visceral injury the probability that infection has occurred must not be lost sight of, and the only safe course to pursue under such circumstances is to drain when in doubt. Cases that require irrigation should always be drained. Other indications for drainage are visceral wounds of the liver and pancreas, and the existence of parenchymatous hemorrhage, which cannot be remedied by any of the different hemostatic measures. A glass drain reaching to the bottom of the pelvis, loosely packed with a strip of iodoform gauze, is advisable. Occasionally, multiple drains are indicated. The Mikulicz drain is to be depended upon in arresting troublesome surface oozing. Drainage must be suspended with the cessation of the primary wound secretion.

Suturing of External Incisions.–Incisions through the median line are rapidly closed by a row of silk or silkworm-gut sutures which are placed close together, and include all the tissues of the margins of the wound. Incisions made in any other place are to be closed by buried catgut sutures uniting the peritoneum and muscular layer separately, and by a superficial row of silkworm-gut sutures including all the tissues except the peritoneum. A large hygroscopic compress composed of sterile gauze and absorbent cotton, held in place by broad strips of adhesive plaster, constitutes the proper dressing. The sutures are removed at the end of the second week, and the patient must not be allowed to leave the bed before the expiration of the fourth week. Four weeks in bed and the wearing of a well-fitting abdominal support for from 3 to 6 months are the most reliable precautions against the occurrence of a postoperative ventral hernia. The drainage opening should be closed with secondary sutures, inserted at the time of operation as soon as the drain is closed; otherwise a ventral hernia will be almost sure to develop in the scar at the former site of the drainage-tube.

After-treatment.—Absolute rest must be strictly enforced. Opiates should be given in doses sufficiently large to quiet the peristaltic action of the intestines. Stimulants must be used to counteract the effect of shock and to restore the vigor of the enfeebled peripheral circulation. No food is to be allowed for at least 48 hours. During this time a mixture of brandy and ice-water, in small doses frequently repeated, or iced champagne, is agreeable to the patient, as it quenches thirst, relieves nausea, and exerts a favorable influence upon the circulation. If more active stimulation is called for to overcome shock and the effects of hemorrhage, whisky, strychnin, ether, musk, or camphor may be injected subcutaneously or by the rectum, while the peripheral circulation is restored by applying dry heat to the extremities and trunk. The subcutaneous infusion of 1 or 2 pints of normal salt solution is an excellent restorative, and is of special therapeutic efficiency in cases in which the vital forces are depressed and life is in danger from the effects of hemorrhage.

Should symptoms of peritonitis set in, a brisk saline cathartic should be given at the end of 48 hours, as at this time the intestinal wounds will become sufficiently united to resist the peristalsis provoked by the cathartic, while the removal of the intestinal contents and the absorption of septic material from the peritoneal cavity thus attained are not only the most efficient means of averting a fatal disease, but also of placing the wounds in the most favorable condition for rapid repair. Reopening of the wound and secondary flushing have done little to arrest or limit septic peritonitis. If the case progresses favorably, liquid food by the stomach may be allowed at the end of the second day, and light solid food at the end of the first week. Under ordinary circumstances no effort is made to move the bowels until the end of the third or fourth day. If early feeding becomes necessary in marasmic or exsanguine patients, this may be effected by rectal alimentation.

Conclusions.—The following conclusions may be formulated:

1. In theory and in practice military surgery is equivalent in every respect to emergency practice in civil life.

2. The wounded soldier is entitled to the same precautions against infection as persons in civil life suffering from similar injuries.

3. The fate of the wounded rests in the hands of the one who applies the first dressing.

4. The first dressing should be as simple as possible, including an antiseptic powder (composed of boric acid 4 parts, salicylic acid 1 part), a small compress of cotton, safety-pins, and a piece of gauze 40 inches square.

5. Any attempt to disinfect a wound on the battle-field is impracticable.

6. The first-dressing stations and the field-hospitals are the legitimate places where the work of the hospital corps and company-bearers is to be revised and supplemented. All formal operations must be performed in the field-hospitals, where the wounded can receive the full benefits of aseptic and antiseptic precautions.

7. Probing for bullets on the battle-field must be absolutely prohibited.

8. Elastic constriction for the arrest of hemorrhage must not be continued for more than 4 or 6 hours, for fear of causing gangrene.

9. The X-ray will prove a more valuable diagnostic resource than the probe in locating bullets lodged in the body.

10. Gunshot wounds of the extremities must be

treated upon the most conservative plan, the indications for primary amputation being limited to cases in which injury of the soft parts, vessels, and nerves suspends or seriously threatens the nutrition of the limb below the seat of injury.

11. Operative interference is indicated in all penetrating gunshot wounds of the skull.

12. Gunshot wounds of the chest should be treated by hermetically sealing the wounds under the strictest aseptic precautions.

13. Celiotomy in penetrating gunshot wounds of the abdomen is indicated in all cases when life is threatened by hemorrhage of visceral wounds, and when the general condition of the patient is such as to sustain the expectation that he will survive the immediate effects of the operation.

And see WOUNDS, for the Carrel-Dakin method.

GYNECOLOGIC EXAMINATION.—Bimanual examination is the most useful of the methods of gynecologic examination. By it are determined the position, size, and consistency of the uterus; the condition of the tubes and ovaries, and pelvic tumors of any variety. It is performed in the following manner: One or two fingers of either hand are introduced into the vagina, and the position and direction of the cervix is noted; the ulnar edge and the tips of the fingers of the other hand are then placed upon the abdomen just above the symphysis, and firmly pressed downward and backward. The uterus, tubes, ovaries, or any morbid growth may in this manner be palpated between the two hands.

The genupectoral or knee-chest position is useful for inspection of the vagina, cervix, rectum, and bladder; also for the replacement of a retrodisplaced uterus. In this position the intestines gravitate out of the pelvis, and if the perineum is retracted or if the urethra or bladder is opened, the vagina, the bladder, and the rectum become distended with air, permitting free inspection of their walls. In assuming this position the patient should rest the knees upon the table; the chest and side of the face thrown forward upon a pillow. The thighs should be vertical and the back straight.

The Sims or lateroabdominal position is a convenient one for inspecting the cervix and vaginal vaults; for making applications to the uterine cavity, cervical canal, cervix, and vagina; and for some minor operations. The patient is placed upon her left side with the left arm thrown back and the left side of the face resting upon a pillow. The thighs are flexed at a right angle to the body; the right knee is thrown a little forward so as to touch the table in front of the left knee. When the perineum is retracted with a Sims speculum, the vagina becomes distended with air, the intestines gravitate out of the pelvis, and a perfect view of the cervix and vaginal vaults is obtained.

Trendelenburg Position.—The patient lies in the dorsal position with the hips greatly elevated, the body making an angle with the horizon of about 45°. The legs and feet hang over the foot of the table, forming a right angle with the thighs. This position is a very useful one in pelvic surgery, since it allows the intestines to gravitate out of the pelvis, and thus exposes to view the pelvic organs.

For the various positions, see the following TABLE OF POSTURES AND POSITIONS.

TABLE OF POSTURES AND POSITIONS

VARIETY.	DESCRIPTION.	WHEN EMPLOYED.
Back posture	See Dorsal recumbent.	
Dorsal elevated	Patient on back, with head and shoulders elevated at an angle of 30° or more.	1. Digital exploration of the genitalia. 2. Bimanual examination.
Dorsal recumbent	Patient on back, with the extremities moderately flexed and rotated outward.	1. Application of obstetric forceps. 2. Repair of lesions following parturition. 3. Vaginal examination. 4. Bimanual palpation.
Dorsosacral or lithotomy position.	Patient flat on back, with legs flexed on thighs and thighs on abdomen. The thighs are abducted.	1. Plastic operations on the genital tract. 2. Vaginal hysterectomy. 3. Diagnosis and treatment of diseases of the urethra and bladder.
Edebohls' posture	Same as Simon's position.	
English position	See Left lateral recumbent.	
Erect position	The occiput and heels on a line; also the nose, groins, and great toes are in the same vertical plane.	1. In the practice of ballottement. 2. In differentiation of tumors, cystic, solid, and hernial. 3. In diagnosing loosening of pelvic joints.
Exaggerated lithotomy	See Simon's position.	
Fowler's position	The head of the bed is elevated 24 to 30 inches, so that the patient is in the semi-erect position.	In abdominal surgery (after peritonitis) to allow the intraperitoneal fluids to gravitate away from the diaphragm (where absorption is rapid) and into the pelvis (where absorption is relatively slow).

TABLE OF POSTURES AND POSITIONS

Variety.	Description.	When Employed.
Genucubital or knee-elbow posture.	Patient upon the knees, with the thighs upright, and the body resting upon the elbows, the head down upon the hands.	When not possible to employ the classic knee-chest position.
Genupectoral or knee-chest position.	Patient upon the knees, with the thighs upright; the head and upper part of the chest resting upon the table; the arms crossed above the head.	1. Replacement of prolapsed funis. 2. Dislodgement of an impacted head. 3. Management of transverse presentations. 4. Replacement of a retroverted uterus or prolapsed ovary. 5. Flushing of the intestinal canal.
High pelvic posture.....	See Trendelenburg's position.	
Horizontal abdominal posture.	Patient flat on the belly, with the feet extended.	Examination of the back and spinal column.
Horizontal position.....	Patient supine on the back, with the feet extended.	1. For employment of palpation. 2. Auscultation of the fetal heart. 3. The position for operative procedures.
"Jack-knife" posture.....	Patient reclining on the back with the shoulders elevated, legs flexed on thighs, and thighs at right angles to abdomen.	For passing the urethral sound.
Knee-chest posture.....	See Genupectoral.	
Knee-elbow posture.....	See Genucubital.	
Kneeling-squatting position.	Patient stooping, with knees pressed upon the abdomen, trunk erect.	Childbirth in difficult cases and in uncivilized nations.
Lateroprone.....	Same as Semiprone.	
Laterosemiprone.....	Same as Semiprone.	
Left lateral recumbent, English, or obstetric position.	Patient on left side, with the right knee and thigh drawn up.	Childbirth.
Lithotomy.....	Same as Dorsosacral.	
Obstetric.....	See Left lateral recumbent.	
Reclining posture.....	Same as "Jack-knife" posture.	
Semiprone or Sims' position, or side posture.	Patient on left side, with right knee and thigh drawn well up above the left; left arm back of patient and hanging over the edge of the table; chest inclined forward so that the patient rests upon it.	1. Curettage of uterus. 2. Intrauterine irrigation after labor. 3. Tamponade of vagina. 4. Rectal exploration. 5. Operations upon the cervix.
Side posture.....	See Semiprone.	
Simon's position, or exaggerated lithotomy position.	Patient flat on back, with legs flexed on thighs and thighs on abdomen, and hips somewhat elevated. The thighs are strongly abducted.	Operations upon the vagina.
Sims'.....	See Semiprone.	
Trendelenburg's position.....	Patient in dorsal position, with body elevated at an angle of about 45°, feet and legs hanging over the end of the table.	In abdominal surgery to favor gravitation upward of the abdominal viscera.
Walcher's position.....	A dorsal posture, with the sacrum at the edge of the table, and lower extremities hanging.	1. In pelvic deformity. 2. To increase the conjugate diameter 1/4 to 1/2 inch. 3. To facilitate bimanual examinations. 4. For version or forceps.

H

HABIT SPASM.—Habit chorea; convulsive tic; Gilles de la Tourette's disease. A choreic disease characterized by simply localized spasmodic movements, or by such movements combined with explosive utterances and psychic symptoms (*convulsive tic*). *Habit spasm* is confined chiefly to young girls, and is marked mainly by spasmodic action of the facial muscles or of the head. *Convulsive tic,* or *Gilles de la Tourette's disease,* is a psychosis allied to hysteria, and occurring usually in children of a neurotic tendency. It is marked by involuntary muscular movements, usually affecting the facial or brachial muscles, and by explosive utterances that may resemble a bark or an inarticulate cry. A word heard may be mimicked at once, and repeated over and over again, usually with the involuntary movements. To this the term *echolalia* has been applied. *Coprolalia,* or the use of obscene language, is another symptom, and occasionally actions are mimicked (*echokinesis*). These may also be associated with curious mental disturbances, the patient becoming the subject of a form of obsession or a fixed idea. See CHOREA, HYSTERIA.

HAIR, FALLING.—See ALOPECIA.

HAIR, GRAYNESS.—See CANITIES.

HAIR, SUPERFLUOUS.—See HYPERTRICHOSIS, ELECTROLYSIS.

HALLUCINATION.—The highest degree of subjective sensation, dependent alone upon morbid stimulation of the sensory cortical centers. There is the perception of nonexistent objects or impressions, creations of the imagination. Hallucinations are variously classed as hypochondriac, hypnagogic, motor, negative, pseudosensorial, unilateral, visual, auditory, gustatory, olfactory, tactile, hemiopic, epileptoid, etc. See INSANITY, DELUSION.

HALLUX RIGIDUS (H. flexus).—An arthritis of the metatarsophalangeal articulation, the result of flat-foot, defective shoes, or injury, and terminating in ankylosis.

HALLUX VALGUS.—An outward deviation of the great toe produced by short, tight, or pointed shoes, occurring in a slight degree in most civilized people. The head of the first metatarsal often becomes enlarged as the result of chronic periostitis. A bursa may form in this situation (BUNION, *q. v.*) which may become inflamed.

HAMAMELIS (Witch-hazel).—The leaves of *H. virginiana,* with properties not fully known. It is thought to be tonic, astringent, styptic, and sedative, and appears to affect the circulation in a manner similar to aconite. It is recommended in hemorrhages from the nose, stomach, lungs, rectum and kidneys, in threatened abortion, and externally for sprains and bruises, foul ulcers, the pruritus of eczema, also in leukorrhea and gonorrhea. A preparation of this drug is sold under the name of "Pond's Extract." It is official in two forms, **H. Cortex,** Hamamelis bark; and **H. Folia,** the leaves; the dose of each is 10 to 45 grains.

Preparations.—Aqua H., *hamamelis water.* Dose, 1 to 3 drams. **Fluidextractum H. Foliorum,** *fluidextract of hamamelis leaves,* is made with glycerin, alcohol and water. Dose, 5 to 45 minims.

HAMMER-TOE.—A permanent hyperextension of the first, and flexion of the second and third phalanges. Slight cases give no trouble; in severe cases amputation may be demanded by the patient. See TALIPES.

HAND IN DIAGNOSIS. Color.—When inspecting the hand of a sick person, one naturally first notices the color of the skin. If the skin is pale, it indicates some form of anemia—some disease in which the blood is deteriorating in quality. If there is a waxy appearance as well as paleness, it is possible that chronic nephritis is present. A bluish tinge, especially blueness of the finger-nails, strongly indicates disease of the heart and in examining that organ we would expect to find some lesion which prevented the free return of venous blood from the extremities. Cyanosis with clubbing of the fingers is characteristic of emphysema and fibroid phthisis, and is usually marked in the later stages in all cases of pulmonary tuberculosis; there may be a mottled appearance on the backs of the hands—small brown spots which do not disappear on pressure. It is also stated by some authorities that in cases of jaundice stretching the skin on the back of the hand will often reveal the characteristic yellowing which is not shown elsewhere (Goodspeed).

Eruptions.—Various eruptions may appear on the hands, the palmar surfaces being, however, nearly always exempt. An itching eruption between the fingers on the backs of the hands may prove to be scabies. Eczema appears on the dorsal surface in preference to the palmar.

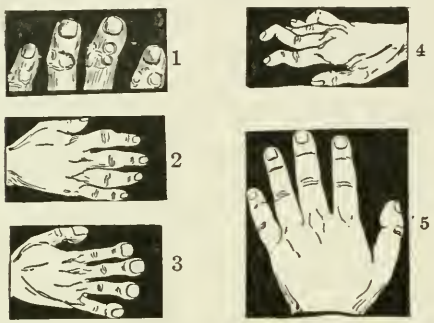
Edema of the hand, if bilateral, would indicate chronic nephritis, but if unilateral, it would point to some lymphatic or other injury in the region of the axilla. An aneurysm of the aorta might also produce an edematous condition in one hand, but the arm would also share in the swelling. Unilateral edema of the hand and arm is sometimes observed as a temporary symptom after cerebral hemorrhage or embolism.

In the later stages of Bright's disease puffiness on the backs of the hands is very prominent, and as the end approaches the edema gradually creeps up the arms. Swelling with redness would, of course, indicate some inflammatory condition—most likely erysipelas or acute rheumatism.

Change in Shape and Size.—Thickening and enlargement of the joints of the fingers are the result of rheumatism, rheumatoid arthritis, or gout. In

rheumatoid arthritis the tenderness is not so great as in rheumatism and gout, but the pain in these affections is more constant than in rheumatism. Besides, gout attacks the toes much more frequently than the fingers. There are further differences between these affections. The rheumatic finger is swollen, but soft and puffy, while in gout it is hard. Then, too, the hot and evidently inflamed condition is not present in arthritis and gout, as it is in rheumatism.

In rheumatoid arthritis the opposing surfaces of the joints become absorbed, and the joints are partially or wholly dislocated. In advanced stages of this disease the fingers will often be found bent and firmly ankylosed, sometimes backward and sometimes forward. Curiously enough, rheumatoid arthritis nearly always spares the thumbs.



1. Heberden's Nodes. 2. Syphilitic Dactylitis. 3. Clubbed Fingers. 4. Arthritis Deformans. 5. Spade Hand of Akromegaly.—(*Greene.*)

Tubercular dactylitis may at first sight closely simulate rheumatoid disease in children; but the spindle swelling is caused by bone expansion, and is accompanied by suppuration, in both of which points it differs essentially from the latter disease. The other group, the rarer diseases, are as follows:

In Paget's disease (ostitis deformans) the cranium and long bones are the parts usually affected; and, though the hands sometimes show changes, these are hardly diagnostic and are very rare.

In akromegaly the large size of the hands is due to the excessive development of all the tissues; there is no appreciable increase in length, only in width and thickness, earning for the hands the epithets "battledore" and "spadelike." The wrists are about normal; the nails are somewhat flattened, small, and longitudinally striated.

In hypertrophic pulmonary osteoarthropathy the carpometacarpus, the hand proper, is about normal in size, but the fingers are enormously enlarged, the bulbous terminal phalanges being especially prominent; the nails are curved and striated, reminding one of the beak of a parrot; there is great enlargement of the wrists.

Myxedematous hands may at first sight be mistaken for either akromegaly or hypertrophic pulmonary osteoarthropathy; but it will be seen that the skin of the other parts of the body is involved, and that it is adherent to the deeper structures.

Vasomotor paralysis of the extremities may somewhat resemble the foregoing; the presence of subcutaneous hemorrhages may clear up the diagnosis.

The hands may exhibit marked changes in rickets, which in rare cases may simulate some of the former diseases, but an examination of the rest of the body will generally readily afford the data for a diagnosis.

In leontiasis ossea (Virchow) the hands may be affected; but for diagnostic purposes, the changes are unimportant.

Nodosities of the fingers have been noted in connection with dilatation of the stomach.

Nails.—The white spots that are often seen on the finger-nails of children have no special clinical significance. Some authorities say they are due to slight injuries; others that they result from processes of growth and development.

The incurved nail associated with a clubbed finger-tip is a sign of chronic pulmonary or cardiac disease of the obstructive type, or an advanced pulmonary tuberculosis. Brittle, striated or split nails most frequently occur in connection with gout, peripheral neuritis, and prolonged exposure to the X-ray. Most important of all to the case-taker are the transverse ridges indicating a past severe illness; these are easily noted, last for a period of over 6 or 8 months, and by their proximity to the matrix indicate approximately the date of the illness.

If the finger-nails are very close and show evidence of being bitten off, the chances are that the subject is of a neurotic temperament, and hysteric manifestations might be expected.

Tremors of the hand may indicate paralysis agitans, general paresis, alcoholism, poisoning by lead or mercury hysteria, Graves' disease, spinal sclerosis, great weakness, as in typhoid fever, senility, and chorea.

In paralysis agitans the whole hand is affected, and usually both hands alike. The head, too, joins in the shaking process. The tremor is fine and rhythmic in character. It is always worse when attention is called to it, and in the early stages of the disease ceases during sleep. The fingers are generally semiextended and the thumb is drawn to the side of the hand, so that it constantly rubs against the forefinger.

The tremor of general paresis is rapid—8 to 10 a second—and is a very fine tremor. It is best felt when the patient's arm is extended and his fingers are resting on the hand of the physician.

In alcoholism the shaking is slow and not constant. It does not necessarily increase when attention is directed to it, and is worse in the morning.

The tremor of chronic mineral poisoning is not more marked in the hands than in other parts of the body. There is a general trembling and unsteadiness of muscular movement; then, too, in lead-poisoning we find the characteristic "drop-wrist," the extensor muscles being unable to hold up the hand. Partial anesthesia, or impaired sensibility to touch, is also a phenomenon of lead-poisoning, the affection being found equally distributed on the two sides of the body.

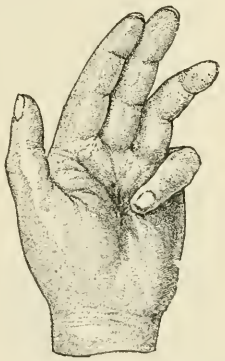
The tremor of Graves' disease is also fine, like that of general paresis, and is best observed when the arm is extended. This motion has been called the "railroad-bridge tremor," on account of its fineness and vibratory character. The fingers do not separately tremble, as in paralysis agitans.

In spinal sclerosis the amount of agitation increases when the subject attempts any muscular act, such as raising a glass of water to the lips (*intention-tremor*).

The movements of chorea are very irregular and arrhythmic, and only one hand or arm may be affected. When the choreic patient attempts any action with the affected hand or arm, the movement is likely to be counteracted by some other involuntary muscular contraction, and the resulting motion is widely different from that intended by the patient.

The trembling and carphology of typhoid fever denote great prostration, and are a sign of serious import, generally foreboding ill.

HAND, DUPUYTREN'S CONTRACTION.–The palmar fascia and its prolongations that run by the side of the fingers and are attached to the periosteum of the first phalanx not infrequently become the seat of a peculiarly obstinate form of contraction, tying the fingers rigidly down into the palm of the hand. It is more common in men than in women, generally begins in middle life, and frequently affects both hands. It has been attributed to heredity, gout and rheumatism, and to habits or occupations necessitating pressure in the palm, or flexion of the fingers, or to inoculation of the subcutaneous connective-tissue with a specific germ by a scratch of the palm by the finger-nail. The affection consists in a shortening of the prolongations of the fascia from the palm on to the sheath of the flexor tendons. The tendons themselves are not affected. The contraction generally begins in the fascia of the little or ring finger as a small rounded fibrous nodule, and later may affect that of the middle finger, and at times the forefinger and also the thumb. The affected fingers are drawn by tense bands toward the palm, and in severe cases may become fixed in contact with it. The skin being adherent to the fascia, is thrown thereby into transverse puckers. The affection may be distinguished from a contracted tendon by the latter forming a tight cord, which can be traced under the annular ligament, and by the skin in the case of the contracted tendon being free. In contraction of the fascia, moreover, two tense bands can generally be traced to the sides of the finger, whereas a contracted tendon is centrally placed. The last phalanx is not involved in the contraction of the fascia, but is often flexed by a contracted tendon.



Dupuytren's Contraction of the Palmar Fascia.—(*Spencer & Gask.*)

Treatment.—The progress of the contraction is checked by applying a splint at night to keep the fingers fully extended, by gentle passive movements and massage. In some cases injections of fibrolysin or thiosinamin have had a good result in causing the scar tissue to disappear. When the finger is already drawn down, the *contracted fascia may be excised* by making a V-shaped incision pointing upward through the skin, which becomes a triangular wound as the finger is straightened. Through it the fascia, with its prolongation forward to the sides of the phalanges laterally, is carefully dissected out. Then the triangular wound is sutured by drawing the edges together in the shape of a Y. There is less tendency to relapse after this than after the older method of subcutaneous division.

Subcutaneous division is done by making several punctures in the palm near the web and at the side of the proximal phalanx opposite the puckers in the skin, not in the creases, so that the punctures do not gape when the fascia is stretched. After the latter operation in particular, a splint must be worn at night for months to prevent recontraction. (Spencer and Gask.)

HAND, PALMAR ABSCESS.—This is a serious matter both on account of the danger of sepsis and because the hand may be left permanently crippled

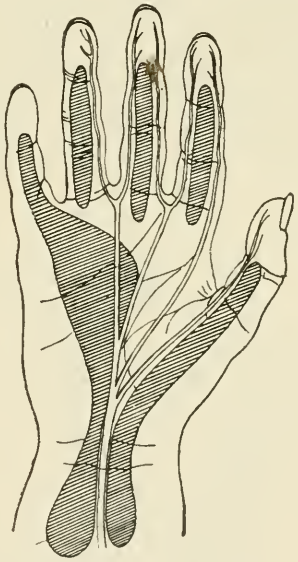
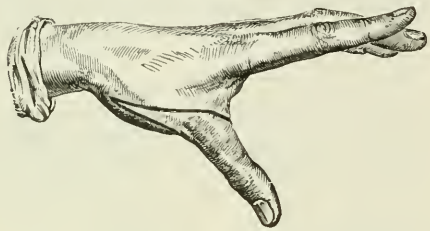


Diagram of Tendon Sheaths of the Hand.—(*Tillaux.*)

as a result of the destruction of tissue and inflammatory adhesions. Immediate evacuation of pus is imperative. If the pus is limited to the connective tissue of the palm, and has not reached the tendon sheaths, the incision should be made over and parallel with the interosseous space in the region of the greatest swelling. If the tendon sheaths are involved, the incision should be made in the long axis of the metacarpal bone. If a large abscess has formed a longitudinal incision should be made, the position of the palmar arches

being borne in mind. The incision is begun just below a line drawn across the palm from the web of the thumb and is made deep enough to go quite through the palmer fascia. A drainage-tube is inserted and the wound is dressed antiseptically (Sluss).

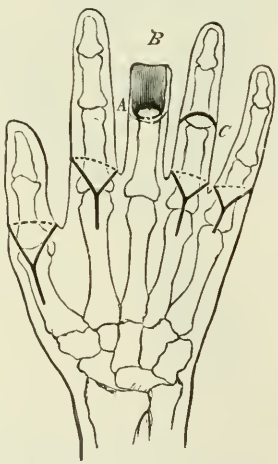
HAND AND FINGERS, AMPUTATIONS.—Amputation at the wrist may be performed by two short flaps, by a long palmar flap, or by an external flap taken from the thumb. In the double flap method the incision is commenced 1/2 of an inch above the styloid process of the radius or ulna. The flaps should be cut square, with rounded



Amputation of Metacarpal Bone of the Thumb.

angles, and about 2 inches in length. The joint should be opened on the dorsal aspect, and on the completion of the disarticulation the styloid processes of the radius and ulna should be sawed off.

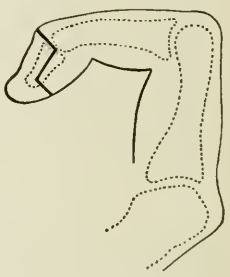
Amputation of the Metacarpal Bone of the Thumb.—By anterior flap operation: Hold the thumb out; insert the bistoury near the metacarpophalangeal joint; its point is thrust between the bone and the muscles of the ball of the thumb, and as close to the bone as possible, and brought



Outline Diagram for Amputation of the Thumb and Fingers.—(*Moullin.*)

out just above the articulation with the trapezium. The bistoury is then made to cut its way outward, and the point of the knife is carried from the upper end along the bone, and around the metacarpophalangeal joint, to meet the other incision. The bone is disarticulated by being forcibly abducted, and the ligaments on the inner side of the metacarpotrapezial joint are cut through first.

Amputation of the Fingers.—It must be remembered that, in all these joints, the bone that projects on the dorsal surface is the proximal one; and that, on the palmar surface, although the fold of the skin corresponds fairly well to the first interphalangeal joint, this is not the case either with the one above or the one below; the circle formed by the skin (when the fingers are flexed) is smaller than that formed by the bones, and consequently the distance between the folds is less than that between the joints; the nearest of the three is the thickness of the metacarpal bone below the articulation; the middle one corresponds to it, and the furthest is the thickness of the phalanx above.



(*After Binnie.*)

Amputation at the Metacarpophalangeal Joint.—A racket-shaped incision is the best, commencing on the neck of the metacarpal, running straight down on to the phalanx, and then winding round the finger below the web. It should divide the extensor tendon at once, and pass right down to the bones. Afterward, the lateral ligaments and a few other structures require division. In the case of the index- and little fingers, the incision should be made at the side, as it is less conspicuous. When strength is required, the head of the metacarpal should be left; but if it is wished to minimize the deformity at all cost, it may be removed obliquely with bone-forceps.

Dislocation of the Thumb Backward at the Metacarpophalangeal Joint.—(*After Agnew.*)

Interphalangeal Amputation.—This is usually performed with a single palmar flap; but single dorsal, lateral, or equal dorsal and palmar flaps may be selected instead.

When a long palmar flap is chosen, the finger is bent to a right angle, and the knife, which should be long and very narrow, is drawn across the front of the joint, so as to open it, dividing the extensor tendon at one sweep. The lateral ligaments are then divided, and the knife is insinuated behind the distal phalanx, and, following its palmar surface, made to cut a long, square-shaped flap from the under portion.

It is usually recommended not to amputate through the proximal phalangeal joint or through the proximal phalanx itself; but, as Jacobson points out, this rule should not be followed in the case of the index- or the little finger, when all the

fingers are amputated, or when the patient prefers to have one left. If the flexor tendons are stitched to the theca, to the periosteum, or even to the skin, the stump follows all the movements of the other fingers.

HAND AND FINGERS, DISLOCATIONS.—Dislocations of the carpal and metacarpal bones are very rare. Their diagnosis is usually obvious. See also Wrist.

The phalanges of the fingers may be dislocated backward or forward. Reduction is easily affected by extension and manipulation.

Dislocation of the metacarpal bone of the thumb from the trapezium may occur in a backward or forward direction, and is easily reduced by extension or pressure.

Dislocation of the first phalanx of the thumb from the metacarpal bone is of more importance. The phalanx is nearly always displaced backward; the shortening of the thumb and the projections of the base of the phalanx and head of the metacarpal bone serve for diagnosis. Reduction is often very difficult; this is usually ascribed to the head of the metacarpal bone being forced between the two insertions of the flexor brevis pollicis, by which its neck is tightly embraced. Humphry has shown, however, that the hindrance to reduction depends upon the fact that the sesamoid bones and the ligaments connecting them are carried back with the phalanx, and being held there by the flexor brevis, and intervening between the metacarpal bone and the phalanx, prevent the articular surfaces of the bones being brought into contact.

Treatment.—Press the metacarpal bone well into the palm of the hand to relax the flexor brevis pollicis, and bend back the first phalanx on the metacarpal bone until the extremity of the thumb points toward the wrist, thus forcing the base of the phalanx wedgewise between the two insertions of the short flexor. Next flex the phalanx, while an assistant, by placing the thumb behind its base, prevents its slipping back. The head of the metacarpal bone will now probably slide into its place between the two insertions of the flexor brevis pollicis, which are forced apart by the wedge-like action of the base of the phalanx. Reduction may sometimes be accomplished by extension: *e. g.*, by the clove-hitch, or, if at hand, by the Indian puzzle-toy or the forceps. These means not proving successful, it is usually advised that the insertion of the flexor brevis pollicis should be subcutaneously divided. Humphry recommends an incision over the sesamoid bones and the introduction of a hook to hitch the sesamoid bones over the head of the metacarpal. In this way, he says, the reduction is immediately effected. As a last resort, the joint may be cut down upon, the bands resisting reduction, divided and the bone replaced; or the joint may be excised, or, perhaps better, left alone, as very fair movement will, as a rule, in time be gained.

HAND AND FINGERS, FRACTURES.—**The carpal bones** are rarely fractured, and then nearly always as a result of direct violence that contuses and lacerates the overlying soft parts at the same time. The seriousness of the lesion will depend upon the extent and course of these complicating injuries. See Carpal Bones (fracture).

The metacarpal bones are fractured usually from direct blows upon the back of the hand. Crepitation and abnormal mobility, together with the marked pain at the site of fracture, give the clue. Displacement seldom occurs.

Frequently a circular bandage, with a pad and protection of the hand for a few days, suffices for treatment. Sometimes an unruly fragment or unusual pain may demand the application of a simple splint. Massage and exercise of the fingers are useful.

The phalanges, from their freely exposed and unsupported position, are frequently fractured; usually from direct force, occasionally from a force acting in the direction of their long axes.

The diagnosis of fracture of bones of the hand or fingers is very simple, and the treatment is simple, consisting of a small padded splint.

HANDKERCHIEF-DRESSING.—A form of temporary dressing for wounds and fractures made of handkerchiefs. There are two varieties: viz., *cravats*, in which the handkerchiefs are folded into rolls like cravats; and *triangles*, the handkerchiefs being folded diagonally in the form of triangles.

The most important **cravats** are the following: **C., Abdominoinguinal.** Two handkerchiefs are folded into cravats and their ends tied together. The body of one is placed beneath the thigh, close up to the nates; the ends are brought to the front, crossed over the groin, then carried around the opposite sides of the body and tied together on one side rather than behind, so that the knot shall not press injuriously upon the back. **C., Axilloacromial.** See C., Parietoaxillaris. **C., Axillocervical.** The body of the cravat is placed in the axilla, the ends are crossed over the shoulder and tied on the opposite sides of the neck. **C., Cervical.** A handkerchief is formed into a cravat, the body placed on the front, back, or sides of the neck, according to the part to be dressed, the ends are carried around, crossed on the opposite side and returned, and fastened with pins. **C., Compound Bisaxillary.** For this two handkerchiefs in cravat form are required. One is tied as an axilloacromial cravat through one axilla, while the body of the other is placed in the opposite axilla, and its ends, being brought across the chest, one in front and the other behind, are passed through the loop of the first and tied in front of the breast. **C., Compound Bisaxilloscapulary.** Form two handkerchiefs into cravats. The one as a loose ring, or form the axilloacromial cravat of one side, and, placing the body of the other in front of the opposite shoulder, bring the ends back, one over the shoulder and the other through the axilla; then form these into a single knot, and complete the dressing by passing the ends through the ring or loop of the other cravat and tying them into a knot. **C., Frontooccipitolabialis.** The handkerchief is formed into a cravat and the middle portion is placed upon the forehead; the ends are carried back, crossed upon the posterior part of the neck, brought forward under the ears, and crossed over

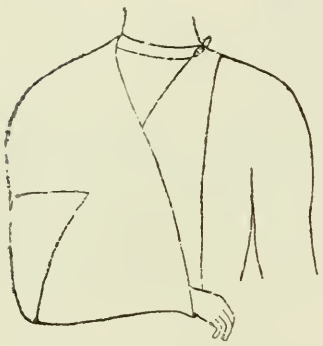
the upper lip. This is used to approximate lip wounds. **C., Ilioinguinal.** A double cravat, also called the *sacrobicrural cravat of Mayor.* The body of a long cravat is placed over the body of the sacrum; the two extremities are brought around the body, down in front of each groin and around the thighs, to be fastened on the opposite side of the body. **C., Ilioinguinal,** or the *cruropelvic cravat of Mayor.* The body of a large cravat is placed over the inguinal region; the upper extremity is carried around the body, the lower extremity around the thigh, and the two ends knotted in front. **C., Metatarsomalleolar.** Place the body of the cravat obliquely across the dorsum of the foot; carry one end under the foot and up in front of the ankle, and the other around the leg above the malleoli, fastening them together in front of the joint. **C., Parietoaxillaris.** One handkerchief is formed into a cravat and its body is placed in the axilla; the ends are tied over the shoulder, forming the *axilloacromial cravat.* A second handkerchief is made into a triangle, and its body placed over the side of the head, and its ends tied into the first over the shoulder. It is used to approximate wounds on the side of the neck and to prevent contraction after burns. **C., Simple Bisaxillary.** Place the body of the cravat in the axilla, cross the ends over the shoulder, and, after carrying one across the back and the other across the breast, tie them together at the anterior border of the axilla of the opposite side. **C., Simple Bisaxilloscapulary.** This is a posterior figure-of-eight, and is best formed with a strip of muslin 3 inches wide and 10 yards long. Place the center of the strip in front of the shoulder and the axilla; bring one end back over the top of the shoulder and the other through the axilla; cross them between the scapulas, carrying the axillary end over the shoulder of the opposite side and back through the axilla, and the humeral end forward through the axilla, the two overlapping each other; then fasten their ends front and back. This is an extemporaneous dressing for fracture of the clavicle. **C., Tarsopatellar.** This requires three handkerchiefs, all in cravat form.

Bitemporal Triangle.

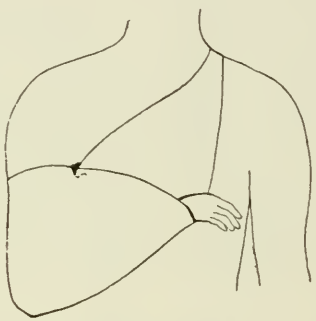
Frontooccipital Triangle.

Auriculooccipital Triangle.

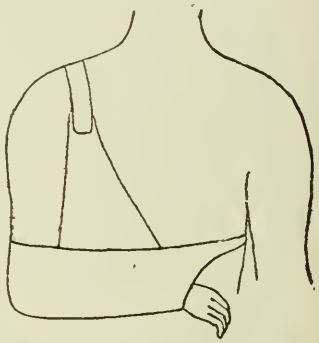
Triangular, or Hunter's Cap of the Head.



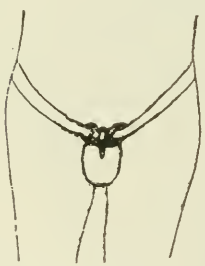
Brachiocervical Triangle.



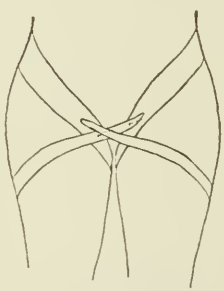
Oblique Triangle of the Arm and Chest.



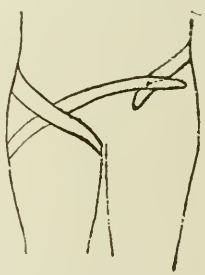
Mayor's Bandage for Fractured Clavicle.



Scrotolumbar Triangle.
(Suspensory bandage of the scrotum.)



Ilioinguinal Cravat (Double).
(The sacrobicrural cravat of Mayor.)



Ilioinguinal Cravat.
(The cruropelvic cravat of Mayor.)

One is placed about the knee as a figure-of-eight; a second round the foot in front of the ankle; the third is passed through the loop of the latter, the ends being carried on each side through the figure-of-eight of the knee, and pinned or tied as they are turned downward. **C., Tibial.** Place the body of a handkerchief, folded into a cravat, obliquely across the posterior surface of the leg, and carry the extremities around the limb, the one below the knee and the other above the malleoli. **Mayor's Bandage for Fractured Clavicle.** The arm is flexed at a right angle and confined to the side of the chest by a triangular handkerchief, the base being placed above the forearm and the two extremities fastened on the back, the apex hanging down in front. The two folds forming the apex are carried up between the arm and the body, and the under one is passed to the sound shoulder, while the upper one is carried to the affected shoulder. A broad piece of bandage is fastened to one apex and carried beneath the handkerchief at the back, and is then brought up and fastened to the other apex on the opposite shoulder.

The most important **triangles** are the following: **T., Auriculooccipital.** A variety of handkerchief-dressing for the head, used in keeping an application to the ear in proper place. The base of the handkerchief is placed in front of the ear to be covered, and the apex directed backward. The lower end is next carried under the jaw and up over the face in front of the ear on the sound side, where it is made to meet the upper end, the two being tied together. **T., Bitemporal.** A form of handkerchief head-dressing, the base being placed over the temporal region upon one side and the apex over the other. The ends are carried round to the opposite temple, crossed, brought back, and secured with pins, and the summit or apex is turned up and pinned above the temporal ridge. **T., Frontooccipital.** A variety of handkerchief-dressing in which the base is placed over the forehead, while the summit is allowed to hang down over the occiput. The ends are next carried backward along the sides of the head, above the ears, and either tied behind the occipital protuberance or crossed, brought forward, and pinned at each side. The apex is then turned forward and pinned to the body of the handkerchief. **T., Malleolophalangeal.** Form the handkerchief into a triangle; place the base under the foot, opposite to the instep; fold the summit back over the toes and the dorsum of the foot, and carry the ends round the malleoli, making them fast in front. Tie the ends in front, or cross them over the dorsum and tie under the sole of the foot. **T., Mammary.** Fold a handkerchief into a triangle; place its base under the breast and its apex over the corresponding shoulder; then carry one end under the axilla and the other over the opposite side of the neck, tying the two behind the scapula of the affected side, and pin to these the summit. **T., Oblique, of the Arm and Chest.** The base of the triangle is placed under the wrist, the apex being allowed to project beyond the elbow. The extremity that is next to the chest is carried over the opposite shoulder, the other extremity being passed through the axilla of the injured side and tied with the first extremity over the sound shoulder. The apex is folded backward around the elbow and fastened. **T., Occipitofrontal.** The same as the *frontooccipital*, only that the handkerchief is reversed, the base being placed over the occiput. **T., Occipitosternal.** One handkerchief is formed into a triangle and another into a cravat. The latter is tied around the chest, forming the sternodorsal cravat. The body of the former is placed over the occiput and its apex over the forehead The ends are brought down on each side of the face and fastened to the cravat about the chest. The apex is turned backward over the vertex and pinned. **T., Palmar.** The base of the handkerchief is placed across the back or the front of the wrist, according as it is desired to dress the palm or dorsum of the hand; the summit is folded back upon the wrist, and secured there by carrying the ends around the same. **T., Scrotolumbar.** See T., Suspensory. **T., Simple Brachiocervical.** The arm being flexed at a right angle, the base of the triangle is placed under the wrist, and the two extremities are tied around the neck, the knot being thrown to one side. The apex is brought around the elbow and pinned in front. **T., Suspensory.** See Scrotolumbar Triangle. Fold one handkerchief into a cravat and tie it around the loins; form another into a triangle, the base of which should be placed under the scrotum, and the extremities brought up, passed beneath the circular cravat, and tied in front. The apex is next carried up, passed beneath the abdominal cravat, and turned down in front, where it may be fastened with a pin. **T., Verticomental.** A form of handkerchief head-dressing in which the body of the handkerchief is placed over the vertex, the ends brought down over the ears and crossed under the chin, carried upward and pinned to the descending portion of the handkerchief. The apex is brought round one side of the head and secured with a pin. **The Triangular, or Hunter's Cap of the Head.** A piece of material is secured, with the side sufficiently long to pass over the head and fasten under the chin. First hold it transversely across until one side is within an inch of the opposite side; the short side is then placed beneath; the two corners of the folded edge are turned inward, forming a triangle. The two extremities of the triangle are taken one in each hand, and while kept tense are twisted and rolled up to the extent of 2 inches. Lifting the bandage and approximating the hands cause the two sides to separate. It is placed on the head with the thin edge over the forehead and the rolled edge around the back of the neck. The ends are brought under the chin and tied.

HANGING.—Death by suspension of the body from the neck, by a rope provided with a slip noose. The immediate cause of death may be asphyxia, cerebral hemorrhage (from strangulation), or dislocation or fracture of the cervical vertebræ. When from a long drop, the method now employed in judicial hanging, where the knot is usually under the chin, death is mostly due to fracture of the vertebræ or injury of the medulla oblongata. When death is not instantaneous, convulsive

movements may continue for some time after suspension, and the heart may continue to beat for a considerable period. The proof that death by hanging has occurred depends upon the position of the body when found, the presence of certain external marks on the neck and of the signs of asphyxia in the internal organs, and the absence of any other possible cause of death. The external signs vary according to the length of time the body has been left hanging and the nature of the cord used. The mark on the neck is generally a hard, dry, yellowish, horny furrow, running obliquely. Similar appearances usually result if the body is suspended immediately after death.

The face is usually turgid, with blood-stained froth about the mouth and nostrils; the tongue is swollen and semiprotruding. In men the penis is often erect, and an escape of prostatic or seminal (?) fluid has taken place. In women the genital organs may be turgid or blood-stained.

Internally, the right side of the heart and lungs will be distended with venous blood. The left side may be empty. Fracture or dislocation of the cartilages of the larynx or of the hyoid bone may be found, and sometimes the inner coats of the carotid artery are found to have been divided. As suicidal hanging is intentional, it is not necessary that complete suspension in the air exist for a fatal termination to ensue.

Opportunity for treatment seldom presents itself. A free supply of air after the body is cut down, and constricting clothing undone or removed, and artificial respiration are the means to restore suspended animation. Bleeding is sometimes useful to relieve cerebral congestion. See Asphyxia, Artificial Respiration, Neck (Injuries).

HARELIP.—A congenital malformation in which the upper lip is vertically cleft on one or both sides of the median line. It is produced by failure of union of the frontonasal process which forms the median portion of the lip, with the superior maxillary processes which form the lateral portions. It is frequently a mere notch, but more usually it extends through the substance of the lip into the nostril above. Single harelip is most common. Cleft palate is often an accompaniment, and malformations in other parts of the body, such as club-foot, etc., are not uncommon.

Mumford notes that no two cases of harelip are alike. They vary as much as do the faces which they deform; and so, from the simple notch in the border, to the double harelip with complete cleft palate, each case must be treated on its own merits.

With all the varieties of deformity, however, there are two main divisions for surgical purposes: those lips which are backed by a sound jaw, and those which are continuous with the nostril and a palatal cleft. In the former class the mortality is *nil*, so far as the lip is concerned, whether treated or not. In the second class the mortality is high when untreated—by some writers placed as high as 30 percent; when treated, the mortality ranges from 2 to 15 percent, according to Fritsche. These deaths are ascribed in all cases to malnutrition, hemorrhage, or bronchitis. Harelip babies are vigorous, puny, well nourished, and rachitic. Most of these babies are well enough at birth, and their subsequent condition depends largely upon the care and intelligence used in their feeding. If care is used the average infant can be brought comfortably up to the sixth or eight week—the proper time for a harelip operation. Operations done earlier must be hurried, and are ineffectual for cosmetic purposes; if done later, except in the simple cases, the advantages of an early molding of the nose and lateral pressure upon a cleft upper jaw are in a measure lost.

This highly important preparatory feeding of the patient is in itself an art, and if outside the experience of the surgeon, should be intrusted to some one skilled in infant feeding. In Mumford's experience its successful prosecution influences very largely the result of the subsequent operation, and its effects are felt even up to the period of dentition.

Ordinarily, there is no difficulty in giving the modified milk mixture prepared in the laboratories for infant feeding. Those mixtures with an alkalinity of 5 to 6 percent answer all practical purposes. When milk laboratories are not accessible, home modification may be done. In administering the milk there are a few practical hints which should be borne in mind. The food is best fed from a spoon; the various shields and patent nipples are needless and troublesome. The child should be placed on the bed in a half-reclining position during feeding, because when prone, the milk is more likely to run up into the nares. If there is a cleft palate, the most scrupulous care must be observed to keep the mouth and nares clean; for this a cotton stick dipped in a weak boric acid or borax and water solution is best. Plenty of clear water to drink should be give between feedings, as the mouth necessarily is very dry, and by the use of the water a proper action of the bowels is maintained. Stimulants should be given if there is pallor or a flabby skin—one or more drops of brandy with each feeding. The brandy should be increased for 2 days before operation, and on the day of the operation, in any case, a goodly measure should be allowed.

Most authorities are now agreed that chloroform is the best anesthetic for the operation, on account of its nonirritating action on the lungs.

In simple notched lips not extending to the nostril, it is well to wait until the child is 3 or 4 years old, as the wound is more easily managed and a most exact plastic operation can be done with the more mature tissues. In these cases, and, indeed, in all others, so far as ultimate beauty of result is concerned, the greatest attention must be paid to the finish of the vermilion border. For this purpose the Nélaton or Malgaigne operations are those to be used. The old-fashioned slashing cuts with scissors and the quick sewing up are bad surgery, and should never be used except when desperate hurry is demanded.

There is a large variety of other flap operations described by authors—Hagedorn's, Mirault-Langenbeck's, Simon's, Giradlès', and many more. They are all designed on the dovetail principle, their object being to fill in the cavity and provide a smooth, red lip border. They sometimes answer

admirably for older children and adults, but not for restless, crying babes. At best, they leave an irregular scar instead of a straight line, and there not infrequently results an ugly notch in the lip border. The intermaxillary bone can usually be forced into position and utilized. In very rare cases it must be sacrificed.

It has been claimed by some writers that double harelip operations should be postponed until the second or third year of life, but others prefer to do them within the first two months, if possible, because the same advantâges apply to the early operations in these cases as to those of single harelip. In all operations, except for a simple notch, the soft parts about the alveolar processes and nares should be dissected free from the upper jaw with blunt-pointed scissors. By clinging closely to the bone, no hemorrhage will result. When the flaps are being cut, the coronary arteries may be controlled easily by an assistant's fingers. Scissors should not be used in cutting the flaps. They are inaccurate, sometimes bruise the tissues, and do not leave so clean and broad a cut surface. A narrow-bladed knife is best.

The old-fashioned harelip pins have gone out of use, and very properly. Even when removed on the third day—the old rule—they leave a scar: and the third day is too early for the removal of deep sutures. In all operations, for both double and single harelip, one shotted stitch of silver wire is sufficient to anchor the parts. It is inserted in the fold behind the alæ, lies in that natural furrow, takes all the strain from the severed deep parts, holds in place the intermaxillary bone, and leaves no perceptible scar. When this stitch has been placed and the parts approximately brought into position, the question of passing the remaining stitches is one simply of time and patience. In all extensive operations, and always in the case of babies, Mumford has adopted the method of J. C. Warren. Working with a stout silk suture, threaded with a needle at each end, the stitch is entered close under the skin in the freshened lip border, is passed deeply through the underlying soft parts and buccal mucous membrane, and tied strongly to its fellow inside the mouth. Three or four of these heavy stitches suffice to hold the parts firmly in excellent apposition; when tied, the ends should be cut long. The slight gaping in the skin flaps of the external wound is closed with a few very fine intestinal sutures threaded in small embroidery needles, which are passed as closely as possible to the cut edges, the greatest care being taken not to draw them tight enough to invert the skin. The fine superficial sutures must be removed on the third day, and it will be found that no perceptible stitch scar results. The deep stitches are removed from the inside of the mouth on the fifth or sixth day, and the wire bridge on the seventh or eight day. By no means the least part of the operation is the application of a proper sustaining strap from cheek to cheek. The old-fashioned adhesive plaster is a wretched device, and should never be used. It is unclean, sweats the parts, and checks any discharges that may collect. The familiar crêpe-lisse "butterfly" is the best support. It is light, clean, sightly, and does not check discharges. Before applying it, it is well to paint the wound inside and outside the mouth with compound tincture of benzoin, to lay a soft absorbent pad across the external wound, and then firmly to secure the "butterfly" with flexible collodion.

Silkworm-gut is sometimes used for sutures. It is applicable only when tied outside the lip. When so used, it always leaves a scar. For older children and adults, excellent and satisfactory results have been obtained with buried catgut. Only by its use can an approach to an aseptic operation be made. The firm resisting tissues of an adult offer an excellent hold for the buried stitch, and if there remains a slight gaping of the skin, it can be closed with the fine intestinal sutures.

An absolutely aseptic program can never be carried out in any harelip operation, but some attempt should always be made to render the field approximately sterile. The constant use of boric acid washes, both before and after operation, should be maintained. At the time of the operation, the upper lip should be thoroughly wiped over, inside and out, with alcohol, which in its turn is to be washed off with water.

During convalescence, especially after the removal of the stitches, some spreading of the upper part of the wound should not discourage the surgeon. As a rule, if the vermilion border holds, the open cleft above will heal, by second intention, in 2 or 3 weeks. There is often a very anxious time about the end of the first week, but the holding of the border is a sure sign that all will yet go well. No one feature in the whole treatment of harelip is of more importance than that of the feeding of young infants during convalescence from the operation. As an immediate result of the operation there is almost always considerable gastrointestinal disorder. This is in part due to the anesthetic and in part to shock, but by far the most important factor is the blood which has been swallowed. No matter what the form of operation or the position in which the child is held, a very considerable amount of blood finds its way into the stomach. If this is vomited, so much the better; but usually it remains and makes trouble. There then follow several days of diarrhea, undigested stools, pain, colic, sometimes loss of appetite and occasionally vomiting. These symptoms may persist many days, and not infrequently most seriously threaten life. More often, however, they merely debilitate the patient, and seriously delay the healing of the wound. Sometimes there is a total lack of success in closing the lip, obviously due to a low vitality in the wound through malnutrition in an infant hitherto perfectly healthy and strong. Of the very greatest importance, therefore, is proper care during convalescence. The ordinary rules for the treatment of an acute mycotic diarrhea are here applicable. On the evening after the operation a brisk purge should be given—castor oil or calomel; and the child should be put on a weak cream mixture. Sometimes even this is not borne, and a thin barley-water mixture or weak, strained chicken soup

should be substituted for it. Meanwhile liberal doses of brandy should be given, and if diarrhea persists, bismuth subgallate, in 3-grain doses or more, should follow each feeding. Gradually the diet may be strengthened as convalescence progresses, until the normal mixtures have been reached. At the same time plenty of water to drink should be given—a precaution most often neglected by uninstructed nurses.

A résumé of the important points brought out by Mumford in the treatment of harelip includes the following considerations:

1. Harelip babies are not necessarily feeble at birth, and by proper feeding may be kept up to the normal standard.
2. Keep the field clean with aseptic washes before the operation.
3. Operate in the sixth to the eighth week.
4. Do not slash with scissors, but cut and trim carefully with a knife.
5. Free the upper lip thoroughly from the jaw.
6. Anchor the nares with shotted wire.
7. Use no pins or heavy outside sutures.
8. Use crêpe-lisse, not surgeon's plaster.
9. Leave the heavy inside stitches for 6 days.
10. Feed carefully and pay attention to the bowels.

HARRISON LAW.—This is a law relating to the production, importation, manufacture, compounding, sale, dispensing, or giving away of opium or coca leaves, their salts, derivatives, or preparations. We print such parts of it as refer to the physician, druggist and veterinarian. On account of the uncertainty of its meaning we decline to venture an opinion on its interpretation.

The Law.—By an act of Congress approved December 17, 1914, it is provided:

That on and after the first day of March, nineteen hundred and fifteen, every person who produces, imports, manufactures, compounds, deals in, dispenses, sells, distributes, or gives away opium or coca leaves or any compound, manufacture, salt, derivative, or preparation thereof, shall register with the collector of internal revenue of the district his name or style, place of business, and place or places where such business is to be carried on: *Provided*, That the office, or if none, then the residence of any person shall be considered for the purpose of this Act to be his place of business. At the time of such registry and on or before the first day of July, annually thereafter, every person who produces, imports, manufactures, compounds, deals in, dispenses, sells, distributes, or gives away any of the aforesaid drugs shall pay to the said collector a special tax at the rate of $1 per annum: *Provided*, That no employee of any person who produces, imports, manufactures, compounds, deals in, dispenses, sells, distributes, or gives away any of the aforesaid drugs, acting within the scope of his employment, shall be required to register or to pay the special tax provided by this section: *Provided further*, That the person who employs him shall have registered and paid the special tax as required by this section: *Provided further*, That officers of the United States Government who are lawfully engaged in making purchases of the above-named drugs for the various departments of the Army and Navy, the Public Health Service, and for Government hospitals and prisons, and officers of any State government, or of any county or municipality therein, who are lawfully engaged in making purchases of the above-named drugs for State, county, or municipal hospitals or prisons, and officials of any Territory or insular possession or the District of Columbia or of the United States who are lawfully engaged in making purchases of the above-named drugs for hospitals or prisons therein shall not be required to register and pay the special tax as herein required.

It shall be unlawful for any person required to register under the terms of this Act to produce, import, manufacture, compound, deal in, dispense, sell, distribute, or give away any of the aforesaid drugs without having registered and paid the special tax provided for in this section.

That the word "person" as used in this Act shall be construed to mean and include a partnership, association, company, or corporation, as well as a natural person; and all provisions of existing law relating to special taxes, so far as applicable, including the provisions of section thirty-two hundred and forty of the Revised Statutes of the United States are hereby extended to the special tax herein imposed.

That the Commissioner of Internal Revenues, with the approval of the Secretary of the Treasury, shall make all needful rules and regulations for carrying the provisions of this Act into effect.

SEC. 2.—That it shall be unlawful for any persons to sell, barter, exchange, or give away any of the aforesaid drugs except in pursuance of a written order of the person to whom such article is sold, bartered, exchanged, or given, on a form to be issued in blank for that purpose by the Commissioner of Internal Revenue. Every person who shall accept any such order, and in pursuance thereof shall sell, barter, exchange, or give away any of the aforesaid drugs, shall preserve such order for a period of two years in such a way as to be readily accessible to inspection by any officer, agent, or employee of the Treasury Department duly authorized for that purpose, and the State, Territorial, District, municipal, and insular officials named in section five of this Act. Every person who shall give an order as herein provided to any other person for any of the aforesaid drugs shall, at or before the time of giving such order, make or cause to be made a duplicate thereof on a form to be issued in blank for that purpose by the Commissioner of Internal Revenue, and in case of the acceptance of such order, shall preserve such duplicate for said period of two years in such a way as to be readily accessible to inspection by the officers, agents, employees, and officials hereinbefore mentioned. Nothing contained in this section shall apply—

(*a*) To the dispensing or distribution of any of the aforesaid drugs to a patient by a physician, dentist, or veterinary surgeon registered under this Act in the course of his professional practice

only: *Provided*, That such physician, dentist, or veterinary surgeon shall keep a record of all such drugs dispensed or distributed, showing the amount dispensed or distributed, the date, and the name and address of the patient to whom such drugs are dispensed or distributed, except such as may be dispensed or distributed to a patient upon whom such physician, dentist or veterinary surgeon shall personally attend; and such record shall be kept for a period of two years from the date of dispensing or distributing such drugs, subject to inspection, as provided in this Act.

(*b*) To the sale, dispensing, or distribution of any of the aforesaid drugs by a dealer to a consumer under and in pursuance of a written prescription issued by a physician, dentist, or veterinary surgeon registered under this Act: *Provided, however*, That such prescription shall be dated as of the day on which signed and shall be signed by the physician, dentist or veterinary surgeon who shall have issued the same: *And provided further*, That such dealer shall preserve such prescription for a period of two years from the day on which such prescription is filled in such a way as to be readily accessible to inspection by the officers, agents, employees, and officials hereinbefore mentioned.

(*c*) Omitted.

(*d*) To the sale, barter, exchange, or giving away of any of the aforesaid drugs to any officer of the United States Government or of any State, territorial, district, county, or municipal or insular government lawfully engaged in making purchases thereof for the various departments of the Army and Navy, the Public Health Service, and for Government, State, territorial district, county, or municipal or insular hospitals or prisons.

The Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury shall cause suitable forms to be prepared for the purposes above mentioned, and shall cause the same to be distributed to collectors of internal revenue for sale by them to those persons who shall have registered and paid the special tax as required by section one of this Act in their districts, respectively, and no collector shall sell any of such forms to any persons other than a person who has registered and paid the special tax as required by section one of this Act in his district. The price at which such forms shall be sold by said collectors shall be fixed by the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, but shall not exceed the sum of $1 per hundred. Every collector shall keep an account of the number of such forms sold by him, the names of the purchasers, and the number of such forms sold to each of such purchasers. Whenever any collector shall sell any of such forms, he shall cause the name of the purchaser thereof to be plainly written or stamped thereon before delivering the same; and no person other than such purchaser shall use any of said forms bearing the name of such purchaser for the purpose of procuring any of the aforesaid drugs, or furnish any of the forms bearing the name of such purchaser to any person with intent thereby to procure the shipment or delivery of any of the aforesaid drugs. It shall be unlawful for any person to obtain by means of said order forms any of the aforesaid drugs for any purpose other than the use, sale, or distribution thereof by him in the conduct of a lawful business in said drugs or in the legitimate practice of his profession.

The provisions of this Act shall apply to the United States, the District of Columbia, the Territory of Alaska, the Territory of Hawaii, the insular possessions of the United States, and the Canal Zone. In Porto Rico and the Philippine Islands the administration of this Act, the collection of the said special tax, and the issuance of the order forms specified in section two shall be performed by the appropriate internal-revenue officers of those governments and all revenues collected hereunder in Porto Rico and the Philippine Islands shall accrue intact to the general governments thereof, respectively. The courts of first instance in the Philippine Islands shall possess and exercise jurisdiction in all cases arising under this Act in said islands. The President is authorized and directed to issue such Executive orders as will carry into effect in the Canal Zone the intent and purpose of this Act by providing for the registration and the imposition of a special tax upon all persons in the Canal Zone who produce, import, compound, deal in, dispense, sell, distribute, or give away opium or coca leaves, their salts, derivatives, or preparations.

SEC. 3. That any person who shall be registered in any internal-revenue district under the provisions of section one of this Act shall, whenever required so to do by the collector of the district, render to the said collector a true and correct statement or return, verified by affidavit, setting forth the quantity of the aforesaid drugs received by him in said internal-revenue district during such period immediately preceding the demand of the collector, not exceeding three months, as the said collector may fix and determine; the names of the persons from whom the said drugs were received; the quantity in each instance received from each of such persons, and the date when received.

SEC. 4. That it shall be unlawful for any person who shall not have registered and paid the special tax as required by section one of this Act to send, ship, carry, or deliver any of the aforesaid drugs from any State or Territory or the District of Columbia, or any insular possession of the United States, to any person in any other State or Territory or the District of Columbia or any insular possession of the United States: *Provided*, That nothing contained in this section shall apply to common carriers engaged in transporting the aforesaid drugs, or to any employee acting within the scope of his employment, of any person who shall have registered and paid the special tax as required by section one of this Act, or to any person who shall deliver any such drug which has been prescribed or dispensed by a physician, dentist, or veterinarian required to register under the terms of this Act, who has been employed to prescribe for the particular patient receiving such drug, or to any

United States, State, county, municipal, District, Territorial, or insular officer or official acting within the scope of his official duties.

Sec. 5. That the duplicate-order forms and the prescriptions required to be preserved under the provisions of section two of this Act, and the statements or returns filed in the office of the collector of the district, under the provisions of section three of this Act, shall be open to inspection by officers, agents, and employees of the Treasury Department duly authorized for that purpose; and such official of any State or Territory, or of any organized municipality therein, or of the District of Columbia, or any insular possession of the United States, as shall be charged with the enforcement of any law or municipal ordinance regulating the sale, prescribing, dispensing, dealing in, or distribution of the aforesaid drugs. . . . .

Sec. 6. That the provisions of this Act shall not be construed to apply to the sale, distribution, giving away, dispensing, or possession of preparations and remedies which do not contain more than two grains of opium, or more than one-fourth of a grain of morphine, or more than one-eighth of a grain of heroin, or more than one grain of codeine, or any salt or derivative of any of them in one fluid ounce, or, if a solid or semisolid preparation, in one avoirdupois ounce; or to liniments, ointments, or other preparations which are prepared for external use only, except liniments, ointments, and other preparations which contain cocaine or any of its salts or alpha or beta eucaine or any of their salts or any synthetic substitute for them: *Provided*, That such remedies and preparations are sold, distributed, given away, dispensed, or possessed as medicines and not for the purpose of evading the intentions and provisions of this Act. The provisions of this Act shall not apply to decocainized coca leaves or preparations made therefrom, or to other preparations of coca leaves which do not contain cocaine.

Sec. 7. Omitted.

Sec. 8. That it shall be unlawful for any person not registered under the provisions of this Act, and who has not paid the special tax provided for by this Act, to have in his possession or under his control any of the aforesaid drugs; and such possession or control shall be presumptive evidence of a violation of this section, and also of a violation of the provisions of section one of this Act: *Provided*, That this section shall not apply to any employee of a registered person, or to a nurse under the supervision of a physician, dentist, or veterinary surgeon registered under this Act, having such possession or control by virtue of his employment or occupation and not on his own account; or to the possession of any of the aforesaid drugs which has or have been prescribed in good faith by a physician, dentist, or veterinary surgeon registered under this Act; . . . .

Sec. 9. That any person who violates or fails to comply with any of the requirements of this Act shall, on conviction, be fined not more than $2,000 or be imprisoned not more than five years, or both, in the discretion of the court.

Sec. 10. Omitted.

Sec. 11. Omitted.

Sec. 12. Omitted.

See Antinarcotic Legislation.

HARTSHORN.—A popular name formerly given to ammonia water. See Ammonium.

HASHISH.—See Cannabis.

HAY-FEVER. Synonyms.—Hay asthma; rose cold; pollen catarrh; autumnal catarrh.

Definition.—A hypersensitive condition of the upper air-passages, with intense catarrhal symptoms, mostly occurring in the autumn or spring, and probably due to the inhalation of irritating particles in the atmosphere, such as the pollen of plants.

Etiology.—Since the publication of Dunbar's work the accepted theory is that hay-fever is caused in predisposed individuals by the toxic action of pollen grains, which contain a proteid substance of the nature of a toxalbumin. In this country golden rod (*Solidago*) and ragweed (*Ambrosia*) are the chief sources of intoxication (autumnal catarrh); while the variety occurring during the spring (rose cold, June cold) is excited by the pollen of grasses and Indian corn. Among predisposing factors may be enumerated: Spring or autumn season; heredity; hypertrophy of the nasal mucous membrane; irritation of the sensitive areas in nostrils; deflection of the nasal septum; nasal polyps; neurotic constitution. Haig lays stress upon uric acid as an etiologic factor.

Pathology.—There is often hypertrophic rhinitis, nasal spurs, or deflection of nasal septum.

Symptoms.—The onset is quite sudden, frequently recurring at the same period of each month for successive years. The attack generally begins with sneezing, coryza, nasal stenosis, headache, burning or pricking sensation in nasal chambers, and an excessive secretion of clear or whitish mucus from the nostrils. There is often lacrimation, burning of eyeballs, conjunctivitis, obstinate hacking cough, asthmatic attacks, and depression.

Diagnosis.—The periodicity or season of the year and character of the attack generally distinguish the disease.

Prognosis.—For temporary relief the prognosis is good, but the disease is prone to recur.

General Treatment.—The system must be supported by proper regimen and the administration of general tonics, such as iron, strychnin, arsenic, phosphorus, or the hypophosphites. Elimination must be promoted by careful attention to the excretions and secretions—intestinal, renal and cutaneous. Patients should always be instructed to drink plenty of water. If constipation exists, it should be corrected at once. Any disturbance of digestion will require appropriate remedies. Frequent hot baths, massage, and electricity have been advocated.

It may be best to restrict animal foods, coffee, and tea to the minimum, and to use fruits and vegetables as the principal articles of diet. As a general tonic:

℞. Solution of potassium arsenite, ℥ j
Syrup of hypophosphites,
enough to make ℥ iv.

Two teaspoonfuls after meals.

The elixir of phosphates of iron, quinin, and strychnin (1 dram to 2 ounces), after meals, is a valuable tonic.

Internally may be given:

℞. Tincture of opium, ℥ j
Tincture of belladonna, ℥ ss
Camphor water, enough to make ℥ iij.

Tablespoonful every 4 hours.

Or:

℞. Extract of belladonna, } each, gr. j
Extract of cannabis indica, }
Camphor, gr. xv
Quinin, gr. xx.

Divide into 6 capsules; 1 capsule every 3 hours.

If the patient can afford it, a sea voyage or a trip to certain coast cities or to the mountains is of great benefit.

Diuretics containing lithium are advisable; also potassium iodid for a short period, followed by salicylate of sodium.

Local Treatment.—The acute symptoms render the patient miserable on account of the burning sensation in nares and pharynx. The excessive watery secretion is often so great as to cause stenosis of the nasal chambers, giving rise to mouth breathing.

Kyle determines the choice of local applications by the chemical reaction of the buccal and nasal secretions; whether the condition is alkaline, acid or neutral, whether it is due to the presence of ammonium salts, the sodium salt, or potassium salts, or whether there are present sulphocyanids, lactic acid or oxalic acid. The proper drug must be selected to counteract these conditions: alkalies such as the citrate, lactate or benzoate of sodium; sodium chlorid and the salicylates; or, on the other hand, boric acid, dilute hydrochloric acid and dilute nitric acid.

Hollopeter, who reports great success in treating this affection, says that the nares must be thoroughly cleansed and scrubbed carefully with Dobell's solution, followed by an application of some oily preparation. He says that simple douching and spraying are insufficient.

The patient may inhale:

℞. Menthol, gr. ij
Spirit of camphor, ℥ jss
Compound tincture of benzoin, enough to make ℥ j.

To this may be added every 2 hours a drop or two of chloroform. The latter, being more volatile than the other ingredients, evaporates more rapidly.

Some hay fever patients are relieved by local applications of suprarenal extract, either adrenalin chlorid sprayed into the nostrils or applied to the mucous membrane with a cotton swab, or in the form of a 10 percent suprarenalin ointment or snuff.

Considerable success has attended the use of Dunbar's serum patented under the name of "*Pollantin*" and marketed both in liquid and in powder form. It is used externally, not by hypodermic injection, and, unlike other serums, must be used daily during the hay fever season, as a single dose does not completely immunize against subsequent attacks. Pollantin is said to be perfectly harmless even in large doses, and repeated use neither lessens the effect nor creates a habit. Dunbar believes that the pollen toxin is identical in the various plants, and utilized for the preparation of his serum the pollen of Indian corn.

Liquid pollantin contains 1/4 percent phenol, which, however, is not sufficient to inhibit bacterial growth, if the preparation is contaminated by contact with the nasal mucous membrane or the eye.

Dosage and Administration.—In the manufacturers' directions for using *powdered pollantin* the patient is instructed to fill about one-fourth of the scoop inserted into the glass tube, hold the scoop under one nostril, and sniff the powder while keeping the other nostril closed. The same dose is then applied to the other nostril. The powder may also be used in treating the eyes, a few grains being introduced into the conjunctival sac with a camel's hair brush. The dose of *liquid pollantin* is 1 drop in each eye, and 4 or 5 drops in each nostril. It is stated that the substance is entirely harmless even in large doses. Pollantin should be used every morning and as often during the day as the symptoms seem to demand.

Hypertrophic rhinitis, nasal polyps, septal deformities and any other surgical conditions that may be present should always be corrected by operative means, in the hope of thus removing one of the causes of the malady (see RHINITIS, chronic).

HEAD, INJURIES.—For **injuries of the scalp,** see SCALP. For **injuries of the skull,** see SKULL. For **injuries of the brain,** see BRAIN. See also NOSE, FACE, EAR, etc.

HEADACHE (Cephalalgia).—Pain in the head. It may be due to organic cerebral disease, congestion or anemia of the brain, functional nervous disorders, toxemic conditions, Bright's disease, high arterial tension without kidney involvement, derangements of the stomach and liver, and reflex causes, such as eye-strain, nasal disease, etc. The character of the pain varies, being superficial or deep, constant or paroxysmal, general or local, dull and heavy, or throbbing and stabbing.

Ocular and Nasal Headaches.—The largest number of frontal, temporal, and so-called "sick" headaches are due to eye-strain, and even though there may be a number of underlying conditions at work to cause a headache, eye-strain of any kind, if present, may be a dominant factor in exciting the attack or in aggravating it, and the relief of this strain will often exert a most favorable influence. No study of headache is complete that does not reckon with the conditions that may exist in the eye; and when etiology is not perfectly clear, these should receive careful attention.

According to Gradle, the characteristics of the ocular and nasal headaches are (1) their location

and (2) their time relations. Their severity is a less reliable guide.

Location.—The most important question concerning the site of a headache is whether it is wholly or predominantly one-sided. One-sided headache is generally due to trouble on the same side of the head, either intracranial or in one of the organs of sense. An exception is that form of migraine which, though one-sided at the time, alternates regularly between right and left, for in this case the source is not one-sided, if it is peripheral at all. Conversely, however, one-sided lesions may in some instances cause headache not limited to the same side. This is sometimes true of unilateral errors of refraction, as well as of affections of one ethmoid or sphenoid cavity. Apart from the side of the head, the location of a headache furnishes no positive indication as to its source. Although headaches are, as a rule, located in the vicinity of the organ in which the irritation exists, there are so many exceptions to this rule, especially in neurotic subjects, that it has but little diagnostic value.

Time Relations.—From the point of view of their time relations, headaches may be classified as: (1) Paroxysms recurring at (*a*) irregular or (*b*) regular intervals; (2) attacks following some specific act; (3) more or less continuous pain. In this connection, too, must be considered the date of suffering and its manner of onset (Gradle).

1. Paroxysms of headache of similar intensity and duration, and occurring at variable intervals, constitute the form called migraine. The experience of oculists is very definite regarding the ocular origin of many instances of migraine. If wholly or predominantly one-sided, migraine is surely dependent either on an error of refraction or, in a smaller proportion of cases, on some nasal disease. If there are eye symptoms, and especially if the migraine is on the side of the notably weaker eye, an ocular origin is very probable. Still, the absolute proof in a given case can only be furnished by the influence of glasses. The absence of eye symptoms does not preclude the existence of a moderate degree of astigmatism as the starting-point of the headache. The form of migraine preceded by scintillations and dim sight—the scotoma scintillans—is not always of ocular origin, although often the result of astigmatism.

In relatively rare instances migraine is induced by nasal disturbances. Grünwald quotes some convincing instances of ethmoid and sphenoid suppuration. Migraine of moderate severity and relative infrequency occurs in persons of apparently normal nervous system and good family history. But great frequency, great severity, or massing of separate paroxysms into a continuous spell indicate other factors exerting a depressing effect upon the nervous system besides a possible peripheral origin in the given case.

Paroxysms of headache with regular periodicity —recurring about the same hour daily—have usually been the result of sinus-disease. In most of these instances the pain should really be classified as a neuralgia. If, however, it is not strictly confined to a small area of nerve distribution, the patient may describe it as a headache. It has been seen in connection with acute or subacute inflammation of the various nasal accessory cavities. When starting from the frontal sinus, it appears as a supraorbital neuralgia which, however, may radiate into a diffuse one-sided headache. The diagnosis is not always easy, even on inspection, for suppuration of the frontal sinus of moderate intensity is sometimes almost latent, and often transient, though recurrent. But there is always the history of a preceding acute coryza. These attacks often yield to either quinin or antipyrin, even when there exists demonstrable sinus-disease. In ethmoid and sphenoid disease the pain is more often described as headache than as a circumscribed neuralgia—usually, but not unvariably, one-sided.

2. Of headaches following specific acts, the most characteristic is the pain brought on by the use of the eyes for near work. The more precise the coincidence of headache with eye work, the more probable is the origin in hypermetropia, hypermetropic astigmatism, myopia, myopic astigmatism, or muscular anomaly. The more neurotic the subject, the greater the probability of headache occurring at irregular occasions during the day, but these eye headaches are never present on rising, and never severe enough to prevent sleep. In any deviations from this rule other factors must be sought. In highly neurotic subjects these ocular anomalies may bring on headaches on using the eyes even for a distant fixation: as, for instance, in the theater, riding in the steam-cars, etc. Finally, there are rare instances, generally in anemic, sometimes in hysteric, patients, of headaches following strictly upon the use of the eyes when no ocular anomaly of any kind exists.

3. Headaches more or less persistent or with irregular intermission may result from optic anomalities, but only in run-down subjects. Very often other assisting factors can be demonstrated, such as stomach or intestinal disease, loss of sleep, and particularly insufficient outdoor exercise. In other instances the refraction may be perfect, but other ocular disease may be found. This is sometimes a pheripheral choroiditis. It has seemed rather characteristic, in such instances, that the pain begins at once on awaking. Continuous one-sided headache, if at all connected with the eye, is usually indicative of some serious inflammatory condition, especially if of recent date and rapid onset. Optic neuritis—especially the retrobulbar form—is to be thought of, even if dim sight is not specifically stated by the patient. The most serious condition that may lead to such symptoms is glaucoma; and the possibility of chronic glaucoma as the cause of severe and persistent one-sided headache should not be forgotten.

Among nasal diseases, the forms most likely to lead to persistent and unusually severe headache are the more intense suppurative inflammations of the sinuses, in which case nasal symptoms always exist. Nocturnal aggravations are not uncommon under these circumstances. Moderate

but very persistent headache is occasionally complained of in nasal stenosis of any kind, but only by distinctly neurotic subjects. It is less generally known that inflammatory conditions of the pharyngeal tonsil are sometimes the source of continuous headache, usually not very severe, in both children and adults; in fact, the existence of such transient inflammations in this region is not yet generally recognized. Persistent, diffuse one-sided headache with irregular exacerbation sometimes may be traced to carious teeth, and ceases promptly after their extraction.

Nervous Headaches.—The head pain is usually of the nature of migraine, and it occurs in hysteric, high-strung, sensitive, and emotional people, especially precocious girls, and may resist every form of treatment. A neuralgic element often exists. A vertical headache often occurs in hysteric women, usually of a boring character, or such as might result from driving a nail into the top of the head. This is the so-called "clavus hystericus." Uterine disease may produce such a headache as well as occipital pain.

In nervous exhaustion, particularly from prolonged worry, headache is common.

Anemic headache is usually frontal; and congestive states of the brain from heart-disease, asthma, and other forms of dyspnea give rise to it. It is usually, in these latter cases, throbbing and is increased by stooping, coughing, or a condition increasing the congestion.

Toxemic Headaches.—A frontal and deep-seated headache is often toxemic from uremia, lithemic fevers, secondary syphilis, diabetes, or chronic alcoholism, and may be very severe. Uremic headache is overwhelming; the headache of secondary syphilis is neuralgic, limited to the temples, and recurs with great regularity at night; lithemic headache occurs in the morning. A heaviness or acutal pain in the head may result from breathing the air of an unventilated room or one overfilled with people, and a similar pain may occur before a thunderstorm. Headaches from hepatic and stomachic derangements are possibly of toxemic origin, and are usually occipital or vertical. The headache which is a feature in certain cases of chronic interstitial nephritis belongs in this group; it is usually, but not always, associated with high arterial tension and arteriosclerosis.

Syphilitic Headache.—Headache is an important stigma of cerebral syphilis. As before stated, it is present in three-fourths of the cases. Dangerous complications seldom occur without this prodromic symptom. This headache is intense, is generally referred to the depth of the brain—an encephalalgia. It is seldom diffuse, but is localized in a definite region. When seated in the parietofrontal region, it is either unilateral or predominates on one side. One of the special characteristics of this headache is the regular exacerbations, followed by remissions or intermissions, to which it is subject. Absent or quite supportable in the day-time, it reappears or becomes intensified in the early part of the night, and subsides gradually toward morning. Exceptionally, its maximum intensity is in the morning at the waking hour. Very seldom, indeed, does it persist night and day without any variation. This headache is often accompanied by an evident change in the mental condition of the patient. In mild cases there may be only slowness of thought and inaptitude for sustained mental effort. In more pronounced cases there are veritable mental torpor, amnesia and a noticeable change of character. These prodromes acquire a still more precise signification when there are added to them formication and numbness of the extremities with transient or enduring pains.

Headache of Arteriosclerosis.—The pain is persistent, of a throbbing character, often associated with tinnitus and vertigo. These headaches are often forerunners of apoplexy. They occur in chronic nephritis as a result of the concurrent arteriosclerosis.

Drug Headaches.—Quinin or salicylates may cause a dull throbbing headache associated with tinnitus.

Headache During Childhood.—In the very young headache is infrequent except in disease of the brain or meninges. In older children the etiology is similar to that in the adult.

1. *Eye-strain, or eye defects,* is the most frequent cause of headache in children. In all cases of headache the possibility of eye-strain or eye defects should first be eliminated by careful refraction and treatment by an efficient oculist before seeking further for the cause.

2. *Headache of Nasal, Pharyngeal, or Aural Origin.*—Adenoids, hypertrophic rhinitis or tonsillitis, nasal polypi, may be the cause. It is made worse by coughing and stooping. Local treatment is in these cases imperative.

3. *Headache of nervous origin* occurs in those of highly neurotic tendency or subject to hysteria or epilepsy, also in brain disease.

4. *Anemic headaches* due to impoverished blood and malnutrition occur generally in school girls from overstudy combined with more or less worrying.

5. *Toxic headaches* are usually due to autointoxication—from the absorption of toxins from the intestines. These are caused also by malaria, uremia, carbonic acid derived from impure ventilation. They are generally accompanied by digestive disorders and constipation.

6. *Gouty or rheumatic headaches* due to the inherited diathesis may be intense. These may be associated with neuralgias and pains in joints or muscles.

7. *Menstrual headaches* may occur in girls at puberty, due to amenorrhea or dysmenorrhea.

Treatment of Headache.—Eye-strain should be sought for and corrected, as well as any existing nasal disease. Toxemic states should be remedied by dietary and medicinal prescriptions. Anemia calls for preparations of iron. Uterine disease should be corrected. Cerebral syphilis demands mercurials and iodids. In other words, to be effective, the treatment must be directed to the cause.

Palliative treatment consists in local applications of cold, evaporating lotions, menthol, thymol.

Various pungent and aromatic spirits are useful for inhalation.

Eau sédative:

℞. Sodium chlorid, ʒ j
Camphorated spirit of wine, ʒ jss
Ammonia water, ʒ j
Water, O j.
Apply locally.

For migraine:

℞. Monobromated camphor, gr. xviij
Citrated caffein, gr. xviij
Acetphenetidin, gr. xxxvj
Sugar, gr. xviij.
Make into 20 powders. One every hour until relieved.

℞. Sodium arsenate, gr. j
Extract of cannabis indica, gr. ij
Extract of belladonna, gr. iv.
Make into 12 pills. Take 1 pill twice daily.

For bilious headache:

℞. Calomel, Compound rhubarb pill, each, gr. iv
Extract of hyoscyamus, gr. ij.
Make 2 pills. One at night.

For uremic headaches:

℞. Potassium acetate, ʒ vj
Infusion of digitalis, ʒ vj.
A tablespoonful every third hour.

For nervous headaches:

℞. Zinc phosphid, gr. iiij
Extract of nux vomica, gr. x
Confection of rose, q. s.
Divide into 30 pills.

HEARING, DRUGS AFFECTING.—Hearing is affected by many drugs. Strychnin and morphin increase the excitability of either the auditory nerve or the center for hearing in the superior temporosphenoidal convolution, making that faculty much more acute. Quinin, antipyrin and salicylates produce hyperemia of the auditory apparatus, causing subjective noises, as humming, buzzing, or ringing, which are very unpleasant. Hydrobromic acid and the bromids, also ergot, will diminish the congestion and thus neutralize or prevent these noises to a great extent. Quinin in large doses is believed by some to have produced permanent injury of the sight and the hearing, but authentic cases of such action are extremely rare, if indeed they can be found at all. Temporary deafness is often caused by quinin but it usually disappears soon after the administration of the drug is stopped.

HEARING, TESTS.—See Ear (Examination).

HEART, EXAMINATION.—In making a physical examination of the heart five methods of diagnosis are employed, namely, (1) Inspection; (2) palpation; (3) mensuration; (4) percussion; (5) auscultation.

These methods are best employed when the patient is in a quiet room with a good light, and in a sitting posture during inspection; in the recumbent posture during percussion, and compared in both positions during auscultation.

Inspection

Precordia.—The precordia is that region of the chest that immediately overlies the heart.

By inspection we note certain appearances: (1) Prominence in this area; (2) the size of the interspaces; (3) the color of the skin; (4) the position of the apex-beat; and (5) the strength and extent of the cardiac impulse.

The Apex-beat.—The apex is that portion of the heart that touches the chest-wall at each pulsation synchronously with the first sound of the heart. The apex-beat is also spoken of as the "cardiac impulse," when it is felt by the hand over the precordia.

The position of the apex-beat in health is between the fifth and sixth ribs, or in the fifth interspace, 1/2 of an inch within the midclavicular line. The apex-beat in health is movable. In distention of the stomach by gas it may be carried upward. In deep inspiration it is carried downward by the expanded lung. In children the apex-beat is usually in the fourth interspace, and nearer the nipple line.

Displacement of the Apex-beat.—

- Upward:
  - (*a*) High position of diaphragm.
  - (*b*) Tympanites.
  - (*c*) Ascites.
  - (*d*) Abdominal growths.
  - (*e*) Pericarditis with effusion.
- Upward and to left:
  - Effusion into right pleural sac.
    - (*a*) Liquid.
    - (*b*) Gaseous.
- Downward:
  - (*a*) Aortic aneurysm.
  - (*b*) Mediastinal tumor.
  - (*c*) Senility.
  - (*d*) Hypertrophy of left ventricle.
  - (*e*) Collapse of abdominal viscera.
- To right or left:
  - (*a*) Hypertrophy and dilatation.
  - (*b*) Effusion of gas or liquid into pleural sac—*i. e.*, pneumothorax, hydrothorax, etc.
  - (*c*) Unilateral emphysema.
  - (*d*) Pleural adhesion and retracted lung.
  - (*e*) Marked solid enlargements of lung or of the left lobe of the liver.
- Apex-beat may be invisible by reason of:
  - (*a*) Interposition of rib.
  - (*b*) Fat chest-wall.
  - (*c*) Feeble heart.
  - (*d*) Emphysema.
  - (*e*) Edema of chest-wall.
  - (*f*) Pericardial effusion (marked).
  - (*g*) Pleural effusion.
  - (*h*) Transposition of the viscera (is present on right side).
- Its area and apparent force may be increased because of:
  - (*a*) Nervous excitement.
  - (*b*) Hypertrophy or dilatation.
  - (*c*) Retraction of lung.

Diminished force of the apex-beat may be due to: (1) Fatty degeneration of the heart; (2) emphysema; (3) left-sided pleural effusion; (4) pericardial effusion.

Palpation

By this physical method of diagnosis we determine: (1) Force of the cardiac impulse; (2) frequency of the heart's action; (3) regularity of its movements (rhythm); (4) thrill.

Increase of the cardiac impulse may be due to: (1) Hypertrophy of the heart; (2) early stages of endocarditis; (3) fevers due to inflammation.

Decrease of the cardiac impulse may be due to: (1) Fatty degeneration of the heart; (2) emphysema; (3) pericardial effusion; (4) dilatation of the heart.

Increased frequency of the action of the heart may be caused by: (1) Excitement; (2) shock; (3) fatty degeneration; (4) goiter; (5) all fevers. See TACHYCARDIA.

Decreased frequency of the action of the heart may be done to: (1) Constipation; (2) atheroma; (3) lithemia; (4) nephritis; (5) chronic myocarditis; (6) Stokes-Adams' disease (30 to 40 beats per minute); (7) it is physiologic in old people. See BRADYCARDIA.

Thrill.—This means a vibratory sensation perceptible to the hand when placed over the precordia. A presystolic thrill is almost pathognomonic of mitral stenosis; hypertrophy of heart with dilatation often produces a thrill over the precordial area.

Mensuration.

By this physical method of diagnosis we determine the circular measurement of the chest and compare the two sides. A good instrument for the purpose is a steel tape-measure, or long strips of lead bent around the chest on each side, or Quain's stethometer may be used.

The points of measurement are the spinous process of a vertebra behind and the median line in front. The two sides are then compared. The average circular measurement of a healthy chest is 32 1/2 inches. Normally, the right side of the chest is slightly increased in right-handed individuals. In disease it is often much increased on the left side in certain forms of congenital heart-disease when hypertrophy supervenes. The position of the apex-beat is sometimes indicated by its distance from the middle line of the sternum, which in normal adults is 9 to 10 centimeters or about 4 inches.

Percussion.

By this physical method of diagnosis we determine the shape and area of cardiac dulness. There is, normally, (1) superficial cardiac dulness and (2) deep cardiac dulness.

The normal area of superficial cardiac dulness is studied best by *light* percussion. It is an approximately quadrangular area extending from the fourth costosternal junction to the apex-beat; from the apex-beat to the junction of the xiphoid cartilage with the sternum; thence up the left border of the sternum.

The normal area of deep cardiac dulness is studied best by *deep* percussion. The dull area has a somewhat triangular shape and extends from the third left costosternal junction to the apex-beat; from the apex-beat to the junction of the xiphoid cartilage with the sternum; thence up the right border of the sternum to the third rib.

The area of cardiac dulness may be (1) increased or (2) diminished.

The area of cardiac dulness is increased in (1) pericardial effusion; (2) retraction of left lung; (3) hypertrophy with dilatation.

The area of cardiac dulness is decreased in (1) emphysema; (2) pneumothorax; (3) gaseous distention of stomach; (4) aneurysm of aorta.

Auscultation.

The posture of the patient should be recumbent when examination is first begun; then the patient should assume the sitting posture, and the examiner should compare the variations, if any. At times the patient should hold the breath.

By auscultation we determine: (1) Quality; (2) intensity; (3) rhythm; (4) murmurs. When the ear or stethoscope is placed over the apex-beat of the heart, two sounds are heard, called the *first* and *second* heart-sounds; these sounds may be represented by the words, "lūbb," "tŭp."

The first sound of the heart occurs during *systole*, and is heard when the apex of the heart impinges against the chest-wall, producing a low-pitch sound, "lūbb," and is caused by the contraction of the ventricle, tension of the auriculoventricular valves, and the impact of the heart against the chest-wall. The first sound of the heart is synchronous with the apex-beat and pulse of carotids. It precedes the pulse in the radial arteries.

The second sound of the heart is heard shortly after the first sound. It is termed the second or diastolic heart sound. It is short and high-pitched, "tŭp." It is caused by the closure of the aortic and pulmonary valves.

Quality of the Heart-sounds.—The first sound of the heart (lūbb) is softer in quality, lower in pitch, and more prolonged than the second (tŭp) sound.

Accentuation of Both Heart-sounds.—Both sounds are accentuated in: (1) Hypertrophy of the heart; (2) pneumonia; (3) anemia; (4) excitement; (5) thin chest-walls.

Accentuation of the first heart-sound is present in hypertrophy of heart.

Accentuation of the second sound (aortic) is present in: (1) Hypertrophy of left ventricle; (2) arteriosclerosis; (3) aneurysm of aorta.

Accentuation of the second sound (pulmonary) is present in: (1) Pulmonary obstruction; (2) hypertrophy of the right ventricle; (3) mitral regurgitation; (4) mitral stenosis.

Weakness of both sounds is present in: (1) Emphysema; (2) fatty degeneration; (3) pericardial effusions; (4) debility; (5) obesity.

Weakness or absence of the second aortic sound is a feature of aortic insufficiency and aortic steno-

sis; **weakness of the second pulmonic** indicates dilatation of the right ventricle and impending cardiac failure.

Rhythm of Heart-sounds.—The acts which constitute a complete cardiac pulsation are: (1) Contraction (*systole*); (2) pause; (3) dilatation (*diastole*); and (4) *rest* of each of its cavities.

This complete heart action, from the ending of one systole to the beginning of the next, may be called its *cycle.* The periods of rest and the periods of action should follow each other in regular time. This is called the **rhythm** of the heart.

The normal **cardiac cycle** is made up as follows: (1) Systolic or first sound; (2) a brief interval of silence; (3) diastolic or second sound; (4) long silence. This is most important to remember, for if these regular intervals of rest are disturbed, the rhythm will be altered, indicating cardiac disease.

Irregular rhythm of the heart-sounds is observed in both functional and organic disease of the heart.

Irregular rhythm from functional diseases of the heart is due to: (1) Irritation of the heart muscle by toxic substances such as tobacco, caffein and the like, or by the products of disturbed metabolism, as in gout and various forms of indigestion; (2) reflex irritation, as from the stomach, liver, hysteria, or disturbance of uterine functions.

Irregular rhythm from organic diseases of the heart is due to: (1) Fatty degeneration; (2) angina pectoris; (3) myocarditis, including disease of the auriculoventricular bundle; (4) mitral regurgitation and mitral stenosis. See HEART-BLOCK.

Heart Murmurs.—By a murmur we mean an abnormal heart-sound. Cardiac murmurs are produced either within the heart (endocardial murmur) or upon its surface (pericardial murmur). Heart murmurs are also divided into (1) organic and (2) inorganic. For the different varieties, see HEART-DISEASE (Organic).

HEART, INJURIES.—Contusions, wounds, and rupture of the pericardium may at times be produced by a severe crush of the chest-walls; but are more often due to the penetration of a fragment of a broken rib or to a stab or gunshot. In the last two instances the heart is generally also involved. The signs are severe shock, hemorrhage, the position and direction of the wound, and subsequently symptoms of pericarditis. The prognosis is always very serious, death occurring either from the effused blood impeding the heart's action, or from pericarditis.

The treatment consists in absolute rest, the local application of cold, and, if inflammation threatens, of leeches. Should the heart's action become seriously impeded by effused blood, serum, or pus, aspiration or free incision and drainage may be required. When there is an external wound, it should be dressed antiseptically.

Wounds of the heart, especially when they penetrate one of its cavities, and particularly an auricle, are generally instantaneously fatal from shock or hemorrhage. Remarkable exceptions occur, however, and patients have been known to linger for a few hours or a few days, or even to recover. When not at once fatal, a wound of the heart is attended with great collapse, syncope, a fluttering pulse, and dyspnea, and later with symptoms of pericarditis. The treatment is the same as that for a wound of the pericardium.

Rupture of the heart, though rare, occasionally occurs as the result of great external violence to the chest-walls, or of some sudden exertion on the part of a patient suffering from disease of the heart's substance. Death is, as a rule, almost instantaneous.

The following case of cardiac injury is particularly interesting, and serves to illustrate the mode of operative procedure (Rehn):

A man 22 years of age sustained the following injury: A wound 1.5 cm. broad was found in the fourth intercostal space, on the left side. He was not bleeding externally when examined, but on account of the facts that his clothing was covered with blood, his state of collapse, his paleness, dyspnea, and an increase of dulness over the region of the heart, and even over the whole pleural cavity, the necessity for operative interference became imperative.

Operation.—After temporary resection of the fifth left rib, near the mammillary line, and emptying the copious collection of blood from the thorax, a small opening was discovered in the pericardium. Through this opening venous blood was found to be escaping. Free incision into the pericardium was then made and the pericardium lifted by clamps applied at the wound. This brought the heart up into full view. Its action could be seen perfectly. The diastole seemed to last longer than the systole. A wound 1.5 cm. long which was bleeding freely was discovered in the middle of the right ventricle. This wound was closed by three interrupted silk sutures, and the bleeding immediately stopped. It was especially to be observed that the finger could be pressed upon the wound without interfering to any considerable degree with the action of the heart.

The principles of operation on pericardiac and cardiac wounds are summarized by Binne as follows: (1) Cleanse; (2) enlarge the external wound; (3) freely expose the injured pericardium by excision of portions of the ribs and sternum; (4) attend to hemostasis; (5) open the pericardium and remove effused blood; (6) attend to cardiac wounds if present; (7) close the wounds in pericardium and in pleura if such be present; (8) close external wound with or without drainage.

HEART, PAIN.—Pain in the region of the heart is due either to functional or organic changes in adjoining organs or structures or to disease of the heart itself, and the probability that it is organic is slight if the patient is young, and decided if he is old.

A large proportion of the patients suffer from **neuralgia of the intercostal nerves,** which is increased by exertion or deep breathing. Often it is so severe as to make the patient catch his breath, or, more commonly, he unconsciously breathes in a superficial manner, and so gradually impairs his respiratory activity to such an extent that he feels oppressed and dyspneic, a condition that greatly increases his distress, as he regards this symptom as confirmatory of his own diagnosis

of heart-lesion. The darting character of the pain and its superficial position, the fact that spots of superficial tenderness can often be found over its course by slight or deep pressure, and that a tender spot can be found at the origin of the nerve in the back, will aid in clearing up the diagnosis and in relieving the mind of physician and patient, particularly if the heart-sounds are normal and arterial sclerosis is not discovered.

In another so-called cardiac pain the difficulty is due to an **accumulation of gas under the heart** in the angle where the transverse colon turns to form the descending colon. As a result of this not only pain, but cardiac palpitation and arrhythmia are produced by reflex causes, even when the abdominal wall may not seem to be very tympanitic. This pain occurs in women with relaxed and pendulous abdomens, who take little exercise, often overfeed themselves with foods productive of gas, and have actual syncopal attacks from this cause. These syncopal attacks may be the most alarming part of the ailment, and give rise to the belief that degenerative changes are present in the myocardium or coronary vessels. During the attack the irregular action of the heart, its feebleness, and its distant sounds may, if the physician is seeing the patient for the first time, make a differential diagnosis almost impossible. Sometimes the distention of the abdomen is not sufficient to account for the symptoms, yet percussion of the lower ribs on the left, in the area of Traube's semilunar space, will reveal marked tympany. According to Hare, an important point in diagnosis is that between the attacks the heart-sounds will be normal and the pulse-tension healthy, whereas in true angina pectoris, there will always be found high tension, with exaggerations of the tension during the attack. Similar attacks due to identical causes may occur in men who are high livers, but are more rarely met.

Closely associated with these forms of cardiac pain, without a marked lesion, is that found in persons who use **tobacco** to excess, and it is to be remembered that the excess of one man is not the excess of another. The pain complained of may be caused by an intercostal neuralgia due to tobacco, plus cardiac palpitation due to the same cause. **Coffee**, even in moderate quantity, produces similar effects in many susceptible individuals, especially in women with a tendency to hyperthyroidism. Cardiac pain of this type is usually not severe, but persistent, and associated with palpitation. It is readily distinguished from angina pectoris.

There seems to be also a form of cardiac pain due to **gastric disorder**, which reflexly disturbs the cardiac branches of the vagus as well. It may exist side by side that just described, or may follow an attack of indigestion due to imprudence in food or drink.

Among forms of nonorganic cardiac pain we must also consider **false angina pectoris.** This is most frequently seen in hysteric, neurotic women or girls, is associated with pallor, a gasping cry, and more or less complete syncope. The pain is rarely excessively severe, and is described as if the heart were being overdistended, whereas that due to true angina is described as if the heart were crushed in a vise. In the cases that Hare has seen the pain in the arm has not been marked, unless suggested to the patient. The facts that the patient is a young female, that the arterial walls are not sclerotic, that there is evidently a neurotic tendency, and, finally, that true angina pectoris is comparatively rare in women, are to be recalled. Thus, true angina pectoris occurred in only 47 women out of 227 cases quoted by Huchard; and, according to Quain, the disease occurs in 80 percent of the cases after 50 years of age. It is true that false angina also occurs in a severe form at the menopause, but here again the character of the pain, the history of the case, and the absence of vascular disease exclude true angina. However, it is not to be forgotten that marked vasomotor disturbances accompany this state. The hands are often very cold and clammy and the skin is generally relaxed. Further, if the aortic sound is normal and not accentuated, the tension low, and the kidneys normal, true angina is to be excluded. The patient may be flushed instead of pale, restless and frightened, or moaning, markedly nervous, while absolute immobility, with an expression of agony and anxiety, is the state in true angina pectoris. Finally, the pain often lasts for some hours, whereas in the true form it is fleeting, as a rule.

Lastly, in connection with these forms of cardiac pain, independent of true cardiac lesions, we must recall the so-called **vasomotor angina** that attacks susceptible persons on exposure to cold, producing a vascular spasm, an increased resistance to the heart, and syncope. The cyanosis and pallor, the contracted arteries and small pulse, all indicate true angina, but no heart-lesions or chronic vascular lesions can be found.

The pain of **mitral stenosis** is not recognized with sufficient frequency. This is because emphasis is not laid upon the constancy of this symptom of valvular disease, and secondary mitral stenosis is a valvular lesion often overlooked; first, because it is not sought so carefully as the more common lesions; second, because it is not so readily heard or differentiated as the others; and, finally—and this fact is very important—the period in which the pain develops is often that of advanced cardiac breakdown, when the action of the heart is so irregular that its sounds are not readily separated, but are confused, and when the auricle is so dilated and feeble that it cannot force the blood through the obstructed orifice with sufficient power to produce a murmur loud enough to be heard above the confused sound, or gallop rhythm, of the heart.

Aortitis is rarely acute; but if so, the pain is exceedingly severe. In the chronic forms it is also somewhat constant and severe, and is characterized by paroxysms. How far these attacks depend upon alterations in the blood supply of the coronary arteries and how far upon a neurosis it is difficult to determine. Such attacks, however,

must be separated from those of true angina pectoris, if possible. This is accomplished in some cases by the presence of more or less constant pain in the aortic area, by the discovery of a constant aortic systolic murmur, indicating aortic roughening, and by the paroxysms involving the upper part of the chest rather than the heart itself.

In **aortic regurgitation** pain may be an early symptom and may actually stimulate angina. Sometimes the pain is mild and constant; in other cases it is paroxysmal; and it often radiates down the arms, particularly the left, as do all severe cardiac pains.

General cardiac dilatation also causes cardiac pain, probably by pressure on surrounding tissues. The diagnosis of this cause of pain is readily made on a physical examination and in association with an injury.

Fatty degeneration of the heart is rarely associated with true pain, the condition being more one of discomfort. So, too, in fibroid heart anginal attacks are not rare.

Angina pectoris is emphatically a disease of the well-to-do, or at least of the class that does not perform manual labor for a living, and it seems peculiarly a disease of professional life, chiefly in medicine and law, or in those persons who are subjected to periods of great nervous strain: as, for example, in financiers. In the lower classes equally marked arterial degeneration ensues, but for some reason high arterial spasm is not so common as in the upper classes, thereby emphasizing the nervous element in these cases. Great caution should be used in making the diagnosis of true angina pectoris. Only when the pain is severe, the patient advanced in years, and the signs of degenerative arterial change are present, should this decision in a given case be reached, and then only after all other causes of cardiac or thoracic pain have been excluded. On the other hand, it is important to recall the fact that the pain of true angina may not be typically cardiac, and may appear to be felt most severely in the epigastrium; and marked gastric disturbance, with belching and vomiting, may be present as a result, in all probability, of a general nerve storm in the pneumogastric filaments; and if such gastric symptoms occur in a woman, a suspicion of hysteria should always be entertained.

The mental anguish, the fixed expression of the face, the slow and feeble pulse, the shallow expectant respirations, the ashy skin and cold sweat, are the symptoms which make the symptom complex of this disease.

Aside from the cardiac pains already named one must recall that of **aortic aneurysm, pericarditis, and pleurisy.** The last of these is readily recognized; the aneurysm is often overlooked because it is not sought, or because, being deeply seated, it cannot be found without the aid of Roentgenography. The pain of aneurysm is often paroxymal, radiates in directions like that of true angina, and the pressure of the growth paralyzes or benumbs nerve-trunks and produces hyperesthetic areas in the skin of the chest.

Further consideration of the symptoms, diagnosis, and treatment of the various causes of cardiac pain is given under the separate headings. See Angina Pectoris, Aorta (Aneurysm), Heart-disease, etc.

HEART-BLOCK.—A form of cardiac arrhythmia characterized by partial or complete *dissociation of the auricular and ventricular systole.* The relation between auricular and ventricular beats may be 2 to 1, 3 to 1, or 4 to 1; or the two cavities may pulsate quite independently of each other. Clinically the condition, which is known as *Stokes-Adams disease* or *syndrome,* manifests itself in *bradycardia* and *periodic syncopal attacks,* with or without convulsions. Secondary symptoms are disturbances of digestion, nausea and vomiting, or both, and of respiration, dyspnea on exertion and, sometimes, Cheyne-Stokes breathing. The pulse rate falls as low as 40 or 30 to the minute, and is not influenced by active movements or change of position; simultaneous jugular and radial tracings show partial or complete dissociation of the auricular and ventricular systole. The syncopal attacks are probably due to cerebral anemia; sometimes the attacks are apoplectiform or epileptiform (cerebral congestion), and an epigastric aura occasionally occurs.

The cause of heart-block is believed by the followers of the myogenic theory of the rhythmic activity of the heart to be a destructive lesion of the *bundle of His,* also known as *Gaskell's bridge,* a bundle of muscular tissue, 18 mm. long, 2.5 mm. broad, and 1.5 mm. thick, extending from the right side of the interauricular septum to the interventricular septum, immediately below the membranous portion. It is the pathway by which the impulse initiating the contraction of the heart is conveyed from the auricle to the ventricle. Others authorities seek the cause of heart-block in a lesion of the pons or medulla, affecting the respiratory and cardioinhibitory centers. Among the pathologic findings in cases of heart-block may be mentioned: gumma; syphilitic ulcer or scar; arteriosclerosis with calcareous nodule compressing the bundle; anemic necrosis; abscess and ulcer of pyogenic origin; tumors and infarcts.

According to the *myogenic theory* the contractions of the heart are originated and maintained by the muscle fibers themselves, as opposed to the neurogenic theory that the heart contracts only in response to stimulation by the cardiac ganglia and the central nervous system. The heart muscle is endowed with the functions of (1) stimulus production; (2) excitability or irritability; (3) conductivity; (4) contractility; and (5) tonicity. Normally the stimulus originates at the *sinoauricular node,* a small bundle of tissue representing the remains of the primitive cardiac tube near the mouth of the superior vena cava, and the term *sinus rhythm* is accordingly used to designate the normal rhythm of the heart, in which auricular and ventricular contractions follow one another in rhythmical sequence. The rhythm may be disturbed, without being altogether abolished, by the occurrence of *extrasystoles, i. e.,* premature contractions of the auricle or ventricle or both, which are

responsible for the ordinary forms of irregularity and especially intermittence. The irregular stimulus initiating the extrasystole usually arises in the *auriculoventricular node* or in the auriculoventricular bundle (bundle of His) and its ramifications, but may arise in other portions of the musculature of either auricle or ventricle; the fundamental sinus rhythm of the heart is, however, maintained. In certain forms of arrhythmia, associated with advanced myocardial degeneration in which the prognosis is grave, ventricular systole precedes, or is synchronous with, the contraction of the auricle, and in such cases it is believed that the impulse originates in the *auriculoventricular node* or *node of Tawara*, an enlargement of the remains of primitive cardiac tissue in the wall of the right auricle, from which the bundle of His arises. This form of cardiac irregularity is called *nodal arrhythmia* or *nodal rhythm*. It has recently been suggested that the term *arrhythmia* be restricted to this type of cardiac irregularity, and that all others be described as *allorrhythmias*.

Treatment should be directed toward the associated conditions. In partial heart-block atropin is said to be of service. In cases of syphilitic origin antisyphilitic treatment should be instituted; and in doubtful cases a Wassermann test should be made.

See Bradycardia.

HEART-BURN.—See Pyrosis.

HEART-DISEASE, FUNCTIONAL (Arrhythmia; Irregular Heart-beat and Pulse-beat).—This subject admits of consideration under a variety of heads. Thus, the cases of arrhythmia, considered in relation to their course, may be (1) *temporary* or (2) *habitual*. In the latter the heart's action may manifest marked irregularity during a period of many years without apparent impairment of the general health. On the other hand, when it is dependent upon obvious organic lesions (mitral affections, cardiac dilatation), it has a graver significance.

Temporary arrhythmia is due to the action of a great variety of causes. It may be evoked by toxic substances, by mechanic embarrassment of the heart's action, by emotional disturbances, and by various reflex causes. Temporary irregularity is, on the whole, more common than the permanent or habitual form of the disorder, and in many cases the irregularity vanishes with the successful removal of the exciting cause or causes. A second classification—more acceptable, because it facilitates an appreciation of the essential elements that enter into the clinical manifestations—is based principally upon irregularity (1) in volume and force as well as wave intervals or (2) in time. The former is spoken of as "*irregularity*," and the latter as "*intermittence*," and the familiar clinical observation that these are often found in association is to be kept in remembrance.

It is further important to remember that there is an irregularity of the heart and another of the pulse; also that trivial irregularities may be shown to exist temporarily in healthy subjects; they are not always appreciable, however, by the ordinary methods of examination, but are readily revealed by the sphygmograph. "Strictly speaking, no pulse is regular, as a time line at the foot of the sphygmographic tracing will prove; if not otherwise influenced, the respiration at any rate disturbs the order, as does muscular effort, even the slightest, especially in nervous or otherwise unstable systems" (Allbutt).

Irregularity in the Volume and Force of the Pulse.—In this variety the pauses between two beats are equal, but the fulness and strength of the beats are unequal. It sometimes happens that a pulse of good volume and strength regularly alternates with one of smaller volume and lesser force—the so-called *pulsus alternans* of Traube. This is a comparatively rare form of arrhythmia, and there is a belief that it is not always a bad augury.

Irregularity in Time.—The simplest form is but an exaggerated degree of the previous variety and is represented by the so-called "**intermittence**," signifying a missed or dropped beat. In the majority of instances this occurs at irregular intervals. On the other hand, there is sometimes noted a regular intermittence, or cyclic irregularity (**allorrhythmia**): *e. g.*, every second, fourth, sixth, or eighth beat being lost. Rhythmic intermittence has been observed in persons with fatty overgrowth associated with more or less fatty degeneration of the heart-muscle, and also in persons taking large doses of digitalis. Moreover, cases are occasionally met in which this form of disorder is purely functional. It is to be noted that intermissions of the pulse may occur when the heart-beats continue in regular succession. This is due to the fact that the cardiac contractions are at times too feeble to propel the blood to the radial artery.

Twin Pulse (Coupled Beat).—The coupled heart-beat is evidenced at the wrist either as a bigeminal pulse or as a false intermission (Claytor). When two beats follow each other quickly (the diastole being shortened), followed by a pause (the diastole being lengthened), we have produced the **pulsus bigeminus.** The first and second beat of each couplet may be of equal volume and strength, but in many cases the second is comparatively feeble. When the second contraction of the ventricle is too feeble to drive the blood-stream to the radials, there is a pseudointermission of the pulse. To distinguish this from true intermittence of the heart-action, direct auscultation of the heart is necessary. The pulsus bigeminus is frequently observed in mitral disease, particularly after compensation is lost. It happens that the heart-beats equal twice the rate of the radial pulse, when every alternate systole of the ventricle fails to produce a radial pulse. With respect to the diastole, the approximated pulsations may be in blocks of three (**pulsus trigeminus**), or even of four (**pulsus quadrigeminus**). Like others, this form of arrhythmia may be unperceived by the patient; it is clear that it often partakes of the nature of the following variety.

Combined Irregularity in Time and Volume.—It would be desirable to distinguish the different

forms of irregularity from one another, but this is not always practicable, particularly in the last stages of valvular affections and in the acute infectious diseases. Symptoms are dependent upon advanced degenerative processes of the heart-muscle and ganglia and the previous forms of arrhythmia are variously combined in different cases. Marked polysarcia may coexist, in which some degree of fatty degeneration of the heart-muscle is also present.

When the pulse becomes feeble, more rapid as well as irregular in volume, strength, and time, instead of stronger with each act of inspiration, it is spoken of as the **pulsus paradox** (Kussmaul). Ordinarily, the heart-beats are stronger during inspiration than during expiration, while in the case of the paradoxic pulse this relationship is reversed. Paradoxic pulse occurs in chronic adhesive pericarditis, in cases of pressure upon the root of the aorta by bands, in pleuropericarditis, and in a very weak heart from any cause.

Delirium Cordis.—When the arrhythmia is extreme and combined with marked rapidity so that the heart falls into a state of absolute disorder, there is said to be *delirium cordis* (Whittaker). The ventricular systole may be so rapid as to be evidenced by mere vibrations (*tremor cordis*). These forms are commonly seen in extreme dilatation of the heart and in advanced exophthalmic goiter.

Embryocardia, or Fetal Heart-rhythm.—The diastole is here shortened, while the first sound of the heart simulates closely that of the second, as in the fetal heart. It is a common concomitant in dilatation of the heart, and it also attends the advanced stages of grave fevers and lobar pneumonia. In the latter disease it is ominous, since it usually indicates oncoming dilatation of the right ventricle

Cantering or Galloping Rhythm (Bruit de Galop).—The sounds are triple, like the footfall of a horse at canter. There is an interpolated second sound, which may be brief and sudden, or it may be dull, and it may occur at any period of the diastole. This interpolated (third) sound, when dull, is generally due to a doubling of the second sound, though rarely it is the first that is duplicated.

Among numerous morbid conditions in which this phenomenon is encountered are: (1) Hypertrophy of the heart, especially hypertrophy of the left ventricle, associated with Bright's disease; (2) dilatation of the heart; (3) these conditions combined, especially when there is adherent pericardium; (4) typhoid fever and some zymotic affections in which myocarditis occurs; (5) some cases of profound anemia and cachexia.

In the instances in which the third or interpolated sound resembles the normal heart-sounds —*i. e.*, brief and sudden—it is probable that, as Potain and others have pointed out, it occurs principally in the absence of pathologic lesions (physiologic reduplication). If one listens to the heart of a patient with an irregular pulse, he will hear either one sound with an intermission or two sounds immediately following the two normal heart-sounds. Wenckebach states that these extra heart-sounds can be considered only as evidence of a systole taking place at an unusual time. If the **extrasystole** occurs in the early portion of diastole, the contraction will be so ineffectual that it will produce but one slight first sound, and will not cause the expulsion of a sufficient amount of blood to give rise to the valvular second tone. If it occurs later, it will be a strong contraction, and will result in two healthy tones. A brief supernumerary sound will also be audible in the course of chronic interstitial nephritis associated with hypertrophy of the heart and general arteriosclerosis. On the other hand, cases have been recorded in which the first as well as the second sound was duplicated (double duplication of the heart-sounds) under conditions of structural disease—*e. g.*, exophthalmic goiter—and rarely in the so-called tobacco heart.

Etiology.—The following is a modification of the etiologic classification of Baumgarten:

Central (Cerebral) Causes.—In organic disease the centers of the pneumogastric and accelerator nerves may be either directly or indirectly (due to pressure) implicated; in which instances the arrhythmia may be temporary or habitual, according to the precise nature of the lesion in different cases; thus, brain tumors, chronic meningitis, abscesses, and the like, may give rise to persistent irregularity of the cardiac rhythm. On the other hand, concussion of the brain, hemorrhage, and even apoplexy may produce a temporary arrhythmia. More commonly, however, arrhythmia is due to psychic influences, although it is to be remembered that emotional disturbances produce, in the majority of cases, occasional or temporary arrhythmia. In melancholia and hypochondriasis it may, however, be of protracted duration. Various other neuroses, including particularly chorea—which may be a choreiform affection of the myocardium—may cause arrhythmia.

Reflex influences, such as produce cardiac irregularity, in dyspepsia and diseases of the liver, lungs, and kidneys. Clinical experience suggests that affections of the gastrointestinal tract furnish the greatest relative proportion of this category, and it is often associated, under these circumstances, with attacks of palpitation. Here may be mentioned the effect of sudden, severe surgical shock. Again, pain—*e. g.*, in hepatic colic—may be so intense as to arrest the action of the heart.

Toxic Influences.—These fall naturally under three groups, the first comprising coffee, tea, alcohol, and tobacco. It is, as a rule, the abuse of these otherwise benign agents that excites arrhythmia. and these poisonings in their more pronouneed forms have been observed to follow excessive indulgence in smoking and in drink. The cause is frequently a composite one, which has to be carefully analyzed. Liebermeister noted that the use of a single cigar, or at most 2 a day, would keep up arrhythmia which had resulted from excessive indulgence. Arrhythmia excited from smoking to excess is usually associated with marked palpitation.

The toxins of the severer forms of acute infec-

tious diseases act poisonously upon the heart-muscle and nerves, inducing arrhythmia (cerebrospinal meningitis, typhus fever, diphtheria, typhoid fever, pneumonia, influenza, etc.). In these affections arrhythmia may arise either during the period of the tachycardia of the acme or during convalescence, and it is of grave significance when associated with feeble cardiac action. It is the characteristic manifestation of tuberculous meningitis in children.

Changes in the Heart Itself.—(1) In the cardiac ganglia: Fatty, pigmentary, and sclerotic changes have been described in cases of arrhythmia, and these may have an important influence in producing disturbances in the rhythm, but as yet we do not know their exact significance. They may be present in cases that have not presented arrhythmia. (2) Mural changes are common in conditions of this kind. Simple dilatation, fatty degeneration, and sclerosis are most commonly present, the latter usually associated with sclerosis of the coronary arteries.

Arrhythmia may occur in the **various dyscrasias** (obesity, gout, syphilis, migraine).

Concerning arrhythmia of the heart in children, Comby and Huebner (whose conclusions are strikingly similar) state that, of whatever origin it may be, the final step in the production is either the action of a toxin on the heart-muscle or nerves, or a reflex disturbance of the innervation.

Symptoms.—In many cases slight, and rarely marked, arrhythmia is discovered accidentally, for the reason that there are no associated symptoms centering about the heart. This is true of certain functional forms and of cases of reflex origin. Arrhythmia is often combined with palpitation, and the presence or history of this serves to excite the attention of the physician, and should lead to a physical examination. It is a matter of common observation, also, that intermittences and irregularities of really serious import often pass unperceived by the patient. Conversely, harmless arrhythmia often attracts the patient's attention and excites great alarm. The feeble heart-action of the acute infections is apt to arrest attention on account of the associated symptom-group.

Physical Signs.—Intermittences and special forms of irregularity are usually detected by combined palpation of the pulse and auscultation. Inspection of the heart may reveal an irregular pulse, but does not, as a rule, give any clue to the precise form of arrhythmia. The results obtainable by palpation of the apex region are sometimes of greater diagnostic importance. Both intermittence and irregularity are evidenced by an alteration of the radial pulse. The examiner should carefully distinguish between irregularity of time only and irregularity of the volume and force of the beat. A good plan is to note first the rate and any irregularity of time (intermittence). This may be the only abnormality, although frequently alteration of the time and irregularity of volume coexist. In the next place one should attempt to estimate carefully the time and degree of deviation from the normal volume and force of the pulse that may be present. To obtain accurate results, sphygmographic and cardiographic tracings are sometimes necessary. Combined auscultation of the heart and palpation of the pulse should never be neglected, since it permits us to differentiate true from false intermittence.

Associated Physical Signs.—These vary within the widest limits, and in given cases the special cause or causes will be found to govern their character. For example, in lobar pneumonia the strength of the right ventricle may become exhausted when there arise the signs of dilatation of this chamber: *i. e.*, of relative tricuspid incompetency. This condition and arrhythmia are often found together. In simple dilatation associated with chronic valvular disease and in fatty degeneration with ensuing dilatation the physical signs may be those of bilateral or unilateral enlargement of the ventricles.

Prognosis.—To estimate the prognostic significance of arrhythmia is sometimes exceedingly difficult. A gentleman with whom Anders was well acquainted was rejected by a leading life insurance company 22 years ago on account of occasional intermittence and irregularity of the heart, although he is still in active business life and manifests great vigor both of mind and body. Osler, in his text-book of medicine, relates that the late Chancellor Ferrier, of McGill University, who died at the age of 87, had an extremely irregular pulse for almost 50 years of his life. Such instances are by no means rare, and, whether temporary or habitual, are to be looked upon as physiologic; but it is one of the most difficult problems in practical medicine to determine the line of demarcation between these and the more numerous cases that have a pathologic basis.

There are cases of mild character, due to gastric disturbances, to constipation attended with flatulence, to mental excitement, and not uncommonly occurring in neurotic subjects, that are not of unfavorable prognosis. In mitral regurgitation irregularity may arise early, and is not incompatible with fair compensation and apparent good health for many years. In mitral stenosis, on the other hand, the existence of marked arrhythmia adds to the gravity of the prognosis. Moreover, an arrhythmia that disappears upon exertion or cardiac stimulation is a not unfavorable sign. On the other hand, one that is aggravated by these agencies is to a like extent unfavorable.

Experience teaches that many forms of arrhythmia are often connected with grave diseases of the heart and other organs, as pointed out under the etiology.

While **prognostic conclusions** are not warranted from the particular forms of arrhythmia, it is found that the delirium cordis is usually met in the advanced stages of dilatation associated with valvular lesions, and hence is of the gravest significance. Embryocardia points to cardiac dilatation, while the pulsus bigeminus and pulsus trigeminus are most often encountered in mitral disease, particularly as an evidence of heart failure. When the myocardium becomes involved (no matter

what the particular complaint), either secondarily to chronic valvular or coronary disease or in association with acute infectious disease, the prospect is gloomy. In general terms, if we except organic lesions of the brain and Bright's disease of the kidneys, the outlook is more favorable when it is due to causes outside of the heart itself. Contrary to what has been stated with reference to arrhythmia in typhoid fever, when this symptom develops after the period of convalescence in diphtheria, it almost invariably heralds a fatal termination. The arrhythmia that not uncommonly occurs in influenza may at times be due to myocarditis, and at others to neuritis; it may lead to a sudden, fatal termination. Again, the irregularity that springs from coronary sclerosis may end life suddenly.

Finally, temporary arrhythmia is, on the whole, a symptom of less danger than the habitual form.

Treatment.—Physiologic arrhythmia, the symptom, without associated symptoms or morbid conditions, requires no treatment apart from methodic, physical training to improve the general systemic development. When due to psychic and reflex influences, and to such toxic substances as tea, alcohol, tobacco, as well as certain drugs, it may be relieved, and even cured, by a removal of the special cause. In purely functional cases in which there is a preponderating neurotic element the subjoined formula has been found useful:

℞.	Iron valerate, Zinc valerate, each,	gr. xxx
	Strychnin sulphate,	gr. j
	Powdered digitalis,	gr. viij.

Make 30 capsules; take 1 after meal-time.

Again, the various neuroses and chronic affections—as gout, Bright's disease—including saturnine poisoning, are to be assailed by the usual measures when arrhythmia develops in their course. The arrhythmia that is dependent upon myocarditis, whether in the acute infectious diseases or in chronic ailments, calls for the use of cardiac stimulants and tonics, while meeting the indications presented by the causative affection.

Among the special stimulants to be mentioned are digitalis, strychnin, strophanthus, nitroglycerin and caffein. The effect of digitalis, particularly when arrhythmia is secondary to chronic valvular disease or the acute infections, is sometimes striking. In a small proportion of cases strophanthus is to be preferred, on account of its happier influence. In either case the remedy employed is to be discontinued when the symptom has vanished. As is stated elsewhere, many cases of marked arrhythmia will not yield to either of these remedies when but one is given; in such, Anders has occasionally obtained good results from digitalis and strophanthus in combination. Evidences of fatty degeneration and atheroma are not contraindications to the use of digitalis and strophanthus, but are signals for the observance of extreme reserve and caution in their use. Anders has frequently proved the therapeutic efficiency of nitroglycerin in cases in which arteriosclerosis was associated. By widening the blood-pass, this remedy tends to diminish the work of the heart.

In extreme cases—often met in the course of acute infectious diseases—time is a paramount element; hence the remedies should be administered hypodermically, and strychnin, in full doses, is the best single agent; it may also be combined with digitalis. Camphor and caffein enjoy an enviable reputation in similar cases. Atropin is said to be useful when the conductivity of the heart fibers is depressed, as in disease of the bundle of His. Brilliant results have followed in arrhythmia after hemorrhage in typhoid fever from the use of intravenous and subcutaneous injection of normal saline solution.

In the lighter chronic forms of the complaint systematic and carefully graduated exercise often serves to strengthen the heart-muscle, and, as a consequence, to overcome the irregularity. In many cases of mild character much can be accomplished also by measures, both hygienic and medicinal, that benefit the general health.

HEART-DISEASE, ORGANIC.

General Remarks on Diagnosis

In order to reach a correct diagnosis in heart affections, etiologic factors, symptoms, and the physical examination must necessarily be taken into account. A knowledge of etiologic conditions is of particular value in acute myocarditis and endocarditis and in chronic affections of the myocardium, for without this aid it might be impossible to differentiate, for example, between a fibroid, a fatty, or a hypertrophic heart. A history of rheumatism or chorea, the presence of an infective disease—such as acute rheumatism, pneumonia, septic pyemia, scarlatina, diphtheria, typhoid, measles, tuberculosis, or gonorrhea—might lead us to suspect an acute lesion. Syphilis, arterial sclerosis, physical and mental overwork, over-indulgence in food or alcohol, would suggest a chronic myocardial, or perhaps a valvular, affection.

Symptoms such as palpitation, precordial distress, dyspnea, general weakness, giddiness, and faintness are common to most cardiac conditions, and consequently are of little value for differential diagnosis, since a serious lesion may exist with but few symptoms, while the most distressing complaints may be present in a mere neurosis. Fainting fits and marked giddiness are, however, more common in aortic insufficiency and mitral stenosis, in consequence of the associated cerebral anemia. Severe precordial pain—one form of angina pectoris—is likely to occur in disease of the coronary vessels and the aortic valves. By far the most valuable information, however, is to be derived from a careful physical examination; educated eyes, fingers and ears are our best assistants.

The points to be looked into are the general facies, the pulse, the shape of the thorax, the position of the apex-beat, abnormal or excessive pulsations, valvular shocks, and the presence of thrills, the area of cardiac dulness, the heart-sounds, associated murmurs, and various complications.

Excessive or persistent **pallor** always calls for an examination of the heart; the face often is dusky and subicteric in hue, or there may be alternate flushings and palings.

Each valvular lesion has a **pulse** peculiar to the pathologic condition present. In mitral leakage the pulse is usually well filled, without peculiarity; in mitral stenosis it is small, badly filled, often irregular and intermittent. The pulsus bigeminus may occur. In aortic regurgitation the pulse is full and bounding, with sudden collapse (water-hammer pulse); in aortic stenosis very slow, thready, and badly filled. A positive (presystolic-systolic) pulsation in the external jugular vein denotes tricuspid insufficiency; a negative one is of no special significance. An arterial pulsation in the liver is sometimes present in aortic regurgitation; a venous one is pathognomonic of tricuspid leakage. Such pulsations should be carefully distinguished from communicated pulsation.

In children, or when the disease has begun in childhood, the **precordium** may be prominent and the intercostal spaces widened, due to hypertrophy.

The apex-beat is more or less dislocated in all cardiac affections, but may be difficult to make out; in such cases if the patient bends forward, it may become palpable. The apical impulse is powerful and heaving in pure hypertrophy and aortic regurgitation; weak in extreme dilatation; diffuse in mitral insufficiency; punctate in mitral stenosis. An increased area of cardiac pulsation is often present in hypertrophy, and if most prominent at the ensiform cartilage and epigastrium, is due to a powerfully acting right ventricle.

Palpation.—In mitral stenosis particularly the closure of the pulmonary valves may be felt as a distinct snap on palpation over the pulmonary cartilage. Palpable thrills are valuable signs of obstructive valvular lesions, but must not be confused with pericardial frictions.

Percussion.—The area of cardiac dulness is increased in pericardial effusions, hypertrophy and dilatation, aneurysms, mediastinal tumors, and retraction of the lung; it is lessened in emphysema and pigeon-breast. The dulness in effusion is usually pear-shaped, with the apex upward, and reaches to the right of the sternum in the fifth interspace. In such a case the apex is dislocated upward and outward, and is within the line of dulness, the heart-sounds being muffled, while the pulse is relatively strong. In dilatation the dull area has rarely a triangular shape, nor does it reach so high without marked pulsation, while the heart-sounds are at first short and snappy. Retraction of the lung, as in fibroid phthisis, may be recognized from other signs of lung involvement. Aneurysms or mediastinal tumors may be excluded from the absence of other distinctive features.

Auscultation.—The heart-sounds may be pure or impure, and may be accompanied or replaced by murmurs. An accentuated aortic second sound is present in high arterial tension from any cause. An accentuated pulmonary sound is due to a hypertrophied right heart. A reduplicated second sound sometimes occurs in mitral stenosis or insufficiency, but it should be remembered that it also occurs normally in children at the end of deep inspiration.

When murmurs are present, one should note the time, the point of greatest intensity, and the line of transmission. It is important, though not always possible, to distinguish a functional (accidental) from an organic murmur. A functional murmur—*e. g.*, in anemia—is heard usually at the pulmonary cartilage, but often at the apex; it is soft, low-pitched and whiffing; systolic; and rarely transmitted so far as an organic one. Differentiation may be impossible, but an unaccentuated pulmonary second sound and a right ventricle of normal size are in favor of functional origin; moreover, the condition is transient. Organic murmurs, as a rule, are loud, blowing, often accompanied by thrills; hypertrophy and dilatation are present and the condition is permanent.

It is often necessary to decide whether a murmur is due to valvular disease or to dilatation of a chamber. If the patient has been under observation this is easy, but later on may be impossible.

Murmurs are systolic, diastolic, or presystolic according to their position in the cardiac cycle. A pericardial friction is of a to-and-fro rubbing character, superficial, inconstant, increases on pressure, not perfectly synchronous with systole and diastole, and eventually disappears; it should not be confounded with an endocardial murmur. It should be observed that in walking the patient up and down a murmur may sometimes be brought out that was previously inaudible. The complications may be general anasarca, effusion into serous sacs, passive congestion of various organs, hemoptysis, albuminuria, or embolism.

Acute Affections of the Heart

These are myocarditis, endocarditis and pericarditis. Etiologically and symptomatically they have much in common. Diagnosis is in general difficult.

Acute Myocarditis.—This is merely an incident in the course of an infective disease, such as acute rheumatism, pneumonia, septicemia, tuberculosis, or typhoid. It is also an almost constant accompaniment of acute pericarditis and endocarditis. Subjective symptoms are generally absent. The condition may be suspected when the heart begins rapidly to dilate, when the pulse becomes more rapid, thready, and irregular, or when the temperature suddenly rises. In rheumatic cases restlessness and delirium may be marked; yet the pulse may run up to 200 and the patient's mind be quite clear. A systolic murmur may be heard at the apex. The condition is more often than not overlooked.

Acute Endocarditis.—The causes and physical signs are those just mentioned; there may be no symptoms. The disease is due to the action of microorganisms, and all grades exist, from a mild inflammation to the so-called "malignant" form. In half the cases the mitral valve is affected, less often the aortic, rarely the tricuspid. The condition may be grafted on a chronic valvular lesion. The pulse is small, rapid, and irregular, and mur-

(*Greene.*)

Dotted lines indicate percussion area (auscultatory).—(*Greene.*)

Dotted lines indicate percussion area (auscultatory).—(*Greene.*)

Dotted lines indicate percussion area (auscultatory.)—(*Greene.*)

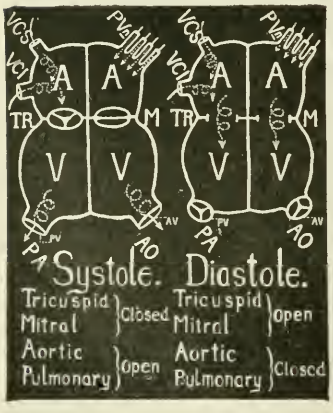
Anemic Murmur.—(*Sansom.*) Coexisting pulmonary and apex murmurs. (Nine percent of cases.)

Anemia.—(*Sansom.*) Murmur over right ventricle and coma. (Eleven percent of cases.)

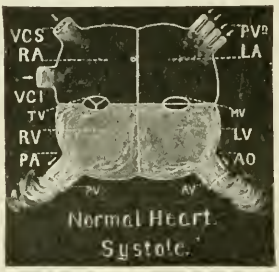
Anemia.—(*Sansom.*) Murmur in aortic area. (Eleven percent of cases.)

Anemia.—(*Sansom.*) Usual site of murmur—pulmonary area. (Fifty-nine percent of cases.)

Anemia.—(*Sansom.*) Systolic apex murmur. (Seven percent of cases.)

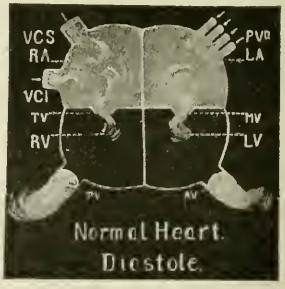


Position of the Valves in Systole and Diastole.—(*Greene.*)



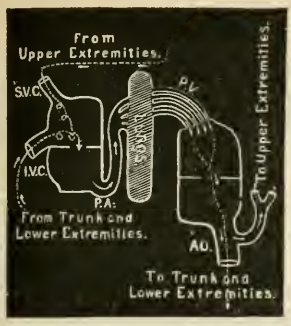
The Normal Heart in Systole.—(*Greene.*)

The full ventricles are contracting, the blood flows freely from them into the pulmonary artery and aorta; the mitral and tricuspid valves are tightly closed; the auricles are refilling.

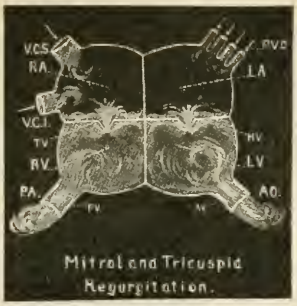


The Normal Heart In Diastole.—(*Greene.*)

The ventricular contraction has ceased, the aortic and pulmonary valves, tightly closed, are shutting off and supporting the blood column; the ventricles are filling from the open mitral and tricuspid orifices above.

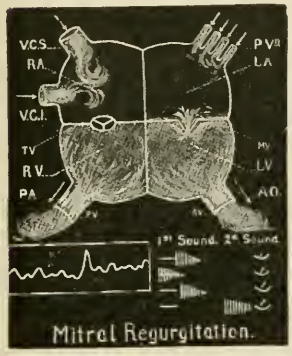


Right and Left Hearts. —(*Greene.*)
S.V.C., I.V.C., Superior and inferior venæ cavæ; P. A., pulmonary artery; P.V., pulmonary vein; AO., aorta.

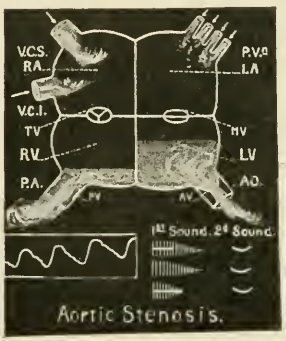


Mitral and Tricuspid Regurgitation.—(*Greene.*)
Heart in systole. Mitral and tricuspid valves both incompetent. *Result.*—Double systolic murmur, enlargement of both right and left chambers, pulsating jugulars, general venous congestion, edema, anasarca, etc.

Mitral Regurgitation. —(*Sansom.*)
Maximum intensity and transmission.



Mitral Regurgitation.—(*Greene.*)
Four varieties of the murmur of mitral regurgitation are shown graphically. The heart in systole, mitral leakage evident. The contracting ventricles are forcing the blood through the open aortic and pulmonary valves; the tricuspid, tightly closed, prevents regurgitation into right auricle. The leaky mitral allows back-flow into the left auricle already filling from the pulmonary veins above. *Results.*—A systolic murmur, dilatation of left auricle, pulmonary congestion, and consequent enlargement of right ventricle.



Aortic Stenosis.—(*Greene.*)
Three varieties of the aortic systolic murmur are represented graphically. Diagrammatic representation of the heart in systole, stenosis of the aortic valve being present; the mitral and tricuspid valves have closed; the right ventricle is nearly empty; the left ventricle is still more than half full of blood, because of the obstruction present at the aortic orifice. *Results.*—A systolic murmur in the aortic area; enlargement of left ventricle, etc.

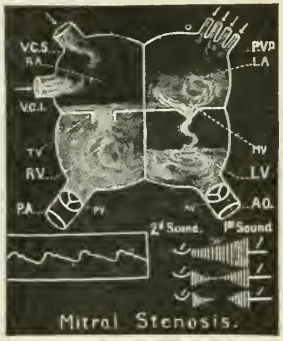
Aortic Stenosis.— (*Greene.*)
Transmission.

Pulmonary Stenosis in Adults.—(*Sansom.*)
Shaded area represents field of maximum intensity.

Pulmonary Stenosis.— (*Greene.*)
Maximum point and direction of transmission.

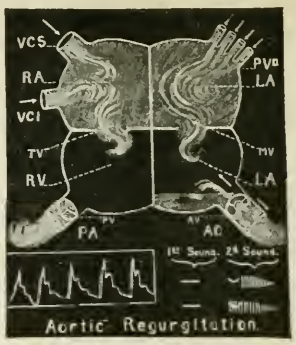
Mitral Stenosis.— (*Sansom-Bramwell.*)
Point of maximum intensity and transmission.

Mitral Stenosis.— (*Sansom.*)
Upper shading, area of audibility of simulated doubling of second sound. Lower shading, area of murmur transmission.



Graphic represention of three varieties of the murmur of mitral obstruction. Heart at moment of auricular contraction immediately before systole (presystole); mitral obstruction evident; aortic and pulmonary valves closed; tricuspid freely opened; *right* auricle nearly empty; right ventricle filled; *left auricle but partly emptied*; *left ventricle barely half full. Result.*—Presystolic or diastolic murmur, dilatation of left auricle, congestion of lungs, consecutive enlargement of right heart.—(*Greene.*)

Aortic Regurgitation. —(*Greene.*) Maximum intensity direction of transmission.



Graphic representation of murmur. Two varieties of aortic diastolic murmur shown graphically. The heart is shown in diastole, aortic leakage being evident. The blood has just been projected into the aorta and pulmonary artery by the ventricular contraction. The pulmonary valve tightly closed maintains the blood column, but through the leaky aortic valve a regurgitant current meets the stream descending from above through the open mitral valve. *Results.*—A diastolic murmur, dilatation, and hypertrophy of left ventricle, a slapping, low-tension pulse.—(*Greene.*)

M.V., mitral valve; T. V., tricuspid valve; A. V., aortic valve; P. V. pulmonary valve; L. A., left auricle; R. A., right auricle; L. V., left ventricle; R. V., right ventricle; V. C. S. vena cava superior; V. C. I., vena cava inferior; P. Vn., pulmonary veins; P. A., pulmary artery; A. O., aorta.

murs are usually present. **Malignant endocarditis** is particularly likely to occur in pneumonia, erysipelas, and infected wounds, and is of two main types: the typhoidal and the septic. The first is marked by grave prostration, erratic pyrexia, delirium or coma, sweating, diarrhea, and skin eruptions. In cases of doubt the blood should be tested for Widal's reaction. The second often sets in with a rigor, followed by high fever. Some cases run a subchronic course, and may simulate a quotidian or a tertian ague. The plasmodium malariæ should then be sought. Other cases simulate cerebral or cerebrospinal meningitis. Cases may be overlooked, as the heart may be negative on examination. Recovery in malignant cases is rare. Emboli may first give the clue to the diagnosis.

Acute Pericarditis.—The etiology is the same as that of acute myocarditis. The inflammation may be primary or secondary. Usually it follows some general infection. It may result from extension of inflammation from a neighboring structure. The resulting changes are similar to inflammation in other serous membranes. These changes present themselves as acute plastic or dry pericarditis or pericarditis with a serofibrinous, hemorrhagic, or purulent effusion. Varying grades of myocardial inflammation are encountered in combination with pericarditis. The disease is characterized by slight fever, precordial distress and pain, disturbed cardiac action and circulation, dry cough and dyspnea. If the effusion becomes purulent, there will be the additional symptoms of sepsis—chills, pallor, irregular fever, sweats, marked leukocytosis. During the first stage of acute pericarditis auscultation reveals excited heart action and usually a rough to-and-fro friction sound, synchronous with the cardiac sounds, uninfluenced by respiration but often increased by pressure with the stethoscope, heard best at the fourth left interspace. Later as the effusion forms, the cardiac sounds are feeble and deep-seated, especially at the apex. As absorption progresses, the friction sound returns, being replaced shortly by the normal heart-sounds. During the effusion stage, the impulse is feeble or absent and when present is considerably displaced. The precordium may bulge. The dulness assumes a triangular shape with the apex upward and base on a line with the sixth or seventh rib. A characteristic sign is dulness in the fifth right interspace (Rotch's sign). Sometimes an area of dulness is found posteriorly below the ninth rib.

Differential Diagnosis.—A loud, persistent murmur, particularly if diastolic or presystolic, is in favor of endocarditis. An unaccentuated pulmonary second sound, while not absolute, is in favor of myocarditis. If endocarditis is present, it is necessary to know whether it is recurrent. If a chronic lesion exists, hypertrophy is of high degree, while in purely acute cases the increase of cardiac dulness is due to dilatation and is never extreme. The harsh friction murmur and signs of effusion are characteristic of pericarditis.

Chronic Affections of the Heart

Those affecting the myocardium are chronic myocarditis, fatty heart, and idiopathic heart

hypertrophy; those affecting the endocardium are chronic endocarditis and atheroma.

Chronic Myocarditis.—More correctly styled "interstitial fibrosis of the myocardium." It rarely supervenes upon a previous acute myocarditis, but generally upon sclerosis of the coronary arteries. This may go on to obliteration of their lumen, and, if sudden, may bring about softening of the heart wall, with aneurysm or rupture. If gradual, formation of scar tissue throughout the organ, with compensatory hypertrophy of the muscle, is the result.

As in other organs, there is considerable reserve power in the heart, and the patient may for years suffer no inconvenience. Symptoms come on insidiously. Upon exertion, dyspnea or palpitation is complained of, and precordial distress, often with weakness and anemia. These may disappear for a time, only to return in greater intensity. The pulse, at first full and powerful, becomes weak, rapid, and irregular; but cases are known in which it only beats 50 or 60 to the minute. It may be bigeminal. As the heart dilates, the area of dulness increases, unless emphysema coexists. A murmur at the apex, if present at all, is due to ventricular dilatation (relative insufficiency). The pulmonary second sound is accentuated if the right heart is hypertrophied. Urgent dyspnea may be present and anginal attacks may be frequent. Vomiting or maniacal fits are not uncommon. The prognosis is always grave.

Chronic Pericarditis.—Adhesive pericarditis is always secondary to an acute attack. The pericardium may bulge and the impulse is more diffused or displaced. Sometimes there is a systolic retraction of the chest-wall. This may be followed by a diastolic collapse of the cervical veins—Friedreich's sign. Broadbent's sign—retraction posteriorly between the eleventh and twelfth ribs—has recently been discredited. Sometimes there is present the pulsus paradoxus (*q. v.*).

Fatty Heart.—This may be due to fatty infiltration or degeneration. The latter occurs in all wasting diseases, Bright's disease, diabetes, and pernicious anemia. The former is a constant accompaniment of general obesity. For years the heart may be adequate and no symptoms be present; eventually all the signs of a chronic myocardial affection set in, and sudden death may occur from syncope or heart rupture. The area of cardiac dulness is increased.

Idiopathic Heart Hypertrophy.—Hypertrophy is often secondary to arteriosclerosis, nephritis, arterial hypoplasia, emphysema, and the like. There is, however, a class of cases—"idiopathic" or primary—where the condition results from overwork, mental anxiety, abuse of alcohol, tea, coffee, or baths. Increased arterial tension is probably the cause in every case. The so-called Munich heart, or "beer-heart," is a type of this condition. The symptoms at first are merely dyspnea and palpitation, but later all signs of cardiac insufficiency set in. The heart-sounds are weak and the apex-beat is weak or absent. The heart dulness may be very extensive.

All the lesions above mentioned are characterized by the same symptoms and physical signs. Differential diagnosis may be difficult or impossible.

Differential Diagnosis.—The points in favor of interstitial fibrosis are arteriosclerosis or late lues, anginal attacks, an unaccentuated pulmonary second sound, and the absence of general obesity.

In favor of fatty heart are presence of wasting diseases; cancer; pernicious anemia; certain poisons, as phosphorus; general obesity.

In favor of simple hypertrophy are abuse of food or alcohol, excess of work or mental strain, increased cardiac dulness, a powerful heaving pulsation, loud heart-sounds, an accentuated aortic second sound, a full pulse, excessive blood-pressure, throbbing carotids, flashes of light, humming in the ears. If the right heart is mainly affected, the pulmonary second sound is accentuated.

In all cases we must exclude a valvular lesion; this is done by a due consideration of the murmurs present. A diastolic murmur is sure evidence of a valvular lesion.

When the cardiac dulness is increased, we must exclude pericardial effusion, aneurysm, mediastinal tumors, sacculated pleuritic exudates, and retraction of the lung. The chief point is in the position and force of the apex. In hypertrophy it is forcibly acting, and corresponds with the outer line of dulness. The history and repeated examinations will, as a rule, differentiate.

Chronic Valvular Lesions

The conditions are *leakage* (*insufficiency*) or *obstruction* (*stenosis*). These are due to sclerotic changes in the valve cusps, resultant from previous inflammatory processes, which lead to loss of substance, fusion of the cusps, stiffness, or puckering, and are often associated with deposition of calcareous material; more rarely the condition is due to atheroma resulting from alcoholism, muscular strain, or syphilis. Aortic insufficiency is especially likely to be of this nature. Such conditions react upon the heart-muscle, bringing about hypertrophy and dilatation of the various chambers. Hypertrophy is compensatory, enabling the heart to meet the increased strain, and while it is in excess, the heart works quite well and compensation is said to be intact.

When dilatation predominates, we get, consequently, lowered arterial pressure, increased venous pressure, with diminished interchange of the body fluids and lessened metabolism. This leads to dyspnea, cyanosis, passive congestion, anasarca, effusions into serous sacs, cough, headache, vertigo, gastrointestinal catarrh, and diminution of urine. Compensation is then said to be ruptured. See below, **Compensation and Incompensation.**

As to the distribution of the lesions, the mitral valve is affected in 58 percent of the cases, the aortic in 36 percent, the tricuspid in 4.33 percent, the pulmonary in 1.66 percent. In old age valvular lesions are more likely to result from degenerative processes, as atheroma.

Mitral Insufficiency.—In these cases blood regurgitates into the left auricle, which consequently

dilates and hypertrophies. An increased amount of blood is forced into the left ventricle, and it also dilates and hypertrophies; eventually all the chambers suffer.

There is diffuse pulsation over the pericardium, and the cardiac dulness is increased both ways. The apical impulse is downward and outward. At the apex can be heard a loud, blowing systolic murmur, either wholly or partially obliterating the first sound, and transmitted well into the axilla, or even into the back. Occasionally, it is quite circumscribed. The pulmonary second sound is accentuated. A systolic thrill at the apex is rare. While compensation is good the pulse is regular, full, and of low tension; later, irregular and small.

Regurgitation without valvular lesion may result from weakening of the heart muscle and loss of the normal sphincter action of the circular fibers around the orifice. This form of regurgitation is temporary and occurs after great muscular fatigue, excitement, or exhaustion. It is to be distinguished from *relative insufficiency*, a condition due to stretching of the orifice along with dilatation of the left ventricle. Relative insufficiency is seen in myocarditis and especially in aortic regurgitation.

The diagnosis of mitral regurgitation is easy, but care must be taken to exclude accidental murmurs due to anemia of simple dilatation.

Mitral Stenosis.—This lesion is generally combined with insufficiency. The cardiac dulness is moderately increased, mainly to the right. The left ventricle, as a rule, is small, and the apex is only moderately dislocated to the left. Epigastric pulsation may be marked. Palpation reveals a presystolic thrill at the apex. This is pathognomonic. The second pulmonic sound is greatly accentuated. At the apex may be heard a rough grating murmur; this is presystolic, increasing rapidly in intensity, to be suddenly cut off at the onset of systole. Rarely the murmur is diastolic. Occasionally, at the onset of diastole may be heard a murmur, then a pause, and finally a short presystolic murmur (Fräntzel's murmur). In the later stages the diastolic sound is sometimes reduplicated—Sansom's double-shock sound. The apical shock is forcible. Gallop rhythm may be present. The pulse is small, badly filled, and irregular. Extreme ascites is not common. Hemoptysis is a common feature. The presystolic murmur alone is not pathognomonic, as it has been heard in cases where at autopsy no mitral lesion was found. When insufficiency is present, a blowing systolic murmur at the apex is heard as well.

Aortic Insufficiency.—Leakage may be due to atheroma, ulceration, or rupture of the cusps. *Cor bovinum* often results, and the condition is sometimes called the "athlete's heart." The cardiac impulse is diffuse; the apical impulse is forcible and heaving, downward and outward. The cardiac dulness is increased relatively more to the left. Pathognomonic is a diastolic murmur at the aortic cartilage or to the left of the sternum at the level of the fourth left costal cartilage (Cabot). This is a long-drawn-out bruit, propagated downward toward the xiphoid or the apex. Generally accompanying it is a systolic murmur. *This rarely indicates aortic stenosis*, since very slight roughening of the valves or the dilatation of the aortic arch, which is usually present, will produce it. Occasionally, at the apex can be heard a rumbling murmur of limited area; sometimes, but not invariably, presystolic (Flint's murmur). The aortic second sound is feeble or absent. The pulse is full and forcible, suddenly falling in tension (collapsing or water-hammer pulse). Capillary pulsation is seen in the nails, and the spleen and liver occasionally pulsate. On drawing the thumb-nail across the forehead, the alternate flushing and paling can be demonstrated readily. On auscultation over the larger peripheral arteries, especially the femoral, a short, sharp systolic sound—the "pistol shot sound" and often a systolic murmur may be heard. Occasionally a diastolic murmur —Duroziez's sign—may also be present. The condition may be unsuspected, and sudden death may occur. Insanity is sometimes associated with this lesion.

Aortic Stenosis.—The rarest, uncomplicated, valvular lesion of the left side of the heart. There exists marked hypertrophy of the left ventricle and the apex is downward and outward. The pulse is slow, hard, and of small volume. At the aortic cartilage is a loud, grating, whistling, or musical murmur, systolic and transmitted up the vessels of the neck. The second aortic sound is absent or greatly diminished—an essential diagnostic sign. At the same region may be felt an intense grating thrill, felt also in the episternal notch. The diagnosis should not be made on the murmur alone, but only when the thrill is present, as a slight roughening of the valves, or dilatation of the arch without stenosis, may cause a loud, rough murmur. When insufficiency is also present, diagnosis may be impossible.

Tricuspid insufficiency is nearly always due to passive dilatation of the right ventricle. The physical signs are characteristic. The cardiac dulness is markedly increased to the right. To the right of the sternum, in the fourth or fifth interspace, is a systolic murmur, transmitted well to the right, together with a systolic thrill in the same region. In the neck is a positive venous pulse; the liver may also pulsate; this must be distinguished from communicated shock. The pulmonary second sound is weak.

Tricuspid stenosis is very rare, generally congenital; cyanosis is marked and the pulse is small. At the pulmonary cartilage is a presystolic or diastolic murmur, and the pulmonary second sound is weak.

Pulmonary insufficiency is rare. Dilatation and hypertrophy of the right ventricle are marked. There is a diastolic murmur at the pulmonary area transmitted down the sternum and a diastolic thrill. There is an interruption of the vesicular breath-sounds during inspiration.

Pulmonary stenosis is congenital. The right heart is hypertrophied; a systolic murmur is heard at the pulmonary cartilage, accompanied by a

systolic thrill. The second pulmonary sound is weak. Tuberculosis of the lungs is likely to occur.

Compensation and Incompensation

The importance of this subject is well expressed by Greene, as follows:

"A clear understanding of these two factors as affecting diagnosis, prognosis, and treatment is absolutely essential, and a lack of it leads to sins of commission no less than omission. Owing to the wonderful interaction of the regulating mechanisms controlling the blood-vessels and the heart, almost every form of heart defect may be so compensated for varying periods as to equalize the circulation and minimize symptoms. A clinician recognizes three distinct phases in the course of any heart lesion: (1) *good compensation*, (2) *impaired compensation*, (3) *lost compensation*. As regards the four chief varieties of valvular lesions, namely, mitral regurgitation or stenosis, and aortic regurgitation or stenosis, *the first stage* may show nothing more than the peculiar murmurs, the characteristic change in the cardiac outline, which indeed may be slight for a long period, and certain characteristics in connection with the pulse or general peripheral circulation. This statement is equally true of certain forms of myocarditis with intermittent *relative valvular* insufficiency and indeed applies to a greater or less extent to all lesions. Sins of commission occur in connection with this stage and consist of meddlesome interference in the way of treatment and the creation of unnecessary alarm through irrational and terrifying statements as to prognosis. *Such hearts need little or no treatment, but do need watching from time to time.*

"(2) **Impaired Compensation.**—This stage is the one most commonly encountered and the sins committed in connection with it are chiefly those of omission due to a failure to recognize and interpret obscure manifestations of the condition.

"In many lesions these symptoms are actually obtrusive; for example, the victim of *aortic regurgitation* complains of dull pain and oppression in the precordium or sharper neuralgic pains radiating to the neck, left shoulder and down the left arm, or he has some subjective or objective dyspnea, attacks of *pronounced* angina pectoris, vertigo, headache, insomnia, probably an increase of the nervous irritability so common in these cases, or signs of secondary mitral lesions may appear.

"*In mitral stenosis* the dyspnea may be marked, especially on exertion, the pulse becomes rapid more markedly irregular and unequal, pulmonary congestion and blood-streaked sputum may be evident, and this may even be reflected in the condition of the kidney, *stomach*, liver and spleen.

"*In mitral regurgitation* much the same symptoms are evident, and if the right heart is markedly weakened or *tricuspid regurgitation* established there is marked diminution of the pulmonary second sound, direct pulsation of the distended jugulars, pulmonary congestion, enlargement of the spleen and liver, indigestion, flatulence and, in short, general, visceral, passive congestion.

"*These symptoms are sufficiently striking and to them are added in any case an extension of the cardiac borders due to a dilatation which may be manifested by the substitution of a weakened heart impulse for that of hypertrophy, and oftentimes by a change in the quality of the murmur.*

"*Edema.*—In *aortic lesions* edema is likely to be absent or slight so long as the mitral holds fast.

Hopeless Incompensation.—(*Greene.*)
Attitude frequently assumed. Triangular area represents superficial cardiac dulness.

In *mitral lesions* edema of the lower extremities *may* be present with even slight degrees of incompensation. In the later stages general anasarca may appear.

"*These are plain, straightforward symptoms, each with its clear meaning, but it is quite otherwise when one deals with the slighter forms of such incompensation* and still more so in relation to the dilatation and slight incompensation associated with *chronic myocarditis;* cases which frequently present no murmur until rest and cardiac stimulants have renewed the tonus of the heart muscle and narrowed the valvular ring.

"**The nervous system** is peculiarly affected in many cases of slight incompensation. *Some of the most typical cases of neurasthenia ever seen by the author have been associated with a silent or almost silent leakage or stenosis of the mitral or aortic valve, and indeed several were associated with unrecognized aortic aneurysm.*

"Nothing is commoner in these cases than nervous irritability, drowsiness or insomnia, lack of concentration and ability to perform sustained mental or physical work, while numbness and tingling of the extremities are frequent. Again and again these cases have been associated with only slight increase of the cardiac area, enfeebled or somewhat fetal heart sounds, and most often, *markedly diminished or absent mitral first sound.*

"**The skin** may be the seat of persistent pruritus or eczema and very often a very slight grade of edema may be present, limited usually to the lower extremities, bilateral and often most marked over the surface of the tibia.

"**The Lungs.**—Persistent dry cough, slight or even marked congestion of the bases, asthmatic seizures, diffuse bronchitis, moderate grades of

emphysema and persistent pharyngitis and laryngitis may divert attention from an underlying incompensation, which is either causative, or a factor in the severity and continuance of pulmonary symptoms.

"**The Gastrointestinal Tract.**—Indigestion and persistent constipation together with recurrent attacks of acute gastric and hepatic disturbance and hemorrhoids are frequently associated with inefficient heart action.

"The author firmly believes that many of the results obtained by the rest cure in neurasthenia may be attributed to the good effect upon the *stomach and heart with the resulting improvement in nutrition.* Certainly under mental and physical rest all of the symptoms described promptly disappear in all minor degrees of incompensation.

"(3) **Complete Incompensation.**—*This term should be applied to those cases in which the heart muscle has completely lost its recuperative quality* as is seen in the terminal stages of all chronic heart affections that terminate gradually, or by sudden though not immediately fatal rupture of compensation. The best examples are seen in terminal cases of coronary sclerosis, fatty heart and chronic myocarditis in general. So also in mitral lesions there comes a time when the heart that has alone or with assistance again and again recovered itself finally yields and resists all therapeutic measures. In such terminal and *irrecoverable* cases the orthopneic patient often rolls the head aimlessly from side to side and wears a peculiarly listless yet distressed and hopeless expression. The term is frequently erroneously applied to cases of very marked and extreme cardiac weakness and especially to that of mitral regurgitation or stenosis associated with secondary tricuspid leakage and general anasarca.

"*In mitral regurgitation especially, the assumption of terminal incompensation is seldom justified as a primary assumption, for there is no cardiac lesion in which proper treatment can do so much, however extreme may be the manifestations.* Indeed in the case of all heart lesions it is only after trying and failing that surrender is justifiable on the part of the physician.

"**Relative Insufficiencies.**—The secondary dilatation of the valvular rings, such as occurs in the tricuspid following prolonged mitral lesion or as a result of myocarditis and severe physical strain, or in the mitral as secondary to aortic lesions, chronic myocarditis or the terminal stage of an interstitial nephritis the prognosis is variable. In such cases under proper treatment the tricuspid usually recovers its function in whole or in part, as does the mitral to a less degree and with less constancy. *The left heart cases associated with sudden rupture* of compensation *through severe strain do badly if the myocardium is not sound, and often terminate quickly and fatally.* So also the mitral insufficiency so often encountered in chronic interstitial nephritis will not respond to treatment with anything like the promptness usually noted in connection with this valvular lesion, and, moreover, the patients of this type are often irritable, restless, difficult to control and quite unlike the ordinary phlegmatic, cheerful mitral-regurgitant patient."

Prognosis of Valvular Lesions.—While compensation is maintained and the patient can and will live quietly, life may be of long lease. In children the outlook is usually bad. Pregnancy has not the prejudicial effect upon the heart-lesion that has usually been taught. Aortic stenosis is the most favorable; next, mitral insufficiency. Worst of all is aortic insufficiency. Stenosis, when accompanying mitral insufficiency, has a somewhat compensating effect.

The following factors make the prognosis more grave: (1) Early life, (2) female sex, (3) old age, (4) lost compensation (indicated by irregularity of pulse, dyspnea, etc.), (5) nephritis, (6) cirrhosis of the liver, (7) diseases of the lungs.

Sudden death from heart-disease is somewhat uncommon. The following conditions may produce it: (1) **Aortic regurgitation.** With this form of cardiac disease death is sure to result sooner or later. One writer has never seen any such patients improve much under any form of treatment, excepting those in whom the disease was dependent on syphilis. With this form of cardiac trouble the patient not only gradually grows worse, but he may drop dead at any moment, and the mode of this death has never been satisfactorily explained. The best explanation that can be given is that the left ventricle becomes more and more enlarged, until we get what is known as the *cor bovinum*, or ox heart, and in some of these cases there will be pressure on the coronary vessels that feed the heart; the patient then dies of anemia of the heart, very much as in angina pectoris. In fact, aortic regurgitation is not infrequently associated with attacks of angina, due to this pressure on the coronary vessels. (2) **Angina pectoris.** A patient with this affection may die in the first attack, or he may survive a dozen or more attacks. With the more recent methods of treatment, the mortality from this disease has been considerably reduced. (3) **Fatty heart,** or fatty metamorphosis of the muscular structures of the heart. This process may go on until the time comes when the heart simply ceases to beat. (4) **Cardiac aneurysm.** In these cases the ventricular wall becomes thinner and thinner until rupture and sudden death occur.

Treatment of Organic Heart-disease

The treatment of acute endocarditis and myocarditis practically resolves itself into the treatment of the primary systemic condition. The danger is not so much from the acute process as from the chronic changes that result and the effects of which are to be of concern in future time. When a rheumatic poison is present, it is questionable if the exhibition of salicylates will prevent endocarditis. It is probable, however, that if the rheumatic attack is cut short, the liability is diminished. In such cases salicylates should be given in 20-grain doses every 2 hours until 2 drams are given, and then gradually diminished until the patient is taking 1 dram a day. This should be kept up for from 2 to 3 weeks or longer. When convalescence

sets in, iron or arsenic is indicated. This treatment is usually very efficacious. Digitalis is rarely of use. Light diet and absolute rest in a recumbent position are imperative. It is of the utmost importance that the patient should not get up too soon, a fault which is liable to occur under the salicylate treatment, since the severe symptoms pass off so quickly. If endocarditis is present, too early a return to activity is extremely pernicious, and increases the subsequent trouble. Patients should usually be 6 weeks in bed, and should be regarded as invalids for at least 3 months longer. Many years may be added to life by adherence to this principle.

The treatment of malignant endocarditis is that of septicemia. If a clear streptococcus infection is made out, antistreptococcus serum may be employed and free stimulation.

The treatment of pericarditis should be prompt. Absolute rest in bed is imperative. It is well to give calomel. A large blister is especially valuable. Cold compresses or the ice-bag should be usually applied, though sometimes heat is more comforting. For the relief of pain, morphin (1/4 grain) with atropin (1/150 grain) should be administered hypodermically. Stimulants such as digitalis, alcohol, aromatic spirit of ammonia and strychnin, are indicated. If the effusion is large, the pericardium should be tapped in the fourth left interspace 1 inch from the sternum. In purulent effusion, free incision followed by drainage is indicated. The treatment of chronic pericarditis is largely symptomatic, tonics and stimulants being of great importance.

The treatment of the chronic affections, both myocardial and valvular, will vary according as compensation is perfect or ruptured.

During the compensation stage it is to be remembered at the onset that drugs are unnecessary, if not actually deleterious. A patient with a chronic lesion should obey rigidly all the laws of hygiene. Excesses in food, exercise, and mental and physical toil should be avoided; alcohol and tobacco should not be used. As such persons are very liable to "take cold," they should avoid extremes of temperature, getting wet, or sitting in drafts, and should always wear flannel next the skin. A morning cool or tepid bath is advisable. Plethoric or obese persons should take an occasional saline purge, and if arterial tension is high, an occasional course of potassium iodid is advisable. A sojourn in an equable climate during inclement seasons is to be recommended.

In recent years, owing to the influence of Schott, of Nauheim, massage, resisted movements, together with dieting and the use of carbonated saline baths, have come into prominence as curative agencies. The graduated walking exercises of Oertel are not now so frequently employed, but may be commended as a sequel to the Schott method. The so-called Swedish movements are somewhat similar to those of Schott, and were introduced by Zander in 1872.

After much debate it seems to be settled that within certain limits the mechanic treatment is a valuable adjunct to other methods; its use, like that of drugs, must be intelligent and guarded, and only applied to certain cases; otherwise much harm may result. The contraindications are: All acute conditions; advanced arteriosclerosis, especially if associated with intestinal nephritis; aneurysm and cardiac neuroses. It should be employed with care when there is any reason to suspect coronary changes and in early rupture of compensation. Gymnastics should be avoided for at least 6 months after an acute attack of endocarditis. Massage is particularly suitable for those convalescing from acute endocarditis,

DIFFERENTIAL DIAGNOSIS OF ORGANIC HEART-DISEASES

Disease.	Heart Dulness.	Heart-sounds.	Pulsation.	Apical Impulse.	Murmurs.	Thrills.	Pulse.	Arterial or Venous Phenomena.
Pericarditis...	Pyriform area of dulness.	May be distant.	.....	Within area of dulness; often weak or absent.	Friction rub at first; occasionally a presystolic murmur at apex.	.....	Strong in proportion to heart-sounds and impulse.	Venous congestion.
Acute myocarditis.	Increased.	Clean or with murmurs; pulmonary second sound often not increased.	.....	Weak.	When present often intermittent.	.....	Small, frequent, and arrhythmic.	.....
Chronic myocarditis.	Variable.	Weak; pulmonary second sound often not increased.	.....	Weak.	May be present; intermittent.	.....	Small, frequent, and arrhythmic; at first may be slow and full.	.....
Fatty heart...	Increased.	Weak, but clean; pulmonary second sound variable.	.....	Weak or absent.	.....	.....	Small, rapid, and arrhythmic.	Pseudo-apoplectic attacks.

DIFFERENTIAL DIAGNOSIS OF ORGANIC HEART-DISEASES

Disease.	Heart Dulness.	Heart-sounds.	Pulsation.	Apical Impulse.	Murmurs.	Thrills.	Pulse.	Arterial or Venous Phenomena.
Idiopathic hypertrophy of heart.	Increased.	Loud; aortic second sound increased; pulmonary second sound may be increased; gallop rhythm.	Often marked epigastric pulsation.	Powerful, diffuse, heaving.	.....	.....	Large and full.	Pulsation in carotids; flushings.
Acute endocarditis.	Slightly increased, due to dilatation.	Pulmonary second sound accentuated.	.....	Dislocated to left.	Systolic; rarely diastolic at apex; or diastolic—rarely a systolic—at aortic cartilage.	.....	Febrile.	.....
Mitral insufficiency.	Increased: at first, mainly to left; later to right.	Present or obscured; pulmonary second sound accentuated.	Diffuse pulsation over precordium.	Diffuse; apex down and out.	Blowing systolic murmur, loudest at apex; transmitted into axilla.	Often a systolic thrill at apex.	At first normal; later small and irregular.	.....
Mitral stenosis	Increased, mainly to right.	Pulmonary second sound accentuated, often reduplicated; first sound often loud.	Area of pulsation increased; epigastric pulsation.	A little dislocated to the left and punctate.	Presystolic at apex: harsh and grating; rarely diastolic and presystolic.	Presystolic thrill felt toward apex.	Very small, rapid, and irregular.	.....
Aortic insufficiency.	Increased, mainly to left at first.	Weak first sound at apex; second aortic feeble or absent.	Pulsation in left axillary line.	Heaving, forcible, well down and out.	A long blowing, diastolic murmur at aortic cartilage; seldom at apex; a systolic murmur may be present at base.	A diastolic thrill may be felt at base.	Quick, vigorous full, and collapsing capillary pulse.	Systolic shock heard in brachials, radials, and crurals, or to-and-fro murmurs; sometimes double shocks in vessels.
Aortic stenosis.	Marked increase to left.	Aortic second sound is weak, or absent.	.....	Downward and outward.	Systolic murmur at aortic region, loud, sustained, singing, or whistling; transmitted up vessels of neck	Systolic thrill in aortic region and in suprasternal notch.	Slow, badly filled; vessel hard.	Anemia in arterial tract.
Tr cuspid insufficiency.	Marked increase to right.	Pulmonary second sound not increased.	Epigastric.	.....	Systolic at right sternal border at 4th and 5th ribs; transmitted well to right.	Systolic thrill may be present in same region.	.....	Positive venous pulse in neck: pulsating liver.
Tricuspid stenosis.	Increased to right.	Pulmonary second sound weak.	.....	.....	Presystolic or diastolic over tricuspid region.	.....	Small.....	Negative venous pulse in neck.
Pulmonary insufficiency.	Increased to right.	.....	.....	Moderate dislocation to left.	Diastolic at second left intercostal space; not heard in neck.	Diastolic thrill at base.	.....	Interrupted inspiratory breath-sounds—Gerhardt's sign.
Pulmonary stenosis.	Increased to right.	Pulmonary second sound weak.	.....	.....	Systolic at second left intercostal space.	Systolic at base.	.....	Marked cyanosis; tendency to hemorrhages.

when there is a tendency to lividity, cold extremities, and local stases, or when the bodily weakness is extreme. Massage promotes the arterial flow, the venous return, and the interchange of lymph, thus stimulating metabolism and assisting absorption and circulation. It may be used as a preliminary to the more active treatment by the Schott or Oertel methods.

The Nauheim or Schott treatment consists in systematically exercising every set of muscles in the body by means of resistance exerted by attendants or by overcoming weights; every gradation in the power exerted can thus be obtained. These exercises are used alone or in conjunction with the use of saline baths saturated with carbon dioxid.

According to Schott, the periodic stimulation of the heart increases its action, and, as a consequence, the cardiac muscle regains some of its natural power, and its nutrition and tone are improved. He also thinks that dilatation is diminished, the pulse improved, and dyspnea alleviated, and that the effects of the baths and of mechanic treatment are very similar. They are supposed to produce their effect largely by a reflex stimulation of the cardiac centers.

It has been doubted by many—especially by Groedel, Guntz, and Leyden—that diminution of the cardiac dulness is a consequence of this treatment. Schott has exhibited a series of skiagraphs of the heart, taken before and after treatment, and it can scarcely now be doubted that his contention is correct; the evidence seems conclusive.

The effect, then, seems to be a more vigorous heart-action, a more complete systole, and a more rapid and perfect circulation, with consequent lessened tension upon the right side of the heart. In a measure the treatment also indicates the reserve power in the heart, and to what extent a return to ordinary habits of life may be permitted. The Schott treatment is of chief value in moderate degrees of fibroid heart, the idiopathic hypertrophy, or when there is fatty infiltration. For those who may not be able to afford a trip to Nauheim, a bath may be employed containing 2 percent of chlorid of sodium to which is added sodium bicarbonate and hydrochloric acid. It would seem that the presence of CO_2 is more important than the salt. See SCHOTT TREATMENT.

Oertel's method is more exacting. It consists, in brief, of a dry diet, avoidance of fats and starches, and graduating walking-exercises. Fluids are cut down to 36 ounces a day. The reduction in fluids tends to reduce the fat in the patient and to concentrate the blood. The diet should be highly nitrogenous. Walks should be taken on the level and then on slight inclines until considerable heights are climbed. The exercise may be slightly prolonged each day. It should be pursued short of extreme dyspnea and until a healthy action of the skin is induced. The effect is much the same as that of the Schott method. The advantage is that one gets the stimulating effects of outdoor exercise. Powell thinks that carefully regulated outdoor sports—as golf, cycling, tennis, fishing, and the like—may be advantageously substituted.

When compensation is on the verge of rupture, rest is indicated. Patients who present dyspnea with slight lividity and cough, with slight edema of ankles and a rapid and irregular pulse, should be confined to bed on a restricted diet. This alone in many cases will restore compensation. Sometimes iron, arsenic, or strychnin, with general tonic measures, may be advisable. The use of digitalis should, as a rule, be reserved for the severer cases of ruptured compensation. In cases of acute heart failure reliance should not be placed on digitalis, as it takes about 3 days to exert its action, and time is precious. Hypodermics of ether, alcohol, camphor, or strychnin must be relied on until the danger is over and the ordinary heart tonics can get time to act. Inhalations of oxygen are of great value.

When compensation is completely ruptured, either in myocardial or valvular affections, some one of the class of heart stimulants—digitalis, strophanthus, caffein—is to be employed. Spartein and convallarin are rarely of use. Of this group, digitalis is by far the most valuable. Its action is to slow the heart, producing more forcible and complete contraction, prolonging diastole, and later contracting the arterioles, thus raising blood-pressure. When there is a weak and irregular systole, with venous stasis and low tension pulse, precisely these qualities are called for; since the irregular beats are gathered up into more effective contractions, the interchange of fluids in the tissues is promoted, and more time is given for the due performance of function.

Strophanthus differs in that it has no effect upon the arterioles, and hence is indicated when vascular tension is high. It is difficult to get a satisfactory preparation. To relieve tension potassium iodid may be prescribed with digitalis.

Caffein causes more rapid action of the heart, and so may be of value in those cases of myocarditis in which the pulse is very slow and the use of digitalis risky.

In mitral stenosis the first weakness is on the side of the right heart, and this at first may be relieved by rest, exhibition of saline purges or diuretics, or even by blood-letting, with restricted diet. If the pulse remains weak and irregular, and other signs of venous stasis do not improve, digitalis is to be used.

In mitral regurgitations are all the conditions for the most advantageous effects of digitalis. In cases, however, of relative insufficiency of the mitral from arterial tension, the condition is compensatory, and digitalis would be of doubtful benefit. In aortic regurgitation it might be doubted whether digitalis would be indicated, since it lengthens diastole, and therefore, theoretically, should not be used. Practically, however, its use is advisable, though we cannot expect as beneficial results as in the case of mitral lesions.

When the breakdown is due to some temporary over-strain—as a dyspeptic, nervous, or gouty attack—attention should be directed to reducing tension by mercurials and salines or the nitrite group, digitalis being reserved until later. Digi-

talis in this condition prevents accumulation of residual blood in the ventricle, and promotes the effective closure of the mitral cusps, and thus is advantageous. It may be given as the tincture, 15 to 20 minims 3 times a day, gradually increased to 90 minims. Signs of saturation—as returning rapidity of pulse, vomiting, or green vision—should be watched for. It is often more effective as the infusion, of which an ounce, freshly made, may be given hot twice a day.

℞. Tincture of digitalis, Simple elixir, each, ʒ iv
Water, q. s. ℥ iij.

One teaspoonful every 4 hours.

℞. Strychnin sulphate, gr. j
Tincture of strophanthus, Elixir curacoa, each, ʒ iv
Water, q.s. ʒ iv.

One teaspoonful every 4 hours.

℞. Citrated caffein, ʒ j
Tincture of digitalis, ʒ ij
Aromatic elixir, ʒ iv
Water, q. s. ℥ iij.

Two teaspoonfuls every 4 hours.

℞. Citrated caffein, ʒ j
Tincture of strophanthus, ʒ jss
Elixir of curacoa, ʒ iij
Water, q. s. ℥ iij.

Two teaspoonfuls every 4 hours.

Anemia:

℞. Strychnin sulphate, gr. j
Reduced iron, ʒ j.

Make 30 pills; 1 pill after meals.

℞. Strychnin sulphate. gr. j
Tincture of iron chlorid, ʒ ij
Aromatic elixir, ʒ iv
Water, enough to make ʒ iv.

One teaspoonful after meals.

Dyspnea.—If hydrothorax is the cause, tap the chest. Morphin in other cases is of much value used freely; if arterial tension is high, nitroglycerin, beginning with 1 minim of a 1 percent solution. A back-rest should be used.

Dropsy.—This often disappears under the action of digitalis. If action is tardy, saline purges or diuretics are advisable. Of great value is the so-called Guy's pill (pulverized digitalis, 1 grain; pulverized scilla, 1 grain; and blue mass or calomel, 1 grain). This often has a miraculous power over effusions. Southey's tubes are occasionally useful.

The Matthew Hay plan is of value. This consists in a restriction of fluids, a dry diet, and the administration of 1/2 of an ounce of Epsom salts before breakfast. The compound jalap power (20 to 30 grains) may be given once or twice daily in place of the salts. Calomel (1/4 of a grain) may be given also until 4 or 5 doses have been taken, followed the next day by 1/2 of an ounce of Epsom salts.

Palpitation.—A Leiter's coil or ice bag over the heart is useful.

Vomiting.—If extreme, stop food and give ice, iced milk, or champagne.

Insomnia.—Spirit of chloroform or ether may be tried; paraldehyd, sulphonal, or trional, and, lastly, morphin.

Syncope.—The aromatic spirit of ammonia (30 drops) may be given every half hour for 2 or 3 doses. One or two drops of the 1 percent solution of nitroglycerin may also be given every 2 or 3 hours by the mouth or 1/100 of a grain hypodermically. Inhalations of nitrite of amyl or of ammonia often prove valuable.

The signs of improvement under digitalis are the steady and slowing of the pulse, diminution of dropsy and lividity, and increase in the flow of urine. It should not be expected that a return to a normal pulse condition will result, since it may be said that there is a certain pulse character to each kind of lesion, and if this character is restored, that is all that can be expected. As a rule, when once patients have taken digitalis, its use must be continued.

HEAT-STROKE. Synonyms.—Insolation; sunstroke; thermic fever; coup de soleil; heat-exhaustion.

Definition.—A depression of the vital powers, the result of exposure to excessive heat. The condition manifests itself as acute meningitis (rare), heat-exhaustion (common), and as true sunstroke.

Etiology.—Exposure to the prolonged influence of excessive heat, either to the direct rays of the sun, to artificial heat in confined quarters, or to diffused atmospheric heat without proper ventilation. Heat cases are most numerous after a protracted period of excessively hot weather.

Among the predisposing causes which act by lessening the power of the system to resist the heat are great bodily fatigue, overcrowding, intemperance, and humidity of the atmosphere.

Differential Diagnosis.—It is of great importance, therapeutically, to distinguish at once between attacks of *sunstroke* and *heat-exhaustion*. Sunstroke is to be differentiated from cerebral hemorrhage and alcoholic insensibility, for which purpose the clinical thermometer is indispensable. See Coma.

Heat-exhaustion develops with a rapid feeling of weakness and prostration; the surface is cool, the face pale, the voice weak, the pulse rapid and feeble; the respiration is increased, the vision grows dim and indistinct, noises develop in the ears; painful muscular spasms are common; the individual is overcome, and is partially or completely unconscious. In some cases the attack of prostration is sudden, the person falling unconscious, with perhaps convulsions or tremors, and shrunken features.

Sunstroke.—The symptoms, developing suddenly, with or without prodromes, are insensibility with or without delirium, or convulsions, or paralysis; the surface is flushed and hot, the conjunctivæ injected, the breathing either rapid and shallow or labored and stertorous, the pulse quick and either bounding or weak, and the temperature in the axilla ranges from 105° to 110°, with suppression of all glandular action. Death occurs as

the result of asphyxia, or from a slow failure of respiration and cardiac action.

Prognosis in attacks of heat-exhaustion, if properly and promptly treated, is favorable. In sunstroke or heat fever it is unfavorable in the majority of cases, death resulting in from half an hour to several hours. Unfavorable indications are excessive body-temperature, cardiac failure, convulsions, absent reflexes, followed by complete muscular relaxations. Favorable indications are decline in surface heat and axillary or rectal temperature, stronger pulse, increased depth of respirations, restored reflexes, and return of consciousness.

After-effects.—The most constant after-effect of sunstroke is a permanent inability to bear high temperatures. When the thermometer reaches as high as 80° F. in the shade, patients become very uneasy. More constant and more troublesome is the loss of the power of mental concentration and failure of the memory. Hot weather always makes such patients worse. Convulsions and mental disturbances are likely to develop. Peripheral neuritis has been recorded as an after-effect, and acute neuritis is also mentioned.

Treatment of Heat-exhaustion.—These cases are successfully treated by placing the patient in the recumbent position, with the head low, and the use of stimulants and external heat. If able to swallow, administer at once brandy (1/2 to 1 ounce) with deodorized tincture of opium (20 to 30 minims), to be repeated p. r. n.; if he is unable to swallow, the remedies may be thrown into the rectum, or whisky, strychnin, and tincture of digitalis may be used hypodermically. As convalescence occurs, tonic doses of quinin sulphate and strychnin sulphate should be prescribed.

Treatment of Sunstroke.—The indications for treatment are the reverse of the foregoing. The patient is in imminent danger from the extraordinary temperature, and measures to reduce it must at once be instituted. Of these, none give such excellent results as rubbing with ice, or by the cold bath or cold pack, and cold effusions, cold enemata, and the hypodermic use of quinin sulphate or antipyrin. The tendency to subsequent rise of temperature is met by wrapping the patient in a wet sheet, or by the repetition of the hypodermics mentioned if consciousness has not been regained; in which case the remedies may be given by the mouth. If convulsions and restlessness occur, the hypodermic use of morphin sulphate (1/4 to 1/2 of a grain), cautiously repeated, is successful. If symptoms of depression occur, the stomachic, rectal, or hypodermic administration of stimulants is indicated, and strychnin sulphate, 1/24 of a grain, repeated half hourly by the hypodermic method. For convalescence, use quinin sulphate, strychnin sulphate, or iron.

HECTIC FEVER.—This is a common accompaniment of prolonged suppuration, from whatever cause, when the wound cannot be kept aseptic and efficiently drained. It has been ascribed to the drain on the system owing to the formation of large quantities of pus; but this is certainly not the only cause, as a chronic abscess may attain a very large size, and exist for years unattended by hectic fever, so long as it remains unopened; nor after opening does it occur if the pus can be prevented from undergoing fermentative or putrefactive changes, and the cavity can be well drained. It would, therefore, appear to be due to chronic blood-poisoning, consequent upon the absorption of the products of fermentation or putrefaction in small quantities at a time.

Symptoms.—Hectic fever is characterized by profuse sweating, rapid wasting, nocturnal rises of temperature with morning remissions, and generally by diarrhea and deposits of urates in the urine. The face is pale and pinched, the cheeks flushed, the eyes bright, the pupils dilated, the tongue red and dry at the edges, and the pulse rapid, small, and weak. The appetite gradually fails, the patient becomes weaker and weaker, and dies, exhausted, of diarrhea, lardaceous disease, etc.

Treatment.—The cause of the suppuration should be removed, or, if this is impossible, the absorption of septic products, so far as practicable, should be controlled by establishing a free drain to the suppurating cavity and by preventing, by the use of antiseptics, the putrefaction of the discharges. At the same time the system must be supported by nourishing diet and stimulants, the sweating combated by dilute sulphuric acid or atropin, and the diarrhea by opium, catechu, or other astringents. See SUPPURATION, TUBERCULOSIS.

HEDEOMA.—The dried leaves and flowering tops of *Hedeoma pulegioides*, Pennyroyal. Dose 1 to 3 drams. Hedeoma is a stimulant aromatic, also somewhat carminative and emmenagogue. Its odor is extremely repulsive to insects, especially fleas and mosquitos. In warm infusion it is a popular remedy for amenorrhea and flatulent colic. It may be used as a corrective with other medicines, and the spirit is well employed on the hands and face to keep away mosquitos. Death by narcosis has been known to result from an overdose of the oil taken to produce abortion.

Oleum H., *oil of pennyroyal*, is the volatile oil, readily soluble in alcohol. Dose, 1 to 5 minims.

HEDONAL.—A urethane having a more pronounced hypnotic action than ethyl carbamate. It is considered safer than most of its class and leaves no after-effects. Dose, 15 to 30 grains.

HELIOTHERAPY.—See BURNS, LUPUS VULGARIS, PHOTOTHERAPY.

HELMITOL.—The methylene-citronate of urotropin. A urinary antiseptic and germicide. It is said to act more rapidly and energetically than urotropin. Dose, 10 to 15 grains.

HEMATEMESIS.—Hemorrhage from the stomach.

Etiology.—(1) Traumatism; (2) mechanic obstruction, as in cirrhosis of the liver; (3) cardiac disease; (4) pulmonary disease; (5) vicarious menstruation; (6) rupture of an aneurysm; (7) ulcer of the stomach; (8) cancer of the stomach; (9) irritant poisons; (10) hysteria.

Diagnosis.—It is to be distinguished from hemorrhage from the respiratory passages. See HEMOPTYSIS.

Treatment requires absolute rest in bed; rectal alimentation, as advised for ulcer of stomach; an ice-bag or ice-cloths to the epigastric region; and hypodermics of ergotol (20 minims) with morphin (1/4 of a grain). Medicines by the mouth should be avoided for several days. The transfusion of blood may be tried in severe cases. See STOMACH.

HEMATICS.—Medicines which augment the quantity of hematin in the blood by enriching its red corpuscles. They consist chiefly of iron and manganese and their compounds.

HEMATIDROSIS.—Bloody sweat caused by the extravasation of blood into the coils and ducts of the sweat-glands, whence it is carried to the surface, mixed with sweat. See SWEAT-GLANDS.

HEMATOCELE.—A swelling occasioned by effusion of blood into the pelvis or into the sac of the tunica vaginalis, or into a cyst connected with the testicle, or into the spermatic cord.

Pelvic hematocele may be intraperitoneal or extraperitoneal. It differs from hematoma in that the bleeding is into the connective tissue, while in hematocele it is effused into the pelvic cavity. An intraperitoneal effusion of blood usually gravitates into Douglas' pouch, and is spoken of as retrouterine hematocele. It may arise from rupture of a vein in the broad ligament, which is rare, and there are no definite symptoms preceding the rupture whence its cause may be inferred. Inflammation of any serous membrane may result in hematocele, or the rupture of an ovary may cause it. It may be due to rupture of a Fallopian tube, or it may follow bleeding from the tubes, as a result of fever, phosphorus poisoning, scurvy, atrophy of the liver, and yellow fever. It may follow abortion or delivery, more often the latter; or it may result from menstrual retention from atresia, stenosis, hypertrophy, or flexions of the cervix, or closure of the tubes at their uterine ends.

The usual course of pelvic hematocele, when reaction from the immediate shock of hemorrhage ensues, is to complete recovery by absorption of the effused blood, and no treatment other than expectant is to be given. Rest in bed, while there is any pain or fever; tonics, if the appetite fails; and laxatives, to prevent the passage of hard scybala, are indicated. A case is very seldom seen while the hemorrhage is going on, because the patient dies or the hemorrhage stops before medical aid can arrive. If hemorrhage can be seen, it is proper to open the abdomen and check it by mechanic and surgical means. If a slight hematocele is followed by signs of increase, the abdomen should be opened. If serious trouble results from the size of the tumor, such as retention of urine or obstruction of the bowel, or if febrile symptoms come on, abdominal section is preferable to tapping.

Hematocele of the tunica vaginalis, cord, or testicle may occur in a healthy state of the parts, or may succeed or be combined with hydrocele. Blows, violent efforts at straining, or accidental wounding of a vessel are causes. A hematocele may be distinguished from a hydrocele by the absence of transparency, the obscure character of the fluctuation, the heavy feeling of the tumor when balanced in the hand, and the sudden mode of its occurrence. An effusion of blood into an encysted hydrocele of the testicle causes an encysted hematocele of the testicle, while extravasation of blood into the substance of the testicle causes what is known as parenchymatous hematocele. See HYDROCELE, TESTICLE (Tumors).

Treatment.—If the patient is seen early, an attempt must be made to limit the extravasation by means of cold, rest, and pressure. Afterward, when there is no fear of further hemorrhage, the size of the swelling should be reduced by tapping, and strapping applied, in the hope of causing absorption of the more solid portion. If this fails, or if the patient is not seen until the disease has already lasted some time, an exploratory incision should be carefully made into the front of the swelling (the position of the vas deferens will usually give a clue to the relation the sac bears to the testis), the contents turned out, and all the fibrin dissected off. As this operation is a very tedious one, likely to be followed by extensive sloughing (the vitality of the sac and of the layers that line it is very low), and as it exposes the testis to considerable danger, the question arises, as in the case of old hydroceles, whether castration is not better for the patient.

HEMATOCOLPOS.—See HEMATOMETRA.

HEMATOMA.—A collection of extravasated blood that has undergone certain changes, and is observed more especially in connection with the ear, the vagina, the scalp, and the meninges. A hematoma acts as an irritant, and arouses inflammation around it until it is encapsulated by embryonic tissue. This tissue, by organizing into fibrous tissue, forms a blood cyst, and gradually absorbs the fluid blood, while the contents of the cyst thicken until a mere fibrous scar remains. When not absorbed, hematoidin forms, and the fluid becomes clear. Suppuration may ensue, an abscess forming.

The means used to combat an acute inflammation may be employed early in the treatment of a hematoma. Rest, elevation and compression, cold, lead-water and laudanum, and tincture of iodin are advisable. When the injury is very severe, heat and stimulation may be used. Massage and ichthyol are serviceable when the swelling is subsiding.

Hematoma auris occurs mostly in the insane, and consists of an effusion of blood or bloody serum between the cartilage and the perichondrium. Protection from injury is usually sufficient, and opening should not be allowed. Aspiration rapidly empties the cavity, but it speedily fills again. The treatment by pressure is very painful and yields no good results.

Pelvic hematoma is an effusion of blood into the cellular tissue of the pelvis. It is rare except as a result of direct violence, or in hemophilia, purpura, or scurvy. The treatment requires the maintenance of the recumbent posture, the relief of pain, and prevention of inflammation by an evaporating lotion: *e. g.*, solution of lead subacetate, 1/2 of an ounce; rectified spirit of wine, 1/2 of an ounce; and rosewater enough to make a pint. Absorption will usually take place under this treatment. Should

labor ensue, it may be necessary to incise the tumor, or it may burst. In either event the cavity should be emptied, washed out with an antiseptic solution (corrosive sublimate, 1:2000), and drainage established. Daily antiseptic washings with an unirritating antiseptic, such as boric acid in saturated solution, should be practised. The recumbent position should be maintained until near complete filling of the cavity.

HEMATOMETRA.—Distention of the uterus with menstrual blood. If the retained fluid is largely mucous or watery in character, the condition is known as **hydrometra**; if suppuration has occurred, it is **pyometra.**

The cause of these conditions is some obstruction to the cervical or vaginal canals. This may be a congenital atresia or it may be acquired as the result of operation or inflammation.

Symptoms.—In case of congenital atresia the symptoms do not develop until after puberty. At this time all the phenomena of menstruation appear except the discharge of blood. There may be excessive pain and a feeling of distention in the pelvis. Examination will reveal the obstruction, and also an enlarged, probably cystic, uterus.

If the obstruction is situated low down in the vaginal canal, the upper part of the vagina will be distended with blood. This condition is known as hematocolpos.

Treatment consists in relieving the obstruction by incision or puncture and in maintaining a patulous condition of the vaginal and cervical canals.

HEMATOXYLON (Logwood).—The heart-wood of *Hæmatoxylon campechianum*, a tree of tropical America. It occurs in chips or powder of a dark, brown-red color, often with a greenish luster, and colors the saliva a dark pink when chewed. It contains tannic acid and a sweet, crystalline coloring principle, which is colorless when pure, but turns red on exposure to light.

The dose of the hematoxylon extract is 5 to 20 grains.

Being devoid of irritating qualities, it is well adapted for use in diarrheas and hemorrhages in young children. It is mildly astringent, its properties depending on the tannin. It does not produce constipation nor disorder the bowels, but colors the stools and the urine blood-red. It has been used as a hemostatic in bleeding of the lungs and in hemorrhages from the uterus and intestines, and as an astringent in leukorrhea.

In chronic diarrhea:

℞. Extract of hematoxylon, ʒ ss
Tincture of opium, ♏ v
Water, ʒ ij.
Two teaspoonfuls 3 times daily.

℞. Extract of hematoxylon, gr. x
Chalk-mixture, } each, ʒ vj.
Cinnamon water, }
Take as a drink two or three times daily.

HEMATURIA.—In the strict sense of the term, hematuria should not include hemorrhage from the walls of the urinary passages, following or preceding micturition; but, for the sake of convenience, they are always considered together, and the blood may come either from the kidney, bladder, or urethra.

The color depends partly upon the amount, partly upon the time it has been mixed with the urine. If the hemorrhage is recent and profuse, as in a villous tumor of the bladder or in rupture of the kidney, the color is simply that of unaltered blood; when it is poured out slowly in the tubules or allowed to collect in the bladder, it gradually becomes more dusky, until the tint is a characteristic smoky brown.

Tests.—The presence of blood in the urine may be recognized:

By the color, red or smoky, carbolic acid gives urine a brownish hue, and certain drugs (such as senna and rhubarb) and articles of diet (beet-root, sorrel, etc.) in quantity turn it red, but they can easily be distinguished. In hemoglobinuria the color is, of course, the same as in hematuria.

By the Spectroscope.—There is a broad, dark band between D and E, which, on dilution, gradually separates into two. Sometimes there is a band between C and D, near the former (acid hematin), or midway between the two (methemoglobin).

By the Microscope.—Blood-corpuscles retain their appearance for some time in acid urine; when it is alkaline, the coloring-matter soon dissolves out. In hemoglobinuria they are absent. Hemin crystals may be obtained in the ordinary way.

By Chemic Reaction.—A dram of tincture of guaiacum is placed in a test-tube, a drop of the urine added, and then some ethereal solution of peroxid of hydrogen floated upon the top. A blue ring develops at the junction if blood is present, but the same effect is produced by many other substances.

The source may be conjectured from the color, reaction, the presence of clots or of casts, the uniformity of the mixture, and the presence of other symptoms, such as renal colic, suprapubic pain, etc. See URINE (Examination).

Renal Hematuria.—The urine may be bright red, but usually it is smoky, and it is always uniformly diffused. The reaction is acid, unless the quantity is very large or there is a profuse secretion of pus; tube-casts may be present and they are of themselves distinctive; a long, worm-like coagulum may come down from the ureter, and the attack may be accompanied by severe pain in the loins, renal colic, or retraction of the testicle. Blood-corpuscles often cannot be detected.

Vesical Hematuria.—The color is usually bright red, unless the urine has been retained some time in the bladder, and the mixture is rarely uniform; the last drops, as a rule, contain most blood, whether the hemorrhage is still going on or whether it has ceased and the sediment has gravitated to the bottom. The reaction may be acid or alkaline; irregular, shapeless clots may be present (they are best seen floated out in water), but too much reliance must not be placed upon this, for the blood may have poured down from the kidney and coagulate in the bladder.

Urethral hemorrhage is always bright red, the blood either preceding or following urination.

Causes.—Hematuria is due either to a morbid condition of the blood (purpura, scurvy, etc.) or to local affections, and these may be occasioned by injury, inflammation, or new growths.

Renal hematuria may be caused by blows upon the loins and renal calculus; all forms of nephritis (even granular kidney) and hyperemia, whether active or passive; carcinoma, sarcoma, and tubercle.

Vesical hematuria may follow wounds—*e. g.*, rupture of the bladder—and contusions caused by calculi, catheters, etc.; cystitis in all its forms and ulceration of the mucous membrane; carcinoma, villous tumors, and tubercle.

Urethral hemorrhage may be due to injury, such as impacted calculus or the passage of a catheter, inflammation, as in gonorrhea; or new growths; such as tubercle.

Treatment.—Perfect rest and opium (unless there is nephritis or renal congestion) are most important. Cold may be applied by Leiter's coils to the loins, the suprapubic region, or the penis and perineum, according to the seat of hemorrhage. Vesical hematuria may be checked by washing out the bladder with water of the temperature of 120° F., or, if the points can be seen, by touching them with a styptic. In urethral bleeding a catheter may be passed and the penis gently compressed around it with a bandage; or, if the hemorrhage is in the region of the bulb, Otis' crutch may be employed. Tincture of hamamelis is said to check vesical hemorrhage when injected into the bladder. Infusion of matico has been used in the same way. Gallic and sulphuric acids, acetate of lead, and ergot may be given internally; but if the hemorrhage comes from a vessel of large size, they are of little service. Coagula occasionally give rise to severe pain, and, if the urine is septic and the bladder atonic, may require speedy removal, for fear of decomposition and septic absorption. This may be done most easily by means of a soft catheter and a lithotrity evacuator, the clots gradually being broken up and sucked away.

HEMERALOPIA (Night-blindness).—It may be a disease of itself, due to overstimulation or to lack of proper nourishment, or it may be a symptom of retinitis pigmentosa or similar degenerative disease of the retina, alone or with disease of the choroid. It is sometimes noticed among people the subject of extreme denutrition from climatic and social influences, such as the lower classes of the Russians; the disease is common in some parts of Russia after the religious fasts during Lent.

Treatment consists in rest from bright light by protective glasses, and in improvement of the general health and the administration of tonics, cod-liver oil, etc.

HEMIANOPSIA.—A term used to indicate obliteration of half the visual field in both eyes. It may be complete, but is usually incomplete. There is generally a bending out of the hemianopsic line at the point of fixation, indicating that the fovea is supplied by fibers from both optic tracts, whereas the remainder of the retina is supplied by the tract on either side: that is, the right optic tract supplies the right half of each retina, and the left supplies the left half.

Varieties.—When the obliterated half is on the same side in both eyes, it is called **homonymous hemianopsia.** Such a condition is indicative of disease or pressure behind the chiasm, before the fibers have crossed. In left-sided hemianopsia there is some lesion of the right optic tract or of its connection with the cerebral cortex, and the reverse of this in right-sided hemianopsia. In **heteronymous** or **crossed hemianopsia**—that is, in both temporal or both nasal halves—there is probably a lesion at some part of the chiasm which includes the decussating fibers of both tracts. **Vertical hemianopsia** is due to lesion in front of the decussation.

In homonymous hemianopsia we have additional aid in locating a tumor or lesion by the pupillary reflex to light. The pupillary centers are near the corpora quadrigemina; if we carefully direct rays of light upon the blind side of a retina in a case of homonymous hemianopsia, and yet get pupillary reaction, we know that the pupillary centers and all the region in front in the path of pupillary reaction are intact; hence the lesion is posterior to the corpora quadrigemina; conversely, if pupillary reaction is destroyed, we have reason to believe that the lesion is between the corpora quadrigemina and the chiasm. This test is known as **Wernicke's sign.**

Causes.—Hemianopsia is usually due to hemorrhage, embolus, traumatism, or tumor.

The clinical significance of hemianopsia depends on the amount and form of the obliterated field and on the associate symptoms, such as hemiplegia, hemianesthesia, aphasia, etc.

Transient hemianopsia is a sign of some cortical disturbance and is probably the result of spasm of the superficial cerebral arteries. It is often associated with unilateral headache, vertigo, aphasia, amnesia, and other symptoms referable to a cerebral origin. In a number of the patients there is a family history of epileptiform seizures. See FIELD OF VISION.

HEMIC MURMURS.—See HEART-DISEASE (Organic).

HEMICRANIA.—See MIGRAINE.

HEMIPLEGIA.—Paralysis of one side of the body, due usually to a lesion of some part of the corpus striatum and internal capsule, of the crus cerebri, or of the cortex or subcortex of the opposite side of the brain. Alternate or crossed hemiplegia is the name given to paralysis of the facial muscles upon one side, with paralysis of the trunk and extremities upon the opposite side of the body. Spastic hemiplegia is a form occurring in infants, in which the affected extremities are subject to convulsive twitching. Spinal hemiplegia is due to disease of the spinal cord, and consists of paralysis of one side or of the whole body, with loss of sensation of the opposite side. See BRAIN (Hemorrhage), PARALYSIS.

HEMLOCK.—See CONIUM.

HEMOGALLOL.—This is hemoglobin deoxidized by pyrogallol. It occurs as a reddish-brown powder, insoluble in water and in alcohol. It is

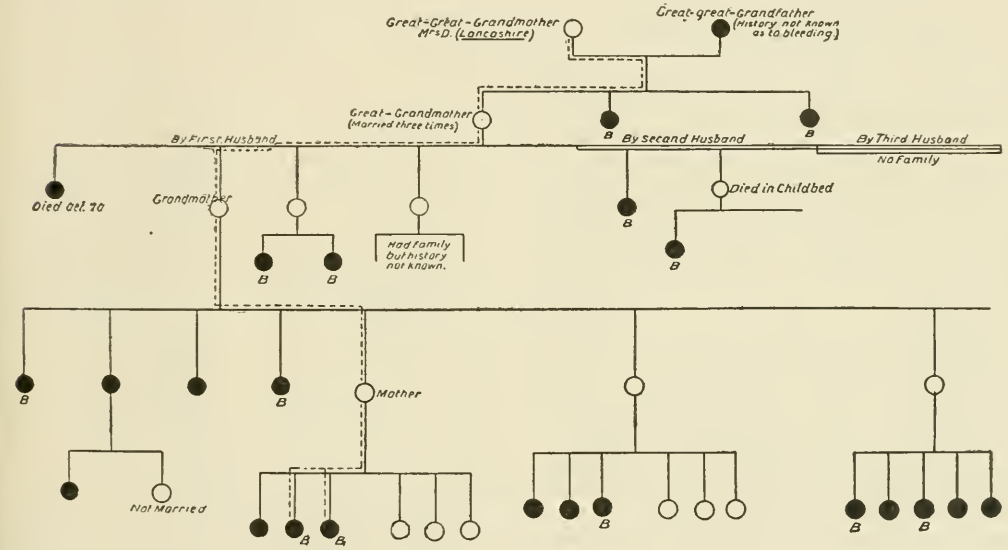
claimed to be the nearest to blood iron of any of the organic iron preparations, and to be readily assimilated without disagreeable effects of any kind. Dose, 4 to 8 grains thrice daily, half hour before meals.

HEMOGLOBIN (Hematoglobin; Hemocrystallin).—A doubly refractive, pleochromatic colloid or crystalline matter, existing in the corpuscles of the blood, and to which their red color is due. In man the amount is 13.77 percent; in woman, 12.59 percent, reduced by pregnancy to from 9 to 12 percent. It is an oxygen carrier or respiratory pigment. The crystals of hemoglobin have a dark-red appearance, with a strong purple or bluish tint; they are very soluble in water. It is the most important pigment in the body, forming 90 percent of the red blood-corpuscles when dried, and from which it may be extracted by water, ether, chloroform, or the bile salts. It is of an extremely complex nature, and is regarded as a compound of a proteid substance, globin, and of a colored body, hematin, which contains all the iron of the molecule. Its most important property is its affinity for oxygen. In some manner this gas forms a loose combination with hemoglobin in the lungs, forming oxyhemoglobin, and is then conveyed by the red corpuscles throughout the body, separating again from its conveyer in the tissues. Hemoglobin deprived of its oxygen is called reduced hemoglobin, and is of purplish color, while the oxyhemoglobin is scarlet. It is thus that the difference between the arterial and venous blood is mainly to be accounted for. The spectra of these two kinds of blood are different. Methemoglobin is another compound of hemoglobin with oxygen, in which the gas is much more closely combined. A still more stable association takes place between hemoglobin and carbonic oxid, which thus produces its rapidly fatal effect by preventing the oxygen-carrying power of the blood.

Certain variations of hemoglobin are recognized in disease: as, for instance, in anemia it is reduced often as much as one-half. See Blood (Examination).

HEMOGLOBINURIA.—A condition of the blood in which the hemoglobin is set free and is secreted in the urine. The etiology is as follows: (1) Specific infectious fevers, such as yellow fever, scarlet fever, diphtheria, malaria; (2) scurvy and purpura; (3) transfusion; (4) certain drugs or chemicals, as chlorate of potassium, sulphuretted hydrogen, carbon monoxid, carbolic acid; (5) certain stages of septicemia; (6) it may follow severe burns; (7) it may be paroxysmal without obvious cause (possibly related to cold and associated with Raynaud's disease).

To make a diagnosis, add a drop of acetic acid to a suspected specimen and boil; a red coagulum indicates hemoglobin. The prognosis depends upon the cause. Recovery usually occurs. Treatment is determined by the nature of the cause which occasions it. See Hematuria; Malarial Fever (Hemoglobinuria); Blood (Examination).



Genealogical Tree of a Hemophilic Family.

○ = Females. ● = Males (not bleeders). ●*B* = Males (bleeders). The dotted line shows the transmission of the disease to patients through four generations.—(*From Thomson and Miles' Surgery.*)

HEMOPHILIA.—The hemorrhagic diathesis; an abnormal tendency to hemorrhage, or ease of bleeding. It usually first appears at about the period of the second dentition. Heredity plays a prominent part in this affection, the disease being transmitted by females, though males are by far the most frequent sufferers.

The bleeding occurs spontaneously or after traumatism, and there are often obstinate swell-

ings of the joints. Men are far more liable than women, and fathers do not seem to transmit the disease to their sons. There is nothing about subjects of hemophilia to distinguish them, when not bleeding, from ordinary persons. The bleeding is nearly always capillary, and may prove fatal in a few hours or after some weeks. An anemic state, which may exist for months, follows the bleeding. Besides superficial bleedings, interstitial hemorrhages, ecchymoses, and blood tumors may be observed. The joints affected are the larger ones, commonly the knee, and most frequently after some injury. The joint becomes swollen and painful, and apparently filled with fluid.

The diagnosis is often easy. If from early infancy a child has suffered repeated bleedings, especially from traumatism and from joint affections, the diagnosis is plain.

The prognosis is not so serious as regards life as was formerly believed.

The treatment of hemophilia includes almost the whole subject of the treatment of hemorrhage. Ligation of arteries is contraindicated, since the hemorrhage is capillary. Ergot, for the same reason, proves of little service. Treatment should be directed to bringing about an increase in coagulation and in the firmness of the clot. Transfusion of a normal salt solution may be necessary. Lime salts may prove useful, and the administration of aromatic substances, such as camphor and turpentine, is advised. Pilocarpin is said to increase the number of circulating white corpuscles. Nuclein, alone or with tissue-fibrinogen, increases the number of white corpuscles in the blood. It is available in the form of yeast, sweetbreads, lamb's fry, and kidneys. It is questionable whether these cell substances do not lose their efficacy by boiling.

Calcium chlorid (15 grains) every few hours, and continued for 3 days, is supposed to favor clot-formation, but it is to be remembered that after the loss of large quantities of blood the coagulability is normally increased. Tablets of bone-marrow have been reported as beneficial.

When bleeding has occurred, very firm pressure and styptics may be tried. Absolute rest in bed is essential, and iron, lead, turpentine, ergot, alum, tannic acid, creosote, and digitalis may be tried. Hemorrhage from a tooth-socket may be checked by cotton-wool soaked in the strongest solution of the perchlorid of iron available, and a pad of wool may be placed over the depression and the jaws firmly bandaged. Epistaxis may be treated by plugging the nares. The actual or galvanocautery may be tried.

Vaccination, tooth extraction, and other minor operations should be performed with caution, and puncture should be as superficial as possible. The patient should be urged to inform the physician of the diathesis in future consultations.

For the joint affections, absolute rest and cold applications, followed by dry heat, are indicated. Splints may be necessary to insure thorough immobility. See HEMORRHAGE.

HEMOPTYSIS.—Blood-spitting. It is usually applied to expectoration of blood from lungs or from air-passages below the epiglottis.

Etiology.—(1) It may occur without obvious cause; (2) traumatism; (3) phthisis; (4) pneumonia; (5) pleurisy; (6) rupture of an aneurysm; (7) venous stasis, as in heart- or liver-disease; (8) purpura; (9) malignant fevers; (10) vicarious menstruation.

Symptoms and Clinical Course.—The onset is usually sudden, accompanied by a sense of heaviness in the chest; subsequently by a warm, saltish taste, frequently occurring just after the act of coughing. The blood is bright red in color if in large amount, but if the quantity is small, it is intimately mixed with frothy mucus and has an alkaline reaction. It may be swallowed and subsequently vomited; an acid reaction then occurs. If the hemorrhage is great, phthisis or rupture of an aneurysm may be suspected. In most cases of hemoptysis the face is pale, the pulse rapid and feeble, and the patient is bathed in a cold perspiration. The paroxysms may occur at intervals of several days, gradually becoming less in amount, or they may be profuse, causing sudden death. In phthisis intercurrent hemorrhages are common. Auscultation of the chest detects mucous râles during inspiration or expiration.

Diagnosis.—It must be distinguished from hemorrhage from the alimentary tract or nasal chambers:

Hemoptysis.	Hematemesis.
1. History of disease of lung, heart, or liver.	1. History of disease of abdominal organs.
2. Hemorrhage preceded by saltish taste in mouth and tickling of esophagus. Blood is ejected by coughing; collapse is great.	2. Hematemesis preceded by sense of heaviness in stomach or by nausea. Blood is ejected by vomiting; collapse not so frequent.
3. Blood is bright red and not coagulated.	3. Blood is dark or blackish, often containing clots.
4. Blood mixed with frothy mucus.	4. Blood mixed with food.
5. Blood alkaline in reaction.	5. Blood acid in reaction.
6. Blood gradually disappears from sputum.	6. Blood may all be discharged at one paroxysm.
7. Blood usually absent from stools.	7. Stools may be black from contained blood.
8. Mucous râles over lungs.	8. Auscultation negative.

The prognosis depends upon the cause. If the hemorrhage is due to rupture of an aneurysm, death usually occurs suddenly. If due to phthisis, the symptom is not necessarily fatal.

Treatment requires absolute rest in bed, guarding against everything which might cause excitement. The head and thorax should be elevated slightly, and to the external surface of the chest ice-bags may be applied. Most patients suffer from a fear of impending death, and morphin (1/4

of a grain) should be given at once. Hypodermic injections of ergotol (10 to 15 minims) may also be given every 3 hours until 3 or 4 doses have been administered. The fluidextract of ergot (20 minims) is also recommended, but is likely to cause severe irritation at the point of insertion of the needle. Gallic acid (20 grains) is also used to check hemorrhage, though not so reliable as ergotol. It may be given every half hour until 4 or 5 doses are used. Alcohol and other stimulants are distinctly contraindicated. Allowing small pellets of ice to be dissolved in the mouth may be of distinct advantage. The hemorrhage is slightly controlled by tying a ligature firmly around each lower extremity, to impede the flow of blood to the lungs. Transfusion or intravenous infusion are last resorts.

HEMORRHAGE.—Hemorrhage is arterial, venous, or capillary.

Arterial hemorrhage is known by its bright crimson or vermilion tint, and by its issuing from the divided vessels in jets, synchronously with the contraction of the left ventricle.

In **venous hemorrhage** the blood is of a dark blue tint, and flows from the divided vessel in a continuous stream.

In **capillary hemorrhage** the blood is of a reddish tint, and exudes from the tissues: in other words, there is a welling up.

Subcutaneous hemorrhage, also called diffused aneurysm, exists when there is no external flow of blood, either from want of parallelism of the wound in the vessel and the open wound in the tissue, or from the rupture of a vessel by a blow, or otherwise, subcutaneously.

Effects of Hemorrhage.—When large vessels or a large number of small ones are divided, death may take place at once. Usually the patient is seized with syncope, after the wound has been bleeding for some time, when the heart's action becomes more depressed, and, the blood becoming more coagulated, nature is given an opportunity to form a clot within and around the artery. After a time reaction takes place, when there is danger or a recurrence of the bleeding, followed by death.

Treatment of Primary Hemorrhage.—Put the finger over each divided extremity of the vessel or apply a provisional tourniquet; place the patient in the recumbent posture, with the head lower than the body. Compress both axillary and both femoral arteries, to divert the flow of blood to the brain. Apply external heat, by means of bottles of hot water, warm blankets, etc.

Stimulate the heart's action by a hypodermic of morphin, 1/4 gr., atropin, 1/100 gr., or of digitalis or ether. As soon as reaction takes place, resort to means to effect a permanent arrest of hemorrhage.

The reaction which follows upon a copious loss of blood is generally attended by the following symptoms: The pulse frequent, soft, and jerky; the heart fluttering and tremulous; the eyes suffused; the skin hot and dry; the countenance flushed; headache, nausea, and possibly vomiting, accompanied by wandering of the mind. The proper treatment of this condition is rest, exclusion of light, and every 4 hours 1/6 gr. of morphin; neutral mixture, (mixture of citrate of potassium, U. S. P. 1880) 1/2 of an ounce. Ice-bags should be applied to the head; the surface sponged with an evaporating lotion. Beef-extract, koumiss, and brandy and milk in small quantities should be given and at regular intervals.

When there is collapse from the loss of blood, a saline injection (1 dram of common salt to 1 pint of water) introduced under the skin in the region of the outside of the thigh or the buttock, by means of an aspirator, has frequently saved life. See TRANSFUSION, INFUSION.

When the hemorrhage takes place in a cavity, in consequence of bleeding from one of the abdominal viscera or from the lungs, the patient should be given, every 4 hours, either 3 grains of gallic acid or 2 grains of acetate of lead, with 1 grain each of powdered digitalis and ergotin, together with 1/2 of a grain of opium. These remedies sustain the action of the heart, produce contraction of the blood-vessels, and render the blood more plastic; hence they are of great utility when the blood-vessels cannot be reached. See ABDOMEN, LIVER, KIDNEY, etc.

Consecutive or recurrent hemorrhage comes on in about 24 hours after an operation; it is generally due to a faulty application of the ligature; including a nerve in the ligature, to the application of Esmarch's bandage, or to reaction that takes place after a shock. The proper treatment is to elevate the stump and compress the main artery; if hemorrhage continues, the wound should be opened, evacuated, washed with warm bichlorid solution, and the bleeding vessels tied. If there is much oozing, the part should be elevated and broad compresses applied. Sponging with warm water and exposure to air for some time is advisable.

Secondary hemorrhage comes on 24 hours from the time of the operation, but more generally about the time of the separation of the ligature. The mode of procedure is to remove the dressings; if there is merely oozing, proceed as directed in Consecutive Hemorrhage; but if the dressings are saturated with blood, the parts swollen and painful, and there are other evidences of profuse loss of blood, reopen the wound, turn out the clots, search for the bleeding vessels, and ligate them. Secondary hemorrhage may take place at the time of the separation of the ligature, and it generally comes from the distal end of the artery. This should be frustrated by compression; but if the hemorrhage continues or recurs, it is proper to cut down upon the artery and ligate it. Secondary hemorrhage may occur from *sloughing* or *ulceration* of an artery, or from imperfect closure of an artery when a ligature separates, either through a diseased state of the artery or of the constitution. In this case it is necessary to cut down upon and secure the bleeding orifice; if this cannot be done, carefully graduated pressure and styptics may be tried. A small button of lint, saturated with perchlorid of iron, may be put into the bleeding point, over which large compresses are placed and firm pressure applied. The bleeding surface may be touched with a hot iron (not

white heat), which will sometimes be more efficacious than any other styptic. Should these measures fail, the artery must be tied above the point of hemorrhage, and, finally, amputation may be necessary. See HEMOSTATICS.

When there is bleeding from arteries, the following rules are to be observed:

Should there be bleeding from an open wound, cut down, and tie the artery at the site of the wound, no matter what its condition; if the artery is brittle, resort to acupressure. If an artery has been wounded, and there is no bleeding when the surgeon first sees the case, is should be let alone, because hemorrhage may not recur; but a provisional tourniquet should be placed over the situation of the main trunk, so that it may be tightened should the slightest appearance of blood make it necessary. The exceptions to this rule are when a patient is to be transported some distance, when he is a hard-drinking man, when the vessel lies directly in the wound, so that it can be seen; in these cases the wounded artery should be secured at once.

If the artery is partially or wholly divided, cast a ligature around each end. In applying a ligature, if a branch is given off near the wounded artery, include it in the grasp of the ligature or secure it separately. If the branch of a main artery is wounded near the trunk, treat it as though it were a wound of the main trunk. On cutting down on a divided artery, if the distal end is so far retracted that it cannot be found, tie the cardiac end and place plugs of iodoform gauze in the wounded or distal side, keeping it in place by successive layers of gauze and a bandage from the distal extremity of the limb to the site of the wound. See ARTERIES (Ligation), ARTERIES (Suture).

For **orificial hemorrhages**, see HEMOPTYSIS, HEMATEMESIS, HEMATURIA, EPISTAXIS, POSTPARTUM HEMORRHAGE, VAGINA.

HEMORRHAGE, POSTPARTUM.—See POSTPARTUM HEMORRHAGE.

HEMORRHOIDS (Piles).—An enlarged and varicose condition of the vessels in the tissues around the anus, sometimes associated with eversion of the rectal mucous membrane.

To treat hemorrhoids successfully, the physician must understand:

1. That all things complained of about the rectum are not hemorrhoids.

2. That all hemorrhoids are not alike, either in pathology, etiology, or symptoms, and therefore cannot be prescribed for or treated in the same way.

3. That a "pile remedy" is no remedy at all, in that every case of this kind is an individual one.

4. That some cases of hemorrhoids may be relieved, perhaps, by palliative measures, but that a pronounced case of piles can be remedied and cured much better and quicker by a surgical operation than by palliative means.

External Hemorrhoids.

External hemorrhoids are divided into two classes: (1) *cutaneous* and (2) *thrombotic.*

Cutaneous Hemorrhoids.—This variety is simply a tag of skin in a state of inflammation, or there may be a proliferation of skin evenly extending around the outside of the anus. This condition, of course, favors an inflammatory attack. Even so simple a cause as friction of wearing apparel may induce it.

Causes.—Constipation, by inducing hardened stools felt at the anal orifice, may cause this form of piles; or the use of heavy, common, printed paper as a detergent may have the same effect. An attack of diarrhea or dysentery, a foul discharge from either the rectum or vagina, scratching with the finger-nails—indeed, any irritation—may, of course, influence these external tags, thereby causing them to enlarge, constituting an external hemorrhoid of the first variety.

Thrombotic Hemorrhoids.—This class is caused by the presence of a blood-clot, caused by the breaking of the vein-wall, which allows the blood to escape and coagulate in the tissues, or by blood coagulating in the vein itself. The location of the thrombotic pile is just at the verge of the anus, and is covered by both mucous membrane and true skin. No attempt should be made to "push them back," as is so often done. The thrombotic pile is less irritable than the cutaneous variety.

Causes.—Any force or exertion which would cause the vein-wall to give way may be a cause. Hence, straining at stool is perhaps the most frequent cause. Men suffering from enlarged prostate or from a stricture in the urethra are very liable to an attack. The heavy uterus of the female—as during pregnancy—a case of cystitis, stone in the bladder, an attack of gonorrhea, or a fissure of the anus may induce the condition.

The symptoms of both cutaneous and thrombotic piles are very much the same: viz., a heavy weight at the lower part of the rectum; an aching pain over the sacrum and down the thighs. These are increased by walking or by the act of defecation; the pain may be very acute or of a dull and heavy nature. An examination will reveal the nature of the trouble.

Treatment of External Hemorrhoids.—It depends upon circumstances whether the treatment should be *palliative* or *operative* from the onset. If the patient is able, at the time the physician is consulted, to attend to his business, it is, of course, best to palliate what distress he has. Fortunately, the majority of attacks of external piles do not compel the patient to go to bed. If, however, the external piles are very large, operation saves time and prevents return. Sometimes, however, circumstances will not permit of an operation.

Palliative treatment is simply that of a local inflammation. Heat or cold, whichever is borne best, should be used. Moist heat is to be preferred to dry. Hot applications can, therefore, be applied by using hot cloths or surgeons' cotton dipped in very hot water and held frequently to the parts. Poultices may also be used to advantage. A sitz-bath is advisable, especially if the action of the bladder is interfered with. The hot-water bag placed against the parts affords much relief.

If cold water is preferred, it can be applied by means of cloths or cotton, or finely cracked ice in rubber or cloth, laid up against the parts. Next

to heat and cold, ointments are to be considered. The following may be beneficial: equal parts of ointment of belladonna and ointment of galls; or the former 1 part, the latter 2 parts and stramonium ointment 1 part. Relief may be obtained by painting the part with liquor ferri subsulphatis (Monsel's solution). Applications of collodion dropped on a bit of cotton wool are recommended. The best local astringent is adrenalin. Warmed suppositories of hamamelis, or of lead and opium may be used.

In the thrombotic hemorrhoid, when some surface of the mucous membrane is exposed, the following will be found serviceable:

℞.	Cocain hydrochlorid,	gr. xij
	White vaselin,	ʒ j.

Apply frequently.

If there is much itching of the parts, the following:

℞.	Menthol,	gr. xij
	Lanolin,	ʒ j.

A favorite formula is:

℞.	Calomel,	gr. xl
	Chloral hydrate,	gr. xxx
	Vaselin,	ʒ j.

The bowels should be kept freely open with an aperient water. See Constipation. Absolute rest, if possible, should be enjoined.

Operative Treatment.—The operative treatment for external hemorrhoids is very simple. *All external piles should be cut off.* Held taut with a tenaculum, each tag should be cut off near its base with a sharp pair of serrated scissors. Any bleeding can be stopped either by torsion, hot water, or the compress. The parts should then be dusted with iodoform, a compress of cotton and a bandage applied, and left on for two days. When it is removed, the parts should be thoroughly cleansed with carbolized hot water, and redressed in the same manner. This should be done each succeeding day until the parts have healed. The thrombotic pile should either be slit open with a sharp bistoury and the clot released, or, what is better, it should be clipped off in its entirety, and dressed in the same manner as in the cutaneous variety.

The question of giving an anesthetic is to be left with the patient and the operator. The subcutaneous injection of cocain around the anus is not advisable.

Internal Hemorrhoids

Internal hemorrhoids are much more serious in their nature and complications than the external variety. Life is frequently endangered. Cases could be cited in which from 1/2 to 1 gallon of blood was lost at one sitting from an internal pile, and that, too, when no operation had been performed.

The hemorrhoid may be as large as a child's fist. By the erect posture alone or by the least exertion this mass may protrude. By friction—coming out and being often pushed in—ulceration is excited, and actual pain is added to the discomfiture of protrusion. The first danger, then, in internal piles is from hemorrhage; the second, inconvenience from protrusion; the third, actual pain.

Varieties.—(1) arterial, (2) venous, (3) capillary. The small capillary pile may bleed so as to endanger life; the large pile never does. The large internal pile protrudes; the capillary pile does not. The small capillary pile can be cured without surgery; the large pile cannot.

Diagnosis.—Such a condition is usually confused with *polypus* and *prolapse* of the bowel. A polypus has a stem or pedicle, which can be traced to its attachment by the finger. A prolapse of the bowel is differentiated from protruding hemorrhoids by its velvety appearance, its soft, bladder-like feeling, and its uniformity in circumference. Protruding piles have no pedicles; they are distinctly separated and are of a tumor-like appearance.

Causes.—Internal hemorrhoids are veritable tumors, produced by the changes brought about by long-continued irritation and the inflammatory process. They are not simple varicosities of veins. It is very difficult, indeed, to assign a cause of this affection. Every case seems to be an individual one, and must be so treated. The drinking of alcoholic or malt liquors, womb displacements, or diarrhea and dysentery, may be the cause. Sometimes more than one cause is found. There is unquestionably a hereditary predisposition to this affection.

Prophylactic Treatment.—It would be well to warn the patient against them. The young should be taught early the necessity of a daily evacuation of the bowels, cleanliness of the parts, the use of soft material as a detergent, the eating of fruit, and the drinking of much pure water. Cold water should be used freely for drinking purposes, as a wash for the anus after every act of defecation, and occasionally injected into the rectum. The habit of taking copious injections of hot water into the rectum is conducive to the hemorrhoidal state, and should be deprecated.

Palliative Treatment.—If existing conditions prevent an operation, or the patient suffering with inflamed painful protruding piles strenuously opposes an operation, palliative treatment should be tried. No attempt should be made to return the protruding mass into the rectum, for it will be futile. Rest in bed is indicated. The best application is heat: hot fomentations—on sterilized material always—hot poultices, or hot vapor to the parts. The bowels should be cleansed at once by an aperient, and kept open. Sometimes the free application of resinol or vaselin with the heat does good. A good formula is:

℞.	Chloral hydrate,	gr. xl
	Extract of opium,	gr. xxx
	White vaselin,	ʒ j.

Ointments containing tannin irritate and cause great pain, and subserve no good. Rest, the application of heat, sometimes cold, keeping the bowels open, a cooling diet, is the best and only treatment required in a palliative way.

Operative Treatment.—Sometimes after the violent inflammatory action subsides atrophy takes place in the mass, and nearly an absolute cure results. Again, the hemorrhoidal mass may slough off, and a cure is effected. Of course, there is danger here of hemorrhage. But, ordinarily, the piles are left in the same condition as they were before the attack, and the patient is informed that the same causes will superinduce another attack. The patient could have been permanently cured by an operation. There are quite a number of operations proposed for the cure of internal piles. In this country the preference is about equally divided between the use of the clamp and cautery and the ligature. The ligature is commended as the safest and best method.

Ligature.—After having purged the patient the day before the operation, he is to have a warm bath the night before, and no breakfast the day that he is operated on. He is put on the table, under an anesthetic, and the parts involved are shaved if necessary and thoroughly washed with a bichlorid of mercury solution, 1 : 5000. Presuming that the field is aseptic, the patient is put in Sims' position, with the legs well drawn up toward the abdomen. A grooved speculum should now be introduced, and the sphincter thoroughly divided. The hemorrhoidal tumors will prolapse. If they do not do so in their entirety, by placing a four-pronged (Mathew's) forceps upon one of them at its base, the entire mass can be pulled into view. The tumors are now to be ligated. A stout, plaited silk thread is the best ligature. The small tumors are secured and tied without transfixing. While the rectum is distended, it should be irrigated with bichlorid solution 1 : 5000. The large tumors are caught well at their base, drawn slowly down, and the forceps held by an assistant. A curved needle threaded with the ligature is passed immediately through the base of the tumor. The needle is withdrawn, the thread is cut, and the ligature tied firmly, first on one side of the tumor, then on the opposite. The tumor is now excised with a pair of straight scissors. At least two-thirds of the pile should be removed. The stumps should be dusted with iodoform and returned into the rectum. If any superfluous skin-tags should exist around the anus, these must be removed during operation. The best plan is, when the tumor is pulled down, to carry the incision out around its base so as to include all such skin or tag, the ligature to be placed in this and cut and tied as directed. Mr. Allingham directs that the incision be made in "Hilton's white line" and the tag cut off separately. A piece of iodoform gauze should now be laid over the anus, some absorbent cotton over this, and a T-bandage applied somewhat firmly One fourth of a grain of morphin should be given hypodermically, and repeated in one hour if necessary. The bowels should be moved on the morning of the third day by an aperient. The ligatures will separate on the eighth or ninth day. The wound should be dressed every day after the bowels are moved until recovery is complete.

Clamp and Cautery.—A pile have been seized with the forceps, the clamp is applied to its base, the pile shaved off, and the raw surface cauterized.

If **crushing** is employed, the pile is drawn into the crusher, which is then screwed tightly home, the pile cut off, and the crusher removed after a minute or two.

Excision has of late been extensively employed by some surgeons. It consists in dissecting away the piles, tying any arteries that bleed, and bringing down the mucous membrane and securing it by suture to the anal margin.

Injections of Carbolic Acid.—The strength usually employed is 1/2 of a dram of the acid to 1 dram each of glycerin and water, 4 to 5 minims being thrown into the center of the pile by a hypodermic syringe. The process has to be repeated several times, and takes some weeks to effect a cure.

Nitric acid is used as an application for the sessile vascular pile, and should be applied with a glass rod through a speculum, and any excess of acid removed by a weak alkaline lotion.

HEMOSTATICS AND STYPTICS.—Agents that arrest hemorrhage when taken internally are called hemostatics. Agents that arrest hemorrhage when applied locally are called styptics. Some styptics act mechanically by promoting the formation of a clot in the mouths of bleeding vessels; others cause the vessels themselves to contract, checking the flow of blood.

The principal **styptics** are adrenalin, acids, alum, antipyrin, cautery, cold, collodion, cotarnin, hydrastinin, ferric chlorid, ferric sulphate, gelatin, lead acetate, matico, silver nitrate, tannic acid, vegetable astringents, zinc sulphate.

The principal **hemostatics** are adrenalin, cotarnin hydrastinin, ergot, digitalis, gallic acid, lead acetate, dilute sulphuric acid, ipecac, hamamelis, oil of turpentine.

Hot air and steam have been used recently with good result in checking hemorrhage, particularly in surgical operations.

HEMP, INDIAN.—See CANNABIS INDICA.

HEPATITIS.—See LIVER (Cirrhosis).

HEREDITARY ATAXIA (Hereditary Ataxic Paraplegia; Friedreich's Ataxia).—A family disease, not always hereditary, characterized by lesions in the posterior and lateral columns of the cord and symptoms similar to those of tabes dorsalis. The cause is unknown. It usually occurs between the second and twentieth years.

Symptoms.—These are essentially ataxia and paraplegia. Speech is scanning, movements of head and arms are jerky. There are nystagmus, loss of knee-jerks, lateral spinal curvature, deformities of the feet, generally extension of the big toe and talipes equinus or equinovarus.

Diagnosis is not difficult. Its characteristic symptoms distinguish it from **tabes dorsalis** in which there are sharp pains, Argyll-Robertson pupil, anesthesia. In **ataxic paraplegia** there is increased knee-jerk, as well as spasms and foot clonus. It is differentiated from **disseminated sclerosis** by loss of knee-jerk instead of exaggeration, and by absence of intention tremor.

Treatment is of no avail, though the remedies used in tabes dorsalis may be tried. The disease may last for years.

Cerebellar Hereditary Ataxia.—This form develops in the third decade. There are scanning speech, ataxia, heredity, nystagmus, but there is Argyll-Robertson pupil associated with ocular palsies, optic atrophy. Club-foot and scoliosis are lacking.

HEREDITY.—The principle or fact of the transmission of physical or mental qualities or tendencies from ancestor to off-spring.

As a single species preserves its physical characteristics by the principle of natural selection, so also must function follow the law dominated by structure. Under certain conditions of climate, altitude, mode of life, and certain other factors, the physical characteristics may be somewhat modified, yet the principle of heredity cannot be escaped. The mental development depends upon those characteristics possessed by the parents, and environment and education in many instances are insufficient to subdue the influences of heredity. Thus we inherit certain characteristics, as trait, type, disposition, temperament, and predisposition to certain employment, or even disease.

The principle of heredity seems most active when the parents are between the ages of 20 and 30. The principle of heredity is continuous. There are no wide gaps that permit of great differences in types. A healthy man and woman beget healthy offspring, and if there is a reversion, it is the exception and not the rule. As mental characteristics necessarily depend upon this principle, so, too, does the physical man.

It is true that by close confinement, overwork, mental activity, and sedentary habits the growing child becomes susceptible to many diseases. But if its parents are strong and healthy, it should also be strong and healthy. Of the different diseases—or the susceptibility to them—which may be transmitted, there may be mentioned syphilis, tuberculosis, cancer, gout, certain skin-diseases, insanity, various criminal tendencies, nervous diseases, such as epilepsy and hysteria.

HERMAPHRODITISM.—A hermaphrodite is an individual with the coexistence of completely developed ovaries and testicles, or of at least one of each gland. The condition is accompanied by some congenital malformation of the genital organs, such as epispadias, hypospadias, cleft of the scrotum, etc., that makes the determination of sex somewhat doubtful. True functionating human hermaphrodites do not exist. See MONSTROSITIES.

HERNIA.—Hernia may be defined as the protrusion of a viscus or part of a viscus through the walls of the body in such a manner that it is covered by some or all of the constituent parts of the walls. In other words, the escaping organ carries various layers of the parieties before it. The term, however, is usually applied to the protrusion of intestine or omentum, or both, through the abdominal walls. In the following discussion it will be limited to protrusions of the abdominal viscera.

Anatomic Parts.—A hernia is composed of its sac or peritoneal investment, its contents, and structures which cover it.

The sac is a portion of the peritoneum derived from the parietal layer of the abdomen. It is pressed down from the hernial contents, developing into a pouch varying greatly in size and shape. In congenital hernia it is due to faulty obliteration of the vaginal process of peritoneum, which normally closes after the descent of the testicle. In some such cases there is a free communication between peritoneal cavity and the scrotum. In other cases obliteration occurs below but not above, so that there is a channel extending from the abdominal cavity to the site of obliteration. This channel is called the funicular process and a prolapse of intestine into it is known as hernia into the funicular process.

The Contents of the Sac.—When the sac contains a loop of intestine, it has been designated an **enterocele**; when only omentum, an **epiplocele**; when both intestine and omentum, an **enteroepiplocele.**

The portion of the intestine found in the sac is usually a part of the ileum, but the large intestine, the bladder, the uterus and ovaries, and in fact any intraabdominal organ except the pancreas may be found in a hernia. It may vary in amount from only a small part of a single loop to that of several coils, even, in rare instances, the larger part of the small intestine. In old retained hernia the contents undergo many changes, developing fibrous bands, adhesions, etc. Intestinal obstruction may take place because of these secondary changes rather than from constriction at the neck of the sac. In old large hernia the neck of the sac is usually firm and inelastic, owing to its plicated folds having become intimately blended.

The coverings of a hernia consist of the skin, fascia, muscular structures, and the peritoneum. In an old strangulated hernia these are often greatly thinned from pressure, a fact to be borne in mind in making the dissection, in order that the imprisoned intestine may not be injured.

When the hernial contents can be restored to the abdominal cavity, the hernia is called **reducible**; when this cannot be effected, **irreducible**; when the function of the intestine is held in abeyance, **strangulated.**

The predisposing causes have already been, in the main, attributed to the imperfect closure of the internal ring, and to the existence of a depression in the peritoneal surface resulting from it.

The exciting causes are many and various: *e. g.*, muscular weakness of the abdominal wall, violent exertion, etc. That these are only exciting causes is evinced by the fact that gymnasts and contortionists are, as a class, remarkably free from hernia.

Sex.—From the anatomic reasons it is apparent that hernia should be more frequent in males than in females. The ratio, as given by many observers, is about that of 5 to 1.

Age.—During the first year of life congenital and acquired hernias are very common. In many of this class a spontaneous cure results. From the medical statistics of the War of the Rebellion,

it appears that the larger number of cases were found in men over 40 years of age.

Nativity.—From the same source it appears that there is a great difference in races: *e. g.*, over 50,000 of each, German and Irish, were examined, with a result of rejection of 82 in 1000 of the former, and 36 of the latter.

Comparative Frequency.—Of the different forms of hernia the inguinal is by far the most common. The estimate is: Inguinal, 75 percent; femoral, 10 percent; umbilical, 5 percent. Inguinal hernia is most common on the right side.

Symptoms of Hernia.—First, a swelling in the region affected: *e. g.*, the inguinal canal, groin, scrotum, or umbilicus. This tumor is usually painless, varies in size with the position of the body, and generally disappears in the recumbent posture. When the hand is placed over the tumor, upon coughing an impulse is usually felt. When the contents are intestinal, the tumor is elastic, resonant upon percussion, and its return within the abdominal cavity is evinced by a gurgling sound. These conditions are absent when only a portion of the omentum is in the sac.

Treatment.—The treatment of hernia consists of palliative and radical measures. The former method comprises the reduction of the hernial contents and their retention by a properly fitting truss. This should be done at the earliest possible moment, as no individual may be considered safe with dislocated abdominal organs.

Trusses are in great variety, and are often inexpertly fitted, even by physicians of experience.

A truss consists of a steel band adapted to about two-thirds of the body, a pad to compress the hernial opening, and a strap to secure the apparatus in position. The spring should be light and flexible, and is covered with leather or hard rubber. The pad varies in solidity: firm, as wood or hard rubber; elastic, as, *e. g.*, a water-pad. It should be so connected to the spring as to admit of a change of its bearing. A truss should be carefully adjusted in its bearing and of strength only sufficient to retain the parts in position. Undue pressure weakens the abdominal wall, and may injure the cord and testicle. After the truss is applied, to be certain that the hernial passage is secure, the patient may cough, bend forward and backward, stoop down with the limbs widely separated, and, finally, sit down with the limbs crossed.

Inguinal Hernia

This variety of hernia is so common that various authors estimate that from 8 to 15 percent of all males are subject to it. An *indirect* or *oblique* inguinal hernia is one which comes out through the internal abdominal ring; a *direct* inguinal hernia is one which comes out through Hesselbach's triangle, a space bounded externally by the deep epigastric artery, internally by the outer border of the rectus muscle and below by Poupart's ligament. The term *incomplete* hernia is applied to one which remains in the inguinal canal (this is also sometimes known as a *bubonocele*); whereas one which passes through the external abdominal ring is known as a *complete* hernia. In the oft-recurring cases of strangulation, when the integrity of an imprisoned loop of the intestine is endangered, life depends upon the prompt execution of wisely determined means of relief. It is the duty of every physician to become thoroughly familiar with the anatomy of the parts, since, of necessity, emergency may, at any time demand of him surgical intervention.

Normally, the inguinal canal traverses the abdominal wall so obliquely that the intraabdominal pressure holds its walls in even lateral coaptation, and any increase of this force only brings them into more firm compact. The vessels descend from above to join the vas deferens at the site of the internal ring. The ring is formed of connective-tissue fibers of the transversalis fascia, and this fascia is greatly thickened and reinforced, making, usually, a firm, strong, tendinous wall, which enters into and largely makes up the posterior border or boundary of the inguinal canal. This fascia was first carefully described by Sir Astley Cooper, and its importance was recognized for a long period by designating it as the *fascia Cooperi.*

Not seldom muscular fibers of the transversalis may be traced about and below the border of the internal ring, in which condition the internal ring may be considered as an opening through the transversalis muscle.

The formation of the internal ring and the inguinal canal is best made clear by tracing the descent of the testicle from the abdomen to the scrotum.

As the testicle passes through the abdominal wall it carries in front of it a layer from each of the muscular or fascial planes which it perforates. Thus, as it comes out of the abdomen at the spot known as the internal ring, it carries a portion of transversalis fascia along, drawing it down like a cone or funnel. Hence the application of the term infundibuliform fascia to this portion of the transversalis fascia. From the next stratum of the belly wall, the internal oblique muscle, it takes up a covering known as the cremaster, and as it passes through the succeeding layer, the aponeurosis of the external oblique muscle, it pushes a fascial investment called the external spermatic fascia in front of it, which is identical with the intercolumnar fascia.

The spermatic cord occupies and fills up the channel thus made by the testicle in the substance of the abdominal wall. This channel is the inguinal canal. It extends from the internal to the external abdominal ring, and in the adult is about an inch and a half long. It is bounded anteriorly by the aponeurosis of the external oblique muscle and in its outer third by the internal oblique posteriorly by the transversalis fascia, superiorly by the arched fibers of the internal oblique and transversalis muscles, and inferiorly by Poupart's ligament.

The external abdominal ring likewise is not a ring in the true sense of the word. It is a cleft in the aponeurosis of the external oblique muscle, situated just above and external to the spine of the pubes, having its base below and its apex above.

The coverings of an indirect hernia are derived

from the various layers of the abdominal parietes, just as are the coverings of the spermatic cord. From within outward they are peritoneum, preperitoneal fat, infundibuliform fascia, cremaster muscle or fascia, intercolumnar fascia, superficial fascia, and skin.

The coverings of a direct hernia are, from within outward, peritoneum, preperitoneal fat, transversalis fascia, intercolumnar fascia, superficial fascia, and skin. The conjoined tendon is usually enumerated among the coverings of a direct hernia, but recent studies, notably those made by Blake of New York and Bonney of Philadelphia, have shown that the conjoined tendon does not exist as a well developed structure in more than one-fifth or one-fourth of all cases. The tendon, when well developed, is firmly fixed to the crest of the pubis and iliopectinal line and above is continuous with the substance of the internal oblique and transversalis muscles, so it is not at all probable that it could be pushed forward by a hernia.

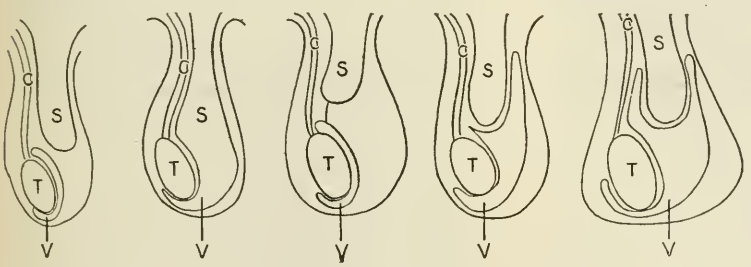
The abdominal peritoneum is delicately interwoven as an investment membrane over the vessels and the vas deferens at their point of separation. It is interesting to note that in the normally developed adult the peritoneum lies as a smooth covering over the internal ring, and that a dimple is formed in it only by traction from without upon the cord. As the result of many years of observation, it is believed that the so-called infundibular process of the peritoneum, described by anatomists as a normal condition, is due to a primarily defective development, and is essentially pathologic, although the subject himself may have escaped a hernial deformity. This is owing to the fact that the imperfect closure of the inguinal ring after the descent of the testicle is common. It was first pointed out by the celebrated Cloquet, of Paris, who found it so common that he considered it the rule rather than the exception. It must be remembered that as a special student he dissected over 500 hernial subjects. By pulling upon the cord a dimpled depression of the peritoneum should take place. The infundibular process, when at all pronounced, is pathologic and not normal.

When we consider the physiologic process by which the testicle escapes from the abdominal cavity, we wonder that the inguinal canal is not more often imperfectly closed. The most frequent cause of inguinal hernia in the male is undoubtedly the imperfect development of the structures that enter into the formation of the internal ring. Almost without exception this is due to the weakening of the lower border of the ring, which causes the opening to lose its valvular character. In this condition the pathologic infundibular process becomes a depression in the abdominal wall and permits at once of a wedge-like hydrostatic pressure to be brought to bear upon the surrounding parts. This is the reason that the disability of hernia is so common; its importance cannot be overestimated, since means for the permanent cure of hernia must be dependent upon a divergence of the ever-constant intraabdominal pressure from the direction of its axis.

Given a depression of the lower border of the internal ring sufficient to permit the internal abdominal strain to act in the line of its opening, and it is only a question of time multiplied into power to produce an inguinal hernia.

These forces may act for years before the structures ultimately give way, and then the processes go on to make every varying degree of disability, from a slight opening, easily closed by the pressure-pad of a light truss, to the enormous scrotal hernia containing many feet of intestine, with large masses of adherent deformed omentum.

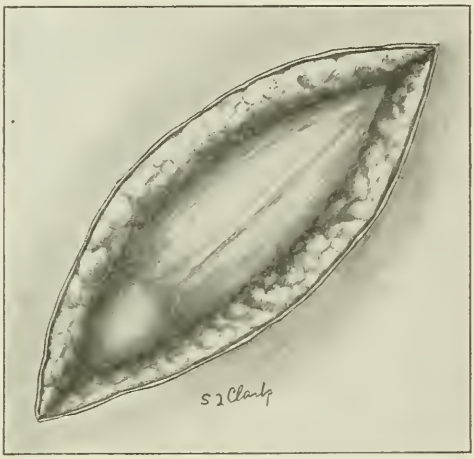
Signs and Diagnosis of Inguinal Hernia.—There is a swelling in the inguinal region having the general characters of hernia already given. When *incomplete* the swelling will be in the groin, and has to be chiefly distinguished from enlarged inguinal glands, a femoral hernia, encysted hydrocele of the cord, testicle in the spermatic canal; abscess in the inguinal canal, and, in rare instances, from fatty and other tumors of the cord. When it is *complete, i. e.*, has passed into the scrotum, the diagnosis has to be made from hydrocele of the tunica vaginalis, hematocele, solid tumors of the testicle, and varicocele. (1) In *enlarged glands*, the canal is free, the glands are felt in front of it, and some cause is present to account for their enlargement. (2) In *femoral hernia* the swelling is external to the spine of the pubes, the neck of the hernia is below Poupart's ligament, the inguinal canal is free, but the hernia can be felt through its front wall, and to return it pressure must be made in a direction downward, backward, and then upward. In inguinal hernia, on the contrary, the swelling is internal to, or covers the spine of the pubes; the neck is above Poupart's ligament; the inguinal canal is occupied by it, and to return it pressure must be made upward and outward. (3) In *encysted hydrocele of the cord* the swelling is translucent, tense, oval, and well-defined, and it cannot be returned into the abdomen. There is no



Acquired Inguinal Hernia. Congenital Inguinal Hernia. Hernia into Funicular Process. Infantile Hernia. Encysted Infantile Hernia.

C. Cord. S. Sac. T. Testicle. V. Tunica vaginalis.—(*Stewart.*)

expansile impulse on cough. (4) When the *testicle is retained* in the spermatic canal that organ is absent from the scrotum; there is no impulse on cough; testicular sensation can be obtained by pressure on the swelling; and the swelling cannot

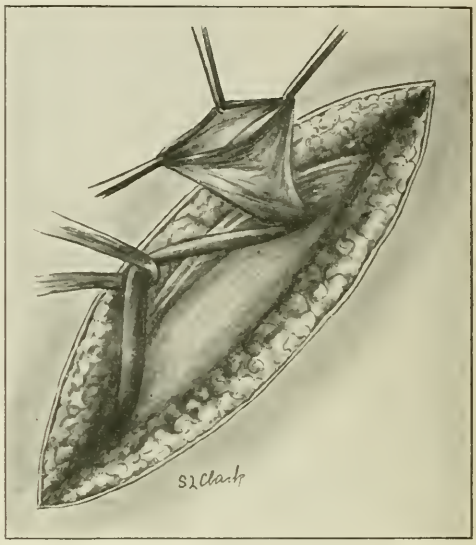


Showing the hernia presenting at the external abdominal ring after the skin and fascia have been divided and the aponeurosis of the external oblique muscle exposed.—(*Bonney and Rodman.*)

be returned into the abdomen. If the testicle is inflamed or the cord is twisted vomiting may be present, but it has not the gushing character of the vomiting of hernia, and constipation, if also present, is not complete. There may, how-

The inguinal canal is about to be opened by an incision made in the groove of a director which has been passed through the external abdominal ring. The structure to be divided is the aponeurosis of the external oblique muscle.—(*Rodman and Bonney.*)

ever, be a strangulated hernia in addition to an inflamed testicle. If in doubt an exploratory incision should be made over the tumor. (5) The swelling in a hernia begins above, in the inguinal canal, and descends into the scrotum. The swelling in a hydrocele begins below, in the tunica vaginalis, and extends upward. The testis



The sac of the hernia has been opened, the contents reduced, and the sac separated from the spermatic cord.—(*Rodman and Bonney.*)

in a complete hernia is forced to the bottom of the scrotum. In hydrocele it is situated posteriorly and at the junction of the lower and middle thirds

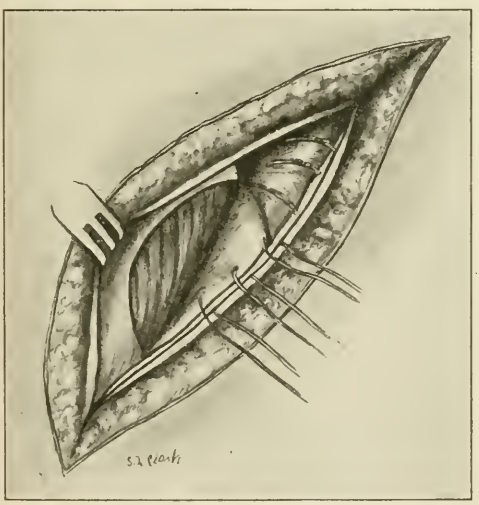
Showing Bassini's method of radical cure. The lower margin of the internal oblique muscle, together with some of the transversalis, has been sutured to the shelving margin of Poupart's ligament. The spermatic cord will be placed upon the new floor thus formed.—(*Rodman and Bonney.*)

of the scrotum. A hernia gives a distinct impulse on coughing; a hydrocele gives no impulse. A hernia is opaque to light; a hydrocele is more or less translucent, though in a hydrocele with a

thick sac there may be little or no translucency. A hernia gives no fluctuation; a hydrocele does give fluctuation. The tumor in a hernia descends well into the scrotum and hangs down straight

Showing the internal oblique and transversalis sutured to the shelving margin of Poupart's ligament without transplantation of the spermatic cord.—(*Rodman and Bonney.*)

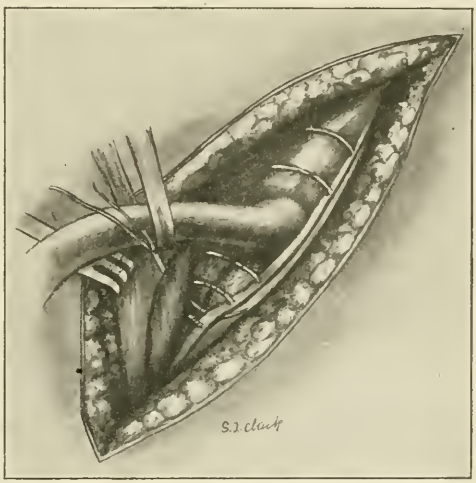
between the legs. A hydrocele is pyriform in shape and stands out more or less from the body. (6) In hematocele there is a history of injury and rapid subsequent formation of a tumor with discoloration of the part. (7) The absence of



Transplantation of the sheath of the rectus muscle.—(*Rodman and Bonney.*)

impulse on coughing together with a history of gonorrhea, tuberculosis, syphilis, or an old injury should prevent one from mistaking an enlarged testicle for a hernia. Acute disease of the testicle or epididymis should never be mistaken for hernia. (8) Hernia is more common on the right side, varicocele on the left. Both disappear when the patient is recumbent unless the hernia be irreducible, in which case there will be no liability of mistaking it for varicocele. Both give a distinct impulse on coughing, but the impulse is different. A more or less solid substance causes the impact against the finger in hernia, whereas varicocele is recognized by the soft purring made by the blood which is forced through the vessels against the finger. Then again, the descent of a hernia can be prevented when the patient is erect by pressing the finger over the internal ring and making pressure. The return of the varicocele, however, cannot thus be prevented.

Of the different procedures for the radical cure of inguinal hernia the one introduced by Bassini, in 1889, has been generally accepted and is believed



Showing a method of transplanting a portion of the rectus muscle as well as its sheath.—(*Bonney.*)

to be founded upon more correct principles and to give better results when correctly performed than any other method.

The principal features of this operation may be summarized as follows: separation of the spermatic cord, or in the female the round ligament, from the hernial sac; high ligation of the sac, which should always be made at least as high as the internal abdominal ring and a little above it when possible; removal of the sac; suture of the lower margin of the internal oblique and transversalis muscles to the shelving margin of Poupart's ligament; transplantation of the cord to the new floor of the inguinal canal thus made; and suture of the aponeurosis of the external oblique muscle over the cord to reform the roof of the canal.

This operation has been variously modified by different surgeons, and perhaps not always with good judgment. Of the useful steps which have been added to it may be mentioned transplantation of the sheath of the rectus muscle and overlapping the aponeurosis of the external oblique

muscle. The latter procedure, though usually thought to be of recent origin, was practised by Lucas-Championnière more than twenty years ago.

There are some surgeons who do not transplant the cord in every case, but we believe it is advisable to do so as a routine measure except in cases in which the hernia is associated with a retained testicle. In such cases the cord is already too short, and if an attempt be made to bring the testicle down into the scrotum, then a lower position can be obtained by suturing the muscles to Poupart's ligament with the cord *in situ*. In cases of this kind in which the hernia is large and the internal ring much dilated, greater assurance against recurrence will be conferred by removing the retained testicle. Some surgeons who transplant the cord in adults do not do it in young boys, believing that equally good results are obtained by omitting this step of the classical operation.

Obstructed Hernia.—By an obstructed hernia is meant one in which the intestinal contents have accumulated to such an extent as to block the fecal current. The term **incarcerated hernia** has also been applied to this condition, but it is an inaccurate one, as it does not convey the idea of the condition which actually exists. It occurs almost always in hernias of the large intestine, which have become irreducible as the result of inflammation. Intestine thus imprisoned loses its peristaltic power more or less, and this functional impairment, together with the mechanical conditions present, permit the occurrence of a gradual fecal obstruction.

Strangulated Hernia.—From a practical point of view the most important change which takes place in hernia is strangulation, by which is meant an occlusion of the lumen of the intestine together with arrest of its blood supply, produced by a constriction, which also renders the hernia irreducible if it was not already so before the said constriction occurred. As a result of strangulation the passage of both feces and gas is stopped and gangrene supervenes in the herniated bowel.

The effects differ, dependent upon the contents and the tightness of the constriction. The tumor usually becomes distended, tense, and tender to the touch. There is abdominal pain, often in the region of the umbilicus; a sense of constriction around the body, and the patient lies with the limbs drawn up in order to relax the abdominal walls. Vomiting early ensues. The pulse becomes feeble and rapid, the tongue dry, the countenance pinched; extreme prostration ensues, and is followed by death.

Diagnosis.—There is generally little difficulty in recognizing a case of strangulated hernia. This may not be true in some forms of partial inguinal hernia, when only a small part of the intestine is caught in the internal ring, and also when the neck of the sac has been returned, with the constricted portion of the intestine unreduced. The case may be considered one of colic, opium may be administered, and the real conditions overlooked until too late to save life.

Operation.—Modern surgical science reverses many of the old rules of practice. In the earlier days, when any opening into the peritoneal cavity was held to be attended with the gravest danger, naturally much emphasis was placed upon the importance of manipulative measures for the reduction of misplaced organs—so-called **taxis.** In the application of the reducing force, elevate the hips so as to reverse the position of the body to a considerable angle, and gently draw the contents of the hernial tumor downward, away from the line of the opening. The reduction is much more easily accomplished in this way than by direct upward pressure. If this fails, an anesthetic should be at once administered, and, if the displaced organs cannot be easily returned, the patient should be operated upon immediately. It is almost superfluous to say that this must be done with the utmost aseptic care.

Incision is freely made over the constricted parts in the direction of the canal, and the dissection carefully made, cutting from above downward until the constriction is reached. This is divided after all the parts have been brought clearly into view. The special probe-pointed knife, of varying curve, which for a century has been used, is now rarely required, since blind surgery is bad surgery, and the subsequent treatment of the parts demands a free open dissection. If the incarcerated intestine can be safely returned, this is done without delay. Oftentimes the judgment is greatly aided in this direction by watching the intestine and its returning circulation under hot irrigation. If necrosis of the intestine has occurred, it may be resected or otherwise dealt with, according to the judgment of the surgeon.

If, as is frequently the case, the patient is much reduced on account of prolonged vomiting, shock, and absorption of ptomains, so formidable a procedure as resection of the intestine and restoration of the continuity of the alimentary tract may be out of the question In such circumstances, the safety of the patient will probably be best subserved by an artificial anus (temporarily).

Masses of deformed omentum may be, and often are, wisely removed. If removed, hemorrhage from the stump is best controlled by double lines of continuous animal suture—double, since by it necrosis of the omentum is less likely to occur, because the constriction is more evenly applied, and with less force.

The peritoneal sac should be made tense by an assistant, dissected to its base, and closed at this point with a continuous suture in the line of the long axis of the wound. The resiliency of the peritoneum is such that no depression will be left upon its inner surface when thus sutured. The posterior wall of the inguinal canal is reformed by closing the aponeurotic structures from below upward upon the cord, thus reconstructing the internal ring and restoring the canal to its original length and normal obliquity.

It is usually wise to include in the suturing the posterior border of the conjoined tendon or lower margin of the internal oblique and transversalis muscles and Poupart's ligament, so as to strengthen the posterior wall of the canal. The suture material used should be absorbable. The tendon suture from the tail of the kangaroo is to be preferred.

The cord, which has been held out of the way by an assistant, is now replaced and the aponeurotic structures sutured over it in order to reconstruct the external wall of the canal, and its lower border is closed so as to form the external ring. These procedures are executed so as to restore the parts to their former normal conditions.

The skin is closed by a buried animal suture, and the wound sealed with iodoform collodion, without drainage.

The after-treatment of patients who have had strangulation is of the greatest importance. Vomiting has been so persistent that the thirst of such patients is well-nigh unquenchable. Therefore, water should be given in moderation as soon as the patient comes out of the anesthetic. Before he has done so, continuous enteroclysis should be begun. Not only is thirst relieved in this way, but the kidneys and skin are made more active, thereby eliminating poisonous products which have been absorbed. A little highly concentrated broth, albumin water, or milk may be given by the stomach as soon as they are likely to be retained.

The bowels should be allowed to act spontaneously, which they will usually do within twenty-four hours. Should such not be the case, an enema may be given. Purgatives by the mouth are dangerous, and should not be given, lest by their drastic action they cause damage to, or even perforation of, the bowel.

It is no longer a question of limiting operative measures for the cure of hernia to cases of strangulation. Little by little the opinions of surgeons have changed, until now it is considered advisable to operate for the cure of hernia in a large precentage of cases formerly condemned to the wearing of trusses.

In a recent exhaustive discussion of this subject Rodman and Bonney state that mechanical treatment should be used only when some good contraindication to operation exists, that the former is uncertain and possibly dangerous, while the latter is practically free from danger and almost invariably successful.

The operation for the cure of hernia, no matter how slight, differs only in degree from the method above described. In most cases the hernial sac is probably empty, but it should always be opened, ligated at or above the internal ring and cut away. In separating the sac care should be taken not to injure the veins of the cord nor to wound the vas deferens. If the plane of cleavage between the sac and the cord be determined, the former can usually be easily stripped off with a piece of gauze wound round the index-finger. In cases of congenital scrotal hernia a tunica vaginalis may be made out of the lower portion of the sac in the manner shown in the illustration. In operations for direct hernia it is always advisable to transplant the anterior sheath of the rectus muscle in addition to performing the various steps advocated above in conformity with the principles set forth by Marcy and Bassini. Within the last few years many surgeons have ceased to transplant the spermatic cord and apparently have obtained satisfactory results. The omission of this step of the operation, however, is not advised except when there is a retained testicle associated with the hernia. If the muscles are much weakened it is advisable to overlap the aponeurosis of the external oblique muscle. In all cases, however, it is obligatory, in order to obtain cure, to reform the posterior wall of the inguinal canal and to reconstruct the internal ring. This is the *sine qua non* of cure. It is surprising to note the ease and rapidity of convalescence in children, and the safety of operative measures even in old age. Apparently, the only risks from operation lie in the possible complication of anesthesia and wound infection.

Marcy has epitomized the records of over 3000 cases of hernial operations in which there was less than a fraction of 1 percent mortality, and the deaths were all referable to extraneous causes.

Femoral Hernia

A femoral hernia is one in which a portion of the abdominal contents pushes its way into the femoral canal and escapes through the saphenous opening. The coverings of a femoral hernia are from within outward peritoneum, preperitoneal fat, septum, crurale, femoral sheath, cribriform fascia, skin.

A femoral hernia appears as a tense globular swelling at the upper and inner part of the thigh, just below Poupart's ligament internal to the femoral vessels, and external to the spine of the pubis. It is usually small, but may sometimes be as large as an orange, or even larger. It then extends upward and outward over Poupart's ligament toward the iliac spine, and appears as an elongated soft and yielding swelling with its long axis parallel to the ligament. Its neck, however, can always be traced below the ligament toward the femoral ring. This form of hernia, although next in frequency to that of inguinal hernia in the male, is by no means common, and occurs usually in the female. A loop of incarcerated intestine is in the greatest danger because of the sharp, unyielding edge of Ginebernat's ligament above and the falciform process below. Even a few hours' constriction may produce necrosis of the intestine. On this account prompt surgical measures are of the utmost importance.

The cure of this variety of hernia is even more satisfactory than that of inguinal hernia in the male, while for anatomic reasons the safe control of the opening by a truss is far less satisfactory. For this reason all cases of femoral hernia should be operated upon.

Cure of Femoral Hernia.—An incision is made over the hernia from above Poupart's ligament vertically downward about 3 inches. After the sac is freed, drawn down, opened, and its contents returned, the neck is cleansed with the finger passed up the femoral canal. It is transfixed by a ligature above the neck; the body of the sac is cut away and with the aid of long slightly curved needles the two ends of the ligature, which has been tied round the neck are passed up the femoral canal anterior to the peritoneum

and should emerge through the abdominal wall just above the round ligament in the female, about a quarter of an inch apart. The tying of the two ends of the ligature will draw the sac well behind the abdominal parietes. While the ligatures are being inserted the femoral vein, also the spermatic cord in the male, should be protected with the finger. Then the fascia and pectineus muscle are drawn up to Poupart's ligament by each end of a suture being passed through the muscle, then up through Poupart's ligament from behind forward, where it is firmly knotted. The saphenous opening can now be closed, taking care to avoid the vein. But the chief point in femoral hernia is to remove the sac and any funnel of peritoneum above.

Umbilical Hernia

Umbilical hernia is much more common in women, especially in multiparous women of excessive adipose development. This variety of hernia is found at or near the umbilical cord. It is extremely difficult of control by a truss: in part because of the extraordinary tendency to adhesions of its contents, especially the omentum. When the intestine is strangulated, the danger is very great, owing to the usually sharp, inelastic border of the hernial opening. If the abdominal wall is excessively fat, the sac old and of considerable size, the operation is by no means easy. Especially important is the care in disinfecting the parts previous to operation, on account of the deep folds usually found in the skin. The sac should be opened with the utmost caution and its contents reduced with great gentleness. Very commonly, deformed adherent omental masses must be removed. It is well to apply a gauze pad for the protection of the abdominal contents before the dissection of the sac. This must be extended to within the ring, and the external margin of the ring is dissected free. The margin of the ring is split laterally to the distance of fully 1/4 of an inch through its entire circumference. The pad is then removed, the peritoneum is evenly sutured upon the median line, and the superabundant sac is resected. The sutures are then applied so that the split margins of the ring may be everted and brought in contact. This can hardly be done with the ordinary interrupted suture, may be effected by the mattress suture taken so as to be tied upon opposite sides, but is best closed by a double continuous suture (shoemaker's stitch). Tendon should be used and the suture should be of considerable size. Chromicized tendon is trustworthy and will remain about 3 months before absorption. The dimpled portion of skin making up the umbilical depression should be cleanly cut away, the skin closed with a buried animal suture, and the wound sealed with iodoform collodion, without drainage. When the abdomen is thick and heavy, a firm supporting bandage should be applied and worn for some weeks.

The Mayos' Operation.—1. *Transverse* elliptical incisions are made around the umbilicus and the hernia. These are deepened to the base of the hernial protrusion.

2. For an inch and a half in all directions from the neck of the sac the aponeurotic structures are carefully exposed.

3. The fibrous and peritoneal coverings of the hernia at the neck are divided in a circular manner and the hernial contents are exposed. If viscera are present the adhesions are separated and reduced. The contained omentum is ligated and removed with the entire sac of the hernia.

4. The margins of the ring are grasped with forceps and approximated. In whatever direction overlapping proves easiest, lies the proper direction for closure.

5. The aponeurotic and peritoneal structures of the ring are incised for a distance of 1 inch or more transversely to each side. The peritoneum is separated from the under surface of the upper of the two flaps thus formed.

6. Beginning 1 inch or more above the margin of the upper flap, three or four mattress sutures are introduced, the loop firmly grasping the upper margin of the lower flap. Sufficient traction is made on these sutures to permit of closure of the peritoneum with a continuous catgut suture. The mattress sutures are tied, the entire lower aponeurotic flap being pulled into the space between the peritoneum and aponeurosis above.

7. With catgut, the lower edge of the upper aponeurotic flap is sutured to the aponeurosis below and the superficial wound is closed.

Ventral Hernia

One of the rarer forms of ventral hernia is a small opening on the median line above, more commonly than below, the umbilicus. These openings occur in the linea alba, and surgically may be classed with those of the umbilicus. Owing to their rarity they are not infrequently overlooked, and by a lack of correct diagnosis a fatal issue may result.

For a great variety of reasons the abdominal cavity is now daily opened, more commonly because of diseases incident to the reproductive organs in woman and for appendicitis.

Septic wounds requiring drainage through the abdominal wall are not infrequently of necessity followed by hernia. It has been estimated that hernia supervenes in 10 percent of all celiotomies, although it certainly should be very much less. This class of hernias is often very troublesome, because of intestinal adhesions, and, as a rule, operation is advised.

The section should be made sufficiently free to permit a complete knowledge of the pathologic conditions. The resulting cure depends in large degree upon the independent suturing in layers of the component parts of the abdominal wall. The peritoneum should be separately closed, and usually 3 or 4 layers of continuous buried absorbable sutures are indispensable. Somewhat fine kangaroo tendon is to be preferred. The skin is closed by a running suture, parallel to the line of incision, as above described, and the wound sealed with iodoform collodion, without drainage.

HEROIN.—Diacetyl-morphin. An acetic ester of morphin, which appears as a white, crystal-

line, inodorous powder of faintly bitter taste. Investigation upon animals of the physiologic action of heroin has shown it to be almost identical with that of morphin. It is one of the most toxic of the morphin derivatives and the habit is readily formed. Being devoid of unpleasant after-effects, heroin, with its hydrochlorid, has been proposed as a substitute for the derivatives of opium. It is used in place of codein as a respiratory sedative. It is largely employed to relieve the cough of bronchitis. It is recommended in all catarrhal inflammations of the respiratory tract, and has been given with good results in pharyngitis, tracheitis, bronchial asthma, and phthisis. The dose is 1/24 to 1/6 of a grain, given in pill or powder or in aqueous solution with the addition of a few drops of diluted acetic acid.

HEROIN HABIT.—Heroin is an ingredient to many trade preparations widely advertised as cough syrups and remedies for asthma. The drug is considered more toxic than morphin and the habit is readily acquired. See DRUG ADDICTION, ANTINARCOTIC LEGISLATION. It has been claimed that the jungle plant—*Combretum sundiacum*—has effected a permanent cure of the habit.

HERPES SIMPLEX (Fever-blisters; "Cold-sore"). Definition.—Herpes simplex is an acute inflammatory disease of the skin, characterized by the formation of small groups of closely aggregated vesicles upon reddened bases.

Symptoms.—There are two chief varieties, according to localization: (1) *Herpes facialis* and (2) *herpes progenitalis.*

Herpes facialis (herpes febrilis, herpes labialis) has its favorite seat near the oral commissures, where it makes its appearance as closely aggregated pinhead-sized to pea-sized vesicles, which, through coalescence, often form bullæ. The lesions soon become pustular, rupture, and dry as yellowish or brownish crusts upon the skin. Vesicles sometimes develop upon the mucous membrane of the mouth, and are called by the laity "canker sores." Herpes runs its course in from 5 to 10 days. Burning and itching are usually present.

Etiology and Pathology.—Herpes facialis is extremely prone to accompany acute diseases, such as pneumonia, typhoid fever, malaria, coryza, and gastric and nervous disturbances. It is perhaps due to a mild toxic neuritis of the cutaneous nerve filaments.

Prognosis.—Favorable. Eruption disappears spontaneously in a week or ten days.

Treatment.—Mild sedative applications, such as oxid of zinc ointment, cold cream, saturated solution of boric acid, etc., suffice. In children painting with collodion protects the part from finger infection.

Herpes progenitalis (herpes præputialis) occurs both in the male and in the female. The groups of vesicles in the former are located upon the inner surface of the prepuce, glans penis, shaft of the penis, etc.; in the female upon the labia minora, labia majora, vestibulum, perineum, etc., In these locations they may, through subsequent infection, become the sites of chancres or chancroids.

Etiology.—A long, narrow prepuce seems to act as a predisposing cause. Unna found herpes progenitalis much more frequent in prostitutes than in the chaste.

Diagnosis.—It is important to differentiate herpes from the more serious genital sores. It must not be forgotten that the abrasion at the site of a herpetic patch offers any easy ingress for the chancroidal or syphilitic virus. See CHANCROID.

Prognosis.—Favorable as to immediate attack. Recurrences are extremely common.

Treatment.—Cleanliness must be strictly enjoined. Astringent lotions, such as equal parts of lotio nigra and lime-water, saturated solution of boric acid, and spirit of camphor, or dusting-powders, such as aristol, calomel, or acetanilid, may be employed. Patients with long prepuces who are subject to frequent attacks should be circumcised. The long-continued administration of arsenic has been advised.

HERPES ZOSTER (Shingles). Synonyms.—Zoster; zona; cingulum.

Definition.—Herpes zoster is an affection characterized by the formation of grouped vesicles along the line of a cutaneous nerve, and accompanied by neuralgic pains.

Symptoms.—After prodromal neuralgic pains, more or less severe in character, there appear in crops irregular groups of pinhead-sized to pea-sized vesicles, which follow in an interrupted manner the distribution of the nerve or nerves affected. When seen early, macules, papules, or vesicopapules may sometimes be distinguished. The vesicles rest upon a highly inflammatory base. The eruption is distinctly unilateral, bilateral cases being of great rarity.

In the course of 1 or 2 weeks, the vesicles, which do not tend to spontaneous rupture, dry upon the skin as yellowish-brown crusts and fall off. As a rule, no permanent trace is left, although in some cases there may be considerable scarring. The vesicles may become pustular, hemorrhagic, or even gangrenous.

The regions most frequently affected are those supplied by the intercostal, lumbar, and trifacial nerves, although any portion of the cutaneous surface may be involved. In *herpes zoster ophthalmicus,* severe destructive inflammation of the cornea, iris, and, indeed, of the entire eye, may occur.

Pain is nearly always present. It may be slight or so severe as to prevent sleep. It is variously described as of a darting, burning, drawing, or tugging character. It may persist indefinitely after the disappearance of the eruption, and may prove most refractory to treatment.

In severe cases febrile disturbance may be present. Herpes zoster seldom occurs twice in the same individual.

Etiology.—It is probably an acute specific disease of the nervous system. It is sometimes seen during a prolonged course of arsenical medication.

Pathology.—Zoster is due to an irritative or inflammatory condition of the central, spinal, or peripheral nerve apparatus. The process is usually an interstitial descending neuritis of one of

the spinal ganglia. There may, however, be merely a simple inflammation of a peripheral nerve.

Diagnosis.—A unilateral eruption, consisting of groups of large vesicles upon an erythematous base, following the course of a cutaneous nerve and accompanied by neuritic pains, is characteristic of herpes zoster. The vesicles of zoster differ from those of eczema in being larger and in showing no tendency to rupture spontaneously.

Prognosis.—Favorable. Spontaneous cure in 1 to 3 weeks is the rule. It should not be forgotten that some cases are followed by persistent neuralgia, and that others may lead to scarring or, in the ophthalmic form, to serious impairment or loss of vision.

Treatment.—**Local treatment** is concerned merely in protecting the parts from injury and infection, and, to a certain extent, in the relief of pain. Ordinary dusting-powders, such as oxid of zinc, starch, talcum, etc., may be employed, or, if there is much pain, morphin and camphor may be added:

℞.	Morphin sulphate,	gr. v
	Pulverized camphor,	gr. xx
	Pulverized zinc oxid,	ʒ j.

Dust on the affected area, cover with cotton, and bandage.

The calamin lotion is often a grateful application.

An excellent method is to paint flexible collodion (containing morphin, if necessary) upon the areas affected.

℞.	Morphin sulphate,	gr. x
	Flexible collodion,	ʒ j.

The galvanic current applied along the nerve often gives marked relief from the pain.

Internal Treatment.—The pain is often so severe as to require the use of an anodyne. The following capsule will be found of service:

℞.	Morphin sulphate,	gr. 1/8
	Phenacetin,	gr. ij
	Quinin sulphate,	gr. j.

One capsule every 4 hours or oftener.

Phosphid of zinc in doses of 1/10 to 1/3 of a grain, every 3 hours is warmly advocated by some. In the neuralgia persisting after the disappearance of the eruption antipyrin, quinin, iron, strychnin, arsenic, and the galvanic current are of value.

HETEROPHORIA.—A tending of the visual lines in some other way than that of parallelism. It may be **esophoria**, a tending of the lines inward; or **exophoria**, outward; or **hyperphoria**, a tending of the right or left visual line in a direction above its fellow; **hyperesophoria**, a tending of the visual lines upward and inward; **hyperexophoria**, upward and outward. See EYE-MUSCLES.

HEXAMETHYLENAMIN.—See UROTROPIN.

HICCUP (Singultus).—A sudden spasmodic descent of the diaphragm accompanied by a spasmodic closure of the glottis, the characteristic noise being caused by the incoming column of air striking against the partially closed glottis. It is a reflex act met in many forms of nervous and gastric disorders, uremia, peritonitis, etc. Undue distention of the stomach by food or drink, or an accumulation of gas due to faulty digestion are the most common causes. It is more frequent in children. It is found in carcinoma of the stomach, in cholera during convalescence, and in typhoid fever (when it is an indication of perforation or of the onset of general peritonitis), and as a true neurosis in gastric and abdominal disturbance. It may accompany hydrocephalus, meningitis, hysteria, or modified epilepsy.

Treatment.—Holding the breath is a popular and frequently efficacious method of arresting it. Attempts to count fifty without taking in a breath may be tried, the act necessitating a violent descent of the diaphragm. In severe cases an emetic or a stimulant to increase natural peristaltic action will give relief. Warm applications or counterirritation to the diaphragmatic region or over the cervical spine will occasionally relieve. Pressure upon the trunk of the phrenic nerve by means of the finger applied over the scalenus anticus muscle has given relief. Chloroform—administered internally, alone or with opium—camphor, belladonna, valerate of zinc, potassium bromid, musk, antacids, and, in severe cases, morphin administered hypodermically have been used. Rapidly eating ice-cream or swallowing quantities of cracked ice has been suggested. Hypnotism has proved successful in obstinate cases.

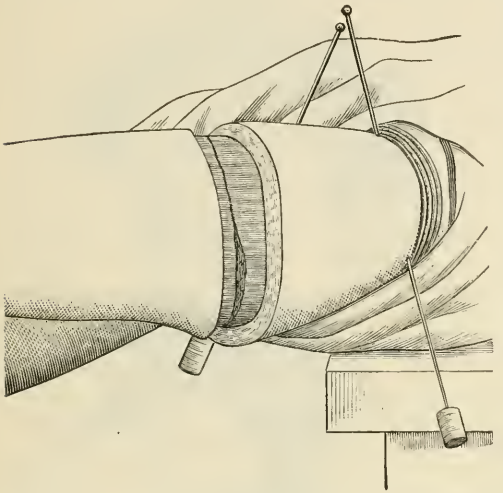
A woman presented herself at the Hôtel Dieu, of Lyons, for a rebellious hiccup, which had resisted all treatment for 4 days. She was asked to show the tongue, and it was noticed that with the putting out of the tongue the hiccup ceased. The same thing has since been tried, and with success, in other cases. All that is necessary apparently is to push the tongue strongly out of the mouth and hold it so for a minute or two. It is also suggested to try the same measure in suffocative cough, such as in whooping-cough, and choking by irrespirable gases.

HIDE-BOUND DISEASE.—See SCLERODERMA.

HIP-JOINT, AMPUTATIONS.—**Wyeth's Bloodless method.**—Bring the hip well over the edge of the table, and apply Esmarch's bandage as high as possible; then take a steel mattress needle at least a foot long, or, if preferred, a needle may be made for the purpose, and, starting at a point 1 1/2 inches below and slightly to the inner side of the anterior superior spinous process of the ilium, pass the needle through the tissues about half way between the trochanter major and the iliac spine, external to the neck of the femur, so that the point will emerge just back of the trochanter. Pass a second needle an inch below the crotch and internal to the saphenous opening, so that the point will come out about 1 1/2 inches in front of the tuber ischii; protect the points of the needles with cork; then pass a long piece of black pure rubber tubing, 1/2 of an inch in diameter, tightly around the limb, above the needles, tying or clamping it. Remove the Esmarch bandage, and examine the femoral artery to ascertain if the circulation has ceased; if it has not, tighten

the india-rubber tube sufficiently to have it under complete control.

Five inches below the pins make a circular incision down to the deep fascia, and reflect back the skin and fascia to the level of the trochanter minor; at this point make a circular sweep with the knife, dividing the muscles to the bone at a much lower level than the trochanter minor, which gives the operator a handle wherewith the subse-

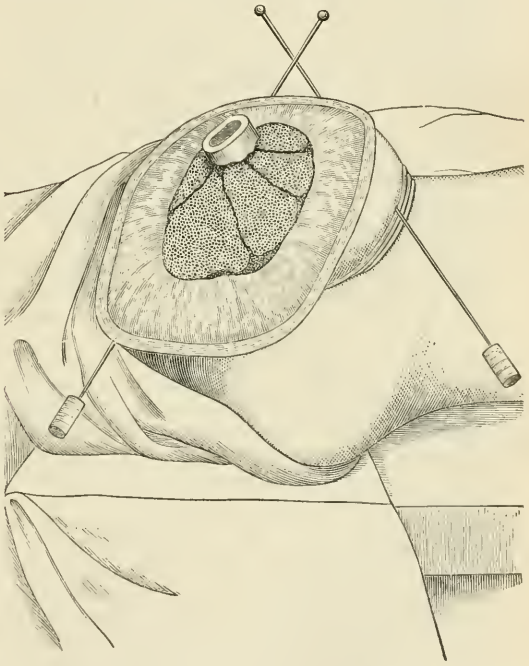


Amputation at Hip-joint, Showing Position of Pins.—(*Wyeth.*)

quent resection of the bone is rendered more simple. Secure all visible vessels, loosen the rubber band, tie all bleeding points. Then open the capsule and disarticulate the bone; this is facilitated by carrying the bone directly upward, forward, and inward, causing luxation to occur, when the ligamentum teres can be readily divided. Control all hemorrhage in the usual manner, bring the flaps in apposition by means of sutures, place the drain externally, and seal the inner end of the wound with iodoform and collodion, in order to prevent infection from urine and feces.

Senn's Bloodless Amputation.—The external incision is made about 8 inches in length, parallel to the long axis of the femur, directly over the center of the great trochanter, extending 3 inches above its upper border. When the knife reaches the trochanter from above downward, its point should be kept in contact with the bone the whole length of the remaining part of the incision. The margins of the wound are now retracted, and any spurting vessels, such as the circumflex arteries, are secured by pressure forceps. The trochanteric muscular attachments are now severed close to the bone with a stout scalpel. The thigh is then flexed, strongly adducted, and rotated inward, when the capsular ligament is divided transversely at its upper and posterior aspect. The remaining portion of the capsular ligament is severed while the thigh is brought back to a position of slight flexion. After complete division of the capsular ligament the thigh is rotated outward, and, if possible, the ligamentum teres is divided; if this cannot be readily done, the head of the bone is forcibly dislocated upon the dorsum of the ilium by flexion, adduction, and rotation inward of the thigh. After dislocation has been effected, the trochanter minor and upper part of the shaft of the femur are cleared by using alternately scalpel and periosteal elevator. By pushing the femur through the opening, as much of the shaft can be cleared as may be desired for the purpose of making a low amputation.

Elastic constriction applied as here indicated will prevent further loss of blood. Bring the limb down in a straight line with the body; flex the thigh slightly; insert long, stout, hemostatic forceps into the wound behind the femur and on a level with the trochanter minor; push the instrument inward and downward in a direction about 2 inches below the ramus of the ischium and just behind the adductor muscle. When its point is felt under the skin, make an incision about 2 inches in length, through which the instrument is made to emerge. Enlarge the tunnel with the forceps; then with that instrument draw along the tunnel a piece of aseptic rubber tubing, 3/4 of an inch in



Amputation at Hip-joint.—(*Wyeth.*)

diameter, and about 3 or 4 feet in length, withdrawing the forceps. The tubing having been grasped in its middle by the forceps, it is cut in two at that point. The anterior segment of the thigh is to be constricted sufficiently to completely interrupt both the arterial and venous circulation. Prior to constriction the limb is rendered bloodless by elastic compression and by keeping it in a vertical position for a few minutes. After having secured the necessary constriction, the elastic

tubes are caught and held in a pair of strong forceps at a point where they cross each other. The posterior segment of the thigh is constricted by the remaining rubber tube, which is drawn tightly behind.

Muscular flaps should be avoided in this amputation; if the conditions for which the amputation is made permit, a long oval anterior and short superior skin flaps should be made, which are best adapted for a useful stump and efficient drainage. In making the anterior flap the incision is commenced at the lower terminus of the straight incision; dividing the tissues down to the muscles, it is carried downward in a gentle curve across the anterior aspect of the thigh, embracing two-thirds of its circumference; it is then carried upward to a point on the inner side just below the opening of the skin occupied by the constrictors. The posterior flap is made in a similar manner, but about one-third shorter. The flaps, including the deep fascia, are reflected to the point where the muscles are to be divided; they are to be held out of the way while the amputation is being completed. The incision through the muscles should be slightly conic, the apex of the cone pointing upward. The sciatic nerve is to be resected to the extent of an inch, and the arteries are tied with catgut in the usual manner. The femoral artery and vein are now isolated and a second catgut ligature, including both of the vessels, is applied 1/2 of an inch higher up. The vein is thus ligated, and the artery is secured by a double ligature.

During the operation the body of the patient is drawn down so that the pelvis rests upon the lower edge of the table, that the position of the thigh can be conveniently changed by the assistant who is intrusted with this work.

HIP-JOINT, DISLOCATIONS. — Dislocations may be congenital, pathologic or traumatic.

Congenital Dislocation

Congenital dislocation of the hip is usually due presumably to arrested development. It may be inherited. It occurs more frequently in females. It is seldom apparent until the child begins to walk. Rarely it occurs during birth due to cramped position of the child *in utero*. The dislocation results in atrophy of the acetabulum, the cavity becoming more and more shallow, and of the head of the femur which rests behind the acetabulum on the dorsum of the ilium. The neck of the femur and the thigh muscles are shortened. The capsule is stretched, an hourglass constriction sometimes being found between the head and the pelvic bone. In unilateral dislocation there is scoliosis and limping; in bilateral, there is a waddling gait and lordosis.

Diagnosis.—Congenital dislocation is distinguished from *pathologic dislocation*, from tuberculosis, and from *traumatic dislocation* by being freely movable and painless. Trendelenburg's sign (dropping of the pelvis on the opposite side, which normally would be raised, when the patient stands on the affected limb) is present as it is in *coxa vara*, also the waddling gait and presence of the trochanter above Nélaton's line, but it differs from the latter condition in that the head of the femur is not in the acetabulum and there is free up-and-down movement. The X-rays should be used in every case.

Treatment.—If recognized early, the length of the limb may be restored by continuous traction for six months to a year, with the limb abducted and pressure made over the great trochanter.

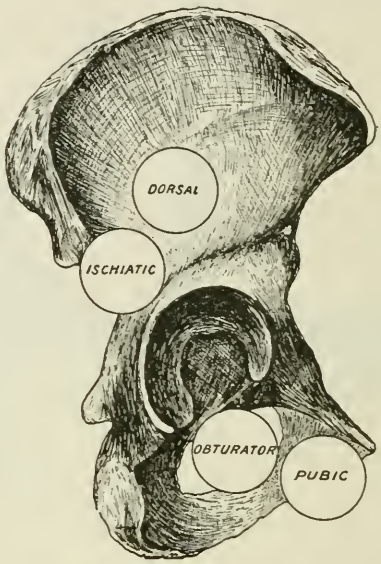


DIAGRAM OF THE MOST COMMON DISLOCATION OF THE HIP.—(*Thomson and Miles' Manual of Surgery.*)

Hibb's Method.—This is based primarily upon the fact that by flexing the thigh upon the abdomen and extending the leg, the head of the bone can be forced downward behind the acetabulum to a point below it. This has been confirmed by means of the X-ray in cases up to the fifteenth year. By this procedure, namely, flexing the thigh in extreme adduction and extending the leg, the muscles, chiefly the adductors and hamstring group, are made to exert in some measure the same pressure in forcing the head downward that they exert in holding it upward when the limb is in full extension parallel with its fellow, so that in this way the muscles which heretofore have furnished the chief difficulty to the reduction of the dislocation become a most important aid in its accomplishment. And what is of equal importance, the greater extension put upon the muscles by the increase in the length of the limb after reduction, makes them contribute largely to the stability of the reduction, and obviates the necessity of wearing plaster so long. Such resistance as the capsule and the Y-ligment may offer will not be increased but may be diminished, and in either case may be ignored. The problem, therefore, becomes one of adopting some means by which in bringing the leg back from the adducted and flexed position by abduction and extension, the head may be forced to travel upward by a more anterior route into the

acetabulum. The two conditions necessary to this end are, first, absolute control of the pelvis, and second, a trochanteric pad so shaped and held against the trochanter that it will force the head upward and forward. An instrument has been devised by Hibbs for this purpose. By means of straps, the pelvis is perfectly controlled, and by the use of a pad held against the trochanter, the head is forced forward into the acetabulum as the leg is brought down, through abduction and extension, from its adducted and flexed position. The reduction is accomplished without traumatism to any structure and as the integrity of the muscles is unimpaired the reduction is more secure, and it is only necessary to wear plaster for a short period of from three weeks to three months.

The Lorenz bloodless method may be used in children, up to seven years in bilateral cases, and about nine years in unilateral cases. Under anesthesia the shortened muscles are stretched by flexion, extension, and abduction of the thigh, during the last of which the adductor muscles are powerfully kneaded. The head of the bone is then drawn down to the level of the acetabulum by traction on the leg, and the thigh flexed on the abdomen, rotated internally, abducted, and finally rotated outward while pressure is made on the trochanter. With the limb in flexion, abduction, and eversion, a plaster-of-Paris cast is applied to the pelvis and thigh as far as the knee. The child is allowed to walk with the limb in this position in order to deepen the acetabulum. At the end of six months the cast is removed, the flexion and abduction lessened, and another cast put on for three more months.

For still older children Hoffa and Lorenz have each devised a *bloody method*. In the Hoffa operation the joint is opened by an incision similar to that of Langenbeck in resection of the hip, shortened muscle-fibers and fascia are cut, the acetabulum is deepened with a gouge, the dislocation is reduced, the limb is fixed in eversion and abduction for a few weeks, and finally the limb is straightened. The Lorenz operation is similar except that the joint is opened in front, the muscles are not severed unless it be found necessary in the case of the hamstrings.

Pathologic Dislocation

Pathologic dislocation may be the result of inflammatory effusion into the joint, as in osteoarthritis, tuberculosis, or it may occur during fevers due to distention when the thigh has been kept continuously flexed in bed, or in paralysis due to the action of unaffected muscles.

Traumatic Dislocations

Traumatic Dislocations.—Dislocations of the hip are infrequent (about 2 percent of all dislocations), very great violence being required to displace the femur head from the deep acetabulum and to tear the strong capsule and accessory ligaments and overcome the firm muscular support.

Etiology.—Adult males from 25 to 50 are most affected, women being less exposed to the producing violence, and children and the aged usually sustaining fracture from a similar force. But it may occur as a purely traumatic injury at birth. Like other traumatic dislocations, these are due almost entirely to indirect force overstepping the range of mobility in the way of flexion, extension, rotation, abduction, and adduction.

Mechanic Production.—To understand this we must take into account the *length of the neck* of the femur, the *angle* at which it joins the shaft, the powerful Y-ligament arising from the anterior inferior spinous process and inserted with its two branches into the outer part of the intertrochanteric line and the internal portion of the same ridge; also the fact that the shallowest portion of the acetabular rim is below.

If excessive *inward rotation* is produced until the femur neck impinges aginst the acetabular rim in front, the head of the bone tends to be forced through the capsule posteriorly. On the other hand, if the rotation is *outward*, the head will be forced through the anterior portion of the capsule. *Hyperflexion* and *hyperextension* alone do not tend to make the bone-head more than simply rotate in its socket. *Abduction* alone would tend to make the bone-head escape from the acetabulum at its lowest and most defective portion. *Adduction* alone could scarcely be made to produce a dislocation so long as the Y-ligament remains intact. The tendency would rather be to force the bone-head through the floor of the acetabulum, producing, in conjunction with the direct inward application of force to the trochanter, the so-called *central* dislocation. If the force were sufficient to rupture the Y-ligament, adduction would, of course, favor the escape of the bone-head through the capsule in an upward direction. The *typical* dislocations are all associated with the preservation of the Y-ligament. When this is ruptured, the dislocation is *atypical*, the bone-head occupying an indifferent position, the symptoms not being characteristic, and the same hindrances to replacement not existing.

While hyperflexion and hyperextension alone, with the trochanter in its normal position between inward and outward rotation, would not tend directly to produce dislocation, when combined with inward and outward rotation, abduction, and adduction they become powerful factors. In throwing the bone-head out of the socket in amputation at the hip, for instance, after the lower part of the capsule has been severed, no method is so easy and certain as forcing the thigh diagonally up over the abdomen, in forced flexion and adduction. Most of the hip dislocations are therefore produced by combinations of forces acting in the various directions already indicated; they are rarely produced by a force acting in one direction only, as in infracotyloid dislocation, due to forced abduction alone.

It would seem probable that Allis' statement is correct, that the bone-head in all of these dislocations with an intact Y-ligament primarily escapes from the lower acetabular segment, its final resting-place being determined by the continued action of the displacing force upward or downward. In practically all dislocations the ligamentum teres

is lacerated. The dislocating force sometimes acts on the limb, the body being fixed; and sometimes on the body, the limb being fixed.

Backward dislocations are the most common, resulting most frequently from forced flexion, adduction, and inward rotation of the thigh. The joint capsule is usually ruptured at its posterior lower portion, and the ligamentum teres at its insertion into the femur head. When the head escapes above the tendon of the obturator internus muscle, it finally lies on the dorsum of the ilium, and the dislocation is termed **iliac**; when below the obturator internus tendon, it rests in the sacrosciatic notch, and is termed **sciatic**, or **ischiatic**.

The symptoms are almost the same in either case; the thigh is rotated inward, and is elastically fixed in flexion and adduction, more or less marked; the

BIGELOW'S METHOD OF REDUCING BACKWARD DISLOCATION OF HIP.

BIGELOW'S METHOD OF REDUCING FORWARD DISLOCATION OF HIP.

trochanter is prominent, more so in iliac than in sciatic dislocations; the limb is shortened, more in iliac dislocation, and with the two thighs placed in right-angled hip flexion; the trochanter lies above the Roser-Nélaton line; passive motion is possible over small arcs in the way of adduction and inward rotation, is very painful, is greater in the iliac than in the sciatic variety, the limb returning to its first position when the force ceases to be applied; attempts at abduction and outward rotation produce a characteristic elastic resistance, due mainly to tension of the iliofemoral ligament. The bone-head can sometimes be directly palpated, especially if the patient is anesthetized, which is usually necessary both for satisfactory examination as well as for the succeeding reduction. Frequently, however, the heavy pad of the overlying gluteal muscles, together with the swelling, completely masks the presence of the head in its abnormal position.

Backward dislocation, especially of the iliac variety, is sometimes confounded with fracture of the neck of the femur. Careful consideration of the cardinal points of the two conditions should always make the matter clear.

Treatment.—In order to effect reduction the patient is laid on his back on the floor on a thin, hard mattress or a folded blanket, and is thoroughly anesthetized; any movements which contemplate reduction must produce relaxation of the powerful iliofemoral ligament. This is accomplished by flexion. The thigh is therefore flexed upon the body, and the leg upon the thigh; one hand grasps the leg at the popliteal space, while the other grasps the ankle. With the limb in this position simple traction will sometimes bring the head into place if it has lodged close to the acetabular rim. Ordinarily, however, certain definite further movements must be made. After flexion the limb is adducted, carried across the abdomen to the sound side, and then slightly rotated outward; it is next swept across the abdomen outwardly in circumduction, and is finally brought down to a straight position beside its fellow. This manipulation usually succeeds in making the bone-head retrace its path through the torn capsule into the acetabulum. Great care and gentleness must be exercised in the movements. If the bone-head fails to enter the rent in the capsule, this maneuver will sometimes cause the head to pass around the acetabular rim to the front of the joint (circumduction). A similar secondary movement of the bone-head may take place at the time of dislocation, so that the position of the head is not always a clue to the location of the rent in the capsule.

If the first attempt fails, strong traction should be tried with the thigh at right angles to the body and strongly adducted; this failing, traction in the abducted position, with slight outward rotation, should be tried. Finally, all efforts may sometimes fail because of the lacerated capsule forming a true obstruction to reduction. In such event, incision and direct replacement become the only remaining resources.

Forward dislocation occurs less frequently than backward, but its subvarieties are more numerous; thus, we have **suprapubic** dislocations, the head resting in the inguinal region above the pubic bone; **pubic**, the bone-head resting on the pubic bone internal to the pubic eminence; **obturator**, or **thyroid**, the head lodging over the obturator foramen; **perineal** dislocation, which is very rare, and in which the head is dislocated as far as the ascending ramus of the ischium.

Symptoms.—Forward dislocations are the result usually of abduction and outward rotation combined with overextension, more rarely with flexion. The limb is held in marked abduction, outward rotation, and flexion, the latter varying with the kind of dislocation, being slight in suprapubic and more marked the further the bone passes inward and downward; abduction varies in the same way, but inward rotation is only possible when the bone-head has cleared the pubic bone and invaded the pelvis. In the suprapubic and pubic forms the head is readily palpable, and its rounded outline can sometimes even be seen; in the obturator and perineal forms it lies more deeply and can be palpated less surely. In the former the limb is shortened, while in the latter it is either lengthened or remains about normal. Some authors state it can also be shortened.

Diagnosis.—Confusion with fracture of the neck

of the femur offers here also the chief difficulty in diagnosis. The single, symptom of elastic fixation is enough to differentiate, but the X-ray will reveal the real condition.

Treatment.—The first step in the reduction of the suprapubic variety should be hyperextension and traction, so releasing the bone-head from its hooked position over the pubic bone, the patient being meanwhile conveniently placed on his back on a table; the thigh is then flexed and the patient put on his back on the floor. The movements should be carried out in such a way as to first relax the Y-ligament, and then bring the bone-head into the acetabulum; this is accomplished in general by flexion in the abducted position, and then inward rotation followed by adduction. Circumduction of the head is especially prone to occur in thyroid dislocation, and is controlled by simultaneous traction on the limb.

Downward dislocation of the hip is very rare, resulting from extreme abduction; the bone-head rests at the lower margin of the acetabulum or on the tuberosity of the ischium; the thigh is flexed, abducted, perhaps everted, the knee-joint being sharply flexed. Reduction is usually easily effected by traction in the flexed position, followed by outward rotation and extension.

Atypical dislocations, as already stated, result from concurrent rupture of the Y-ligament. In such cases the femur head may find a resting-place in any direction without producing characteristic symptoms. The **supracotyloid dislocation** may result primarily with rupture of this ligament, or secondarily from an iliac dislocation.

HIP-JOINT DISEASE.—Hip-joint disease is a tuberculous lesion of the hip-joint, originating as an ostitis or a synovitis, chronic or progressive in character, and tending toward recovery, ankylosis, or complete destruction of the joint. Many different terms have been proposed to describe this affection, the most common of which is coxalgia; but that used is satisfactory and practical.

In collecting statistics it has been found that, next to the spine, the hip-joint is the most frequently affected by tuberculosis, the reasons for which may be briefly stated as follows: (1) the age of the epiphyses at the time of the beginning of the disease; (2) the direction of the nutrient artery to this joint; (3) the effect of superincumbent weight upon this articulation; (4) the effect of heredity on this as well as other articulations; (5) the influence of traumatism or injury upon this joint, leading to the localization of tuberculous germs in the inguinal parts.

In regard to age it is found that the disease occurs most frequently under 14 years, the proportion being 84.5 percent. Boys are more frequently affected than girls.

The influence of heredity is traceable in about 75 percent of cases but like all predisposing factors, its importance in individual cases is only relative. It must be remembered that the disease may be acquired by a child without any hereditary factor, an injury to the joint permitting the tuberculous germs that have gained entrance to the blood to localize themselves in the joint.

Pathology.—In most instances of hip-disease the lesion is primarily osseous, the head of the femur being the point usually attacked. Occasionally, particularly in adults, synovitis becomes tubercular arthritis. More rarely infection occurs from injury to the round ligament, a condition described and illustrated by Coulson and Agnew. The tubercle bacilli, having located themselves, continue their destruction until circumscribed by reactive inflammation or by the destruction of the joint or the death of the patient. Occasionally the process becomes a necrotic one, the epiphysis being separated as a sequestrum. In very rare cases the inflammation runs its course without the formation of pus (*caries sicca*), the lesion corresponding to fibroid phthisis in the lungs. The cartilage covering the head of the bone may be lifted off by granulation tissue. This form is exceedingly painful, and calls for early incision or erasion. According to the location of the primary lesion, three varieties are recognized: (1) The femoral, (2) the acetabular, and (3) the arthritic.

Symptoms.—A certain group of symptoms that pursue a more or less typical course is observed in every case. These were formerly divided into three stages but there is no pathologic or clinical reason for preserving this classification in the hip-joint when it is not used in any other joint.

The early symptoms are limping, pain, hardening about the joint, deformity, muscular atrophy, and glandular swelling in the neighborhood of the joint.

Limp.—Limping is very important as an early sign, although it is not a constant one. It is very slight and is noticeable sometimes in the early morning and again later in the day. Limping is due to stiffness and pain in the joint, and becomes intensified by exertion.

Pain.—Another early symptom is pain, which is usually referred to the knee. In most cases it is periodic, coming on suddenly while the child is at play, often in the latter part of the day, and disappearing at night. Various theories have been offered to explain why this pain is referred to the knee, but the one now generally accepted is that it is reflex, occasioned by pressure on the obturator nerve, transmitted to the short saphenous nerve, through the communicating branch passing between the femoral and profunda femoris vessels.

Hardening.—Very little induration or enlargement of the joint is noticed early in the progress of the disease unless it is of the very acute type.

Deformity.—This is one of the earliest and most constant symptoms. There exists a reflex tetanic contraction of the muscles of the joint, apparently the result of an effort to fix the joint and to diminish the jar upon motion. This fixation and the consequent atrophy of the muscles constitute the most positive symptoms. The limb is held slightly flexed and often slightly abducted or adducted.

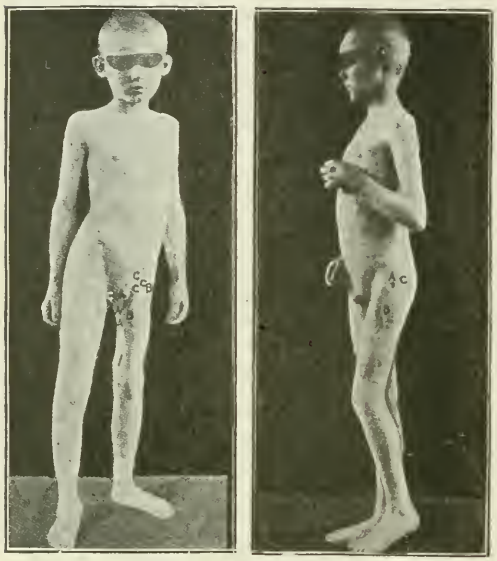
Under anesthesia the muscular spasm disappears entirely, thus showing the true nature of the rigidity.

Wasting.—Very early and most persistent is the

atrophy of the muscles of the thighs and buttocks. This has been noted as early as the eighth day and is due partly to disuse, partly to trophic disturbances, and partly to nerve irritation. The latter theory was deduced by Brown-Séquard from his experiments.

Glandular Swelling.—The enlargement and tenderness on palpation of the deep glands above Poupart's ligament may be frequently noted as an early sign.

General Condition.—Usually very little constitutional disturbance is exhibited at this period. The children may even increase in weight, and thus give a false idea of health.



Exit of Abscesses in Hip-Joint Disease.
A. Arthritic. *B*. Femoral. *C*. Acetabular.

Night-cries.—This distressing symptom happens early in the night, just as the child is falling asleep. The muscular relaxation, occurring as consciousness is lost, permits friction and pain within the inflamed joint, and the child awakens with a loud cry.

Abscesses.—Although there are some cases in which there is no suppuration—caries sicca—yet an abscess may occur early in the progress of the case. It is more commonly seen early if the joint itself has been involved.

The above illustrations indicate the location of the abscesses.

Grating.—A joint crepitation may be brought out by rubbing together the exposed cancellous tissue in the bone surfaces. The cartilage becomes eroded and grating ensues.

After the formation of abscesses the general health of the child is affected, as is shown by anorexia, pallor of the skin, fluctuations of temperature, irritability and diarrhea.

As the disease progresses, shortening, adduction, dislocation or ankylosis with recovery or suppuration, destruction of the joint, asthenic symptoms, and death from some visceral lesion may occur. Adduction, flexion, and shortening are characteristic of the position of the thigh. These changes are due at first to destruction of cartilage and ligaments, but later to real bone absorption and dislocation of the head of the femur.

As a consequence of the adduction and shortening, we have undue prominence of the buttock on the affected side, marked upward and backward tilting of the pelvis, lordosis, and a sometimes compensatory double lateral spinal curvature.

Tendency toward recovery is indicated by a gradual improvement of all the general and local symptoms—the sinuses close, the hardening and enlargement diminish, and the joint becomes ankylosed.

When the disease results fatally, it is due to exhaustion from continued suppuration, terminating in amyloid degeneration of the viscera. Tubercular meningitis is a not uncommon termination.

Lordosis of Lumbar Spine When Limb is Straight
P. Psoas muscle.—(*Walsham.*)

Diagnosis.—Hip-joint disease may usually be recognized if attention is paid to the cardinal symptoms.

These include:

1. Spasm.
2. Wasting.
3. Lameness, limp.
4. Deformity of limb—apparent and real.
5. Pain.
6. Swelling.

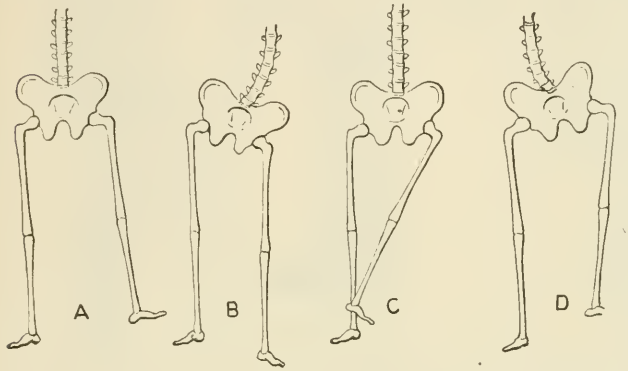
1. The deformity in the hip-joint is due to reflex tetanoid spasm, and is the most important symptom present. It is this spasm which produces the flexion, adduction, and abduction of the limb. The spasm can best be recognized by first examining the sound limb to ascertain the normal degree of motion. The spasm is most marked in the adductor muscles, and early adduction of the limb before the appearance of abscesses, and before the occurrence of much pain, is considered by the French authorities to be diagnostic of acetabular disease.

Disappearance of Lordosis When Limb is Flexed.
P. Psoas muscle.—(*Walsham.*)

2. The wasting of the limb in the early stage is directly due to spasm of the muscle. This is the second most important symptom. The disease of the limb later leads also to wasting.

3 and 4. The limp or lameness very early present is due first to the peculiar attitude of the limb, and later to the shortening that occurs from the absorption of the head of the bone.

As a diagnostic sign, limping is of little value. The attitude of the limb in the early stage is due to the spasm of the muscles, as before alluded to, producing flexion, *abduction*, and *adduction* of the limb. The body adapts itself to the changed position of the thigh, and this, with some atrophy of the gluteal muscles, produces the changes in the position of the gluteal folds, or *flattening of the buttock*, formerly considered so characteristic of hip-joint disease. At the present time the changes in the gluteal folds are not considered of great diagnostic importance. The changes that occur in the position of the limb from muscular spasm lead to "apparent elongation of the limb." This is determined by measuring from the umbilicus to the internal malleolus on the sound side, and also on the affected side taking care that both limbs are in same relative position. Later, the attitude of the limb is also affected by the absorption of the head of the bone, leading to what is known as "real shortening of the limb." This is determined by measuring from the anterior superior spinous process on the sound side to the internal malleolus on the same side, and comparing this with a similar measurement on the affected side.



Effects of abduction (*A*) and adduction, (*C*) in causing apparent lengthening (*B*) and apparent shortening (*D*) of the limb in hip-disease, when the limbs are parallel. Note effect on lumbar spine. In *C* and *D* foot should be inverted.—(*Walsham.*)

The position of adduction of the limb produces "apparent shortening" while abduction causes "apparent lengthening."

5. The pain, which may be absent in hip-disease, is referred to the inner side of the thigh above the knee to a space as large as can be covered by the hand. The pain varies in the different forms of the disease. In the femoral form it is often intermittent. In the arthritic it is acute, constant, and accompanied by a feeling of tenderness and fulness about the joint. In the acetabular form the pain is more marked on motion or jarring, but the pressing of the joint surfaces together or striking or jarring the limb to elicit pain should be discouraged, as pain thus elicited is untrustworthy as a diagnostic sign.

6. Swelling of the hip-joint is most marked in the femoral form, being confined to the front and back of the joint. The swelling is usually accompanied by induration or hardening about the great trochanter. This is best determined by grasping with the thumb and forefinger the trochanter on each side. The trochanter of the affected side will be found much thicker.

The most important diagnostic signs of hip-joint disease are limitation of motion, wasting, attitude of limb, and pain and induration.

Differential Diagnosis.—Hip-joint disease is frequently mistaken for other diseases through failure to recognize the cardinal symptoms. Rheumatism of the hip is so rare in childhood, and the positive symptoms are so easily recognized, that it is surprising to find how frequently hip-joint disease is mistaken and treated as rheumatism. Contusions and sprains of the hip are frequently mistaken for hip-disease, and this is not strange, considering that acute synovitis of the hip-joint from injury not infrequently becomes chronic tuberculosis of the hip. The pain in the hip-joint, the perfect movement of the joint in every direction, and the absence of the cardinal symptoms of spasm, atrophy, deformity, and induration would render the diagnosis positive. From periarthritis, congenital dislocation, infantile spinal paralysis, and sacroiliac disease, attention to the positive symptoms of hip-joint disease will readily distinguish this affection. From psoas contraction in lumbar Pott's disease, hip disease is readily distinguished by the free function of the joint when the leg is still further flexed upon the abdomen. There are two conditions, however, from which it is difficult to distinguish hip-joint disease. These are hysteric affection of the hip and chronic synovitis of the hip-joint. From the hysteric affections of the hip true hip-disease may be distinguished by the absence of an inherited or acquired neurotic diathesis, the presence of hyperesthesia and paresthesia, the readiness with which the spasm may be overcome, and the effect of antineurotic medication upon the patient. The use of anesthesia is an important aid in determining the absence of the positive symptoms of hip-disease. From chronic synovitis, a differential diagnosis is at times impossible, but generally if the case recovers within six months it is not tubercular. As the treatment of the two is identical, the differentiation is not so essential.

Prognosis.—The tendency of hip-joint disease is toward recovery. The progress is directly influenced by the age of the individual, type of the disease, the presence or absence of complications, and the efficiency of mechanic treatment. The influence of traction methods of treatment upon the progress and prognosis must be recorded, since the use of traction in the treatment of these cases appears to result in a more speedy cure and in fewer abscesses. Perfect recovery occurs in the arthritic form of the disease in a certain proportion of cases, but in the other forms there is always more or less

deformity. Death usually occurs from amyloid changes in the liver, kidney, or spleen, from excessive suppuration, or from tubercular meningitis. This last condition is sometimes the termination in the mild attacks of the disease. The occurrence of albuminuria is not now considered a fatal symptom, but one calling for operative interference.

Treatment.—The treatment of hip-joint disease should include the employment of constitutional remedies, together with efficient local measures. Improved hygiene, abundance of sleep, and liberal diet, should be included in the general management of the case. Constitutional medication includes the use of tonics, especially iron and hypophosphites, alteratives, such as cod-liver oil, iodin and its salts. A change of climate is sometimes recommended, but with discretion, the seashore being best suited to the late suppurative stages, and the mountains for the same type of phthisical cases that are improved by an increased altitude—viz., during the first stage or in nonsuppurative cases.

Local medication is of no value. A hot-water bag may give temporary relief to pain but efficient mechanical treatment is more to be relied upon. Bier's congestion treatment, while difficult of application to this part, is always indicated in this form of disease.

Special Treatment.—The special treatment of hip-joint disease may be divided as follows:

A. Mechanic Treatment.
1. Recumbency.
2. Fixation.
3. Traction.

B. Treatment of Complications.
1. Abscesses.
2. Deformity.

C. Surgical Treatment.
1. Aspiration.
2. Incision.
3. Erasion.
4. Excision.

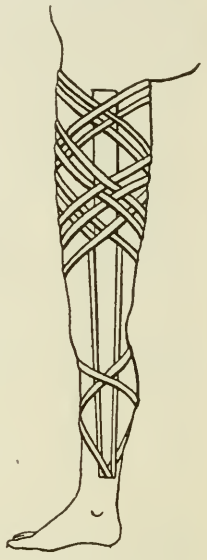
Mechanic Treatment.—Recumbency as a mode of treatment is employed by all orthopedic surgeons, the only difference of opinion being as to the length of time during which patients should be confined to bed. The appearance of complications—*i. e.*, abscesses or deformity—is an indication for bed treatment; but in the absence of these, two or three weeks are often sufficient, especially if a traction splint is applied while the patient is in the recumbent position. Fixation of the joints by means of splints is recognized as an important principle in the treatment of this disease, but almost all surgeons agree on the superior advantage of traction, with or without fixation. The expectant plan of treatment, without the use of apparatus, has now become obsolete, and science and humanity both demand that, as soon as a correct diagnosis is made, expectant methods should be abandoned, and that fixation or traction, or both, should be employed. Traction methods are undoubtedly preferable. The advantages of the traction methods are threefold: (1) A shorter time for cure; (2) a diminished number of abscesses; (3) a perfect recovery.

1. A shorter time will be required if traction methods are continuously employed from the beginning to the end of the treatment, because of the earlier relief, the less frequent relapses, and the smaller number of abscesses and other complications.

2. Comparison of the methods employed abroad with our own shows a much larger number of abscesses in Europe.

3. When continuous traction methods are employed, perfect recovery may be more confidently expected in a large numbr of cases. Different types of disease must be recognized, and the arthritic variety is more amenable to treatment than either of the others; but notwithstanding this, the most favorable variety will be conducted to the better termination, more quickly, and with a greater hope of a perfect result by the use of traction methods.

Adhesive Plaster Cut for Extension.



Extension Adhesive Plaster Applied.

Cases in which perfect motion has been obtained, with a fraction of an inch of shortening, and without deformity—ideal results—have been frequently reported.

Continuous traction can best be accomplished by dividing the treatment into 4 parts:

(1) Bed traction; (2) the traction splint with crutches; (3) the traction splint alone; (4) the traction splint as a protective apparatus.

1. Traction may be employed while the patient is in bed by using the ordinary Buck's method for fracture of the femur; applied by means of Z-O plaster; or the Sayre extension may be used, made of heavy adhesive plaster (manufactured by Maws, of London, or Shivers, of Philadelphia). The plaster is so cut that there are 5 pieces or tails, radiating from the narrow end, to which the buckles are attached. It is applied by lacing and crossing these ends over one another up the limb, and is secured with a muslin bandage. By means of a short leather strap, from 3 to 6 pounds extension is made. Bed extension is only employed during acute exacerbation, and only for a limited period—for 1 or 2 weeks or until the acute symptoms have subsided.

2. The traction splint is adjusted, as described in all systematic works, by securing the waist-band, buckling the perineal straps, attaching the straps of the foot-piece to the leg extension, and, by means of the ratchet and key, making extension until a comfortable amount of traction has been made. Motion should be restricted at the pelvic joint, and the apparatus must be applied and traction made in the direction of the axis of deformity. If the case has been treated thoroughly and efficiently from the commencement of the attack, deformity

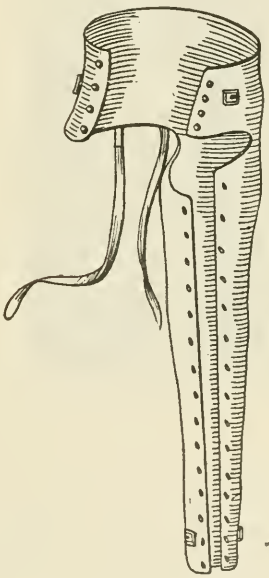
Traction Splint Applied as in Third Part of the Plan of Treatment.

will be avoided, or if an acute attack occurs, with pain, flexion, and adduction of the limb, the patient should be at once placed in the recumbent position until it has subsided. The foot-piece should extend sufficiently below the shoe on the diseased side to allow the foot to swing clear, and a high shoe should be worn on the sound limb, sufficiently high to allow the brace to swing clear (about 3 inches) when the child walks on crutches. The brace-crutch treatment is employed until all evidence of acute disease has disappeared, or for from 6 to 8 months.

3. At the end of this period the crutches are discarded and a shoe about 1 1/2 inches high is worn on the sound side to equalize the length of the limbs, and the child walks on the traction splint.

4. After a variable period, ranging from 1 to 2 years, the high shoe is altogether discarded, and the foot-piece is fitted close to the shoe of the affected side, the perineal straps are loosened, but are still worn, and the patient continues the use of the traction splint, as a protective brace only. This should be worn for at least a year after the cure has been established, to prevent relapse. The treatment by the plaster spica with a high shoe on the sound side and crutches is all that is needed in many cases and will be found to secure as brilliant results as any other method in proper cases. The "weight-bearing" method of the European surgeons is likewise efficient in those cases where the tendency to breaking down is absent but there is no doubt that this method promiscuously applied is more destructive and more frequently followed by abscesses than those of fixation and traction.

Treatment of Complications.—In regard to the treatment of abscesses much difference of opinion exists among orthopedic authorities, some incising all abscesses early, and others permitting spontaneous absorption or rupture in all cases. The preferable course seems to be a middle one, the abscesses being incised when they increase rapidly in size or when they exhibit a tendency to burrow to great distances, or when they interfere with the health of the patient. Even in adopting this plan of treatment, most abscesses will require incision. Before incising an abscess connected with the hip-joint, permission should be obtained to proceed with whatever operation may be necessary. Great care should be taken to avoid pressure upon the abscess, unless an attempt is to be made to entirely remove the diseased parts; since the tuberculous germs may be disseminated throughout the body, and general tuberculosis or tubercular meningitis result. The cavity of the abscess should be washed with bichlorid solution 1 : 4000, or, if large, with a boric solution or sterile



Modified Plaster Cast Traction Splint.

Modified Traction Splint Applied.

water, 1 to 2 drams of sterilized iodoform oil, 5 to 10 percent, and the dressing to be completed with a sterile compress and bandage. The whole treatment will extend over a period of from 2 to 4 years.

For general use by practitioners who are unable to have special apparatus manufactured to suit each case, a simple and efficient plan of traction may readily be devised by means of a modified plaster cast. The adhesive plaster strips are first applied. The entire limb on the affected

side should be thoroughly padded with cotton batting, secured by a roller from the malleoli to the waist. This is best applied in the vertical position, with the patient standing on a chair and the limb swinging clear, or, better, resting on an inverted basin or dressing-stool, with the buttocks close to the edge of the bed and an assistant making firm traction. Before completing the cast, 6 buckles are incorporated in the dressing: 2 front and 2 back, each over the spinous processes, and 1 about 3 inches above each malleolus. These may be attached to strips of tin, leather, or webbing. The cast may be strengthened by strips of tin or by a wood bandage. It is then trimmed out around the perineum, and may be made removable by splitting down the front, binding, and adding eyelet hooks. Two perineal strips are attached to the buckles above and the extension strips are secured below, and by these means any amount of extension may be made. A cheap wooden patten on the sound foot and a pair of crutches complete an outfit with which hip-joint disease may be treated scientifically.

Excision of the Hip by Lateral Incision.

Same, Showing Degree of Motion.

The deformity of the thigh incidental to the disease may be overcome in the early stages by bed treatment with extension. In the later stages, when ankylosis, either fibrous or bony, is present, operative procedures will be necessary, and these may best be determined by skiagraphy. If the ankylosis is of the fibrous or false variety, it can be overcome by tenotomy, myotomy, or forcible correction; but none of these operations should be performed until the sinuses, if present, have been closed for one year. When true or bony ankylosis is present, the deformity can only be overcome by osteotomy or osteoclasis, the former operation being recommended. Several methods of osteotomy have been proposed, but the only one now in general use is the division of the femur below the trochanters, subcutaneously, with a saw, or what is known as Gant's operation, or by means of a chisel, as modified by Maunder. The operation of Adams through the neck of the bone is not suitable, and the operation of Barton between the trochanters does not give so good results as the one already recommended. After all operations for correction of bony ankylosis it must be remembered that the limb will remain fixed in the corrected position, and motion at the hip-joint must not be expected.

Surgical Treatment.—Aspiration of the abscess is not satisfactory, because the contents of the joint are not always sufficiently fluid to be removed in this manner. When the distention of the capsule is great in acute cases, aspiraton will occasionally arrest the disease, and always relieves the acute symptoms. It should always be performed under the strictest antiseptic precautions, and the wound should be hermetically sealed with iodoform collodion. The injection of iodoform oil in this joint has not been satisfactory, since it causes irritation and usually requires incision for its removal.

Simple incision of the joint is sometimes employed instead of aspiration, but has no particular advantage over the latter, except when the joint contents are thick. By far the best operation upon the hip-joint is that proposed and performed by De Forest Willard. It consists of an exploratory incision over the most dependent portion of the abscess, the removal with a heavy curet of "every particle of diseased tissue that can be reached," the insertion of rubber drainage-tubes, and the application of a large antiseptic dressing. This operation is as far in advance of formal excision to-day as excision was formerly in advance of amputation.

When the exploratory incision reveals too extensive areas of disease to remove by erasion, formal excision of the hip-joint will be required. The indications for this, at the present time, formidable operation are long-continued suppuration, extensive disease of the bone, and myeloid disease of the kidneys, as evidenced by albuminuria. The latter condition, it will be observed, is considered, at the present time, an indication for operation, and not a contraindication. X-ray photography is of considerable importance in deciding between erasion and excision. In considering the operation of incision it must not be forgotten that it is at least as fatal as the corresponding amputation. After this operation, and in performing it, every necessity for the comfort and safety of the patient must be at hand. After this operation motion is usually obtained.

HIPPOCRATIC FACIES.—See Face in Diagnosis.

HIPPOCRATIC OATH.—A solemn engagement entered into in ancient times by young men about beginning the practice of medicine, and especially by the Asclepiads. The formula itself has been ascribed to Hippocrates, and is certainly

very ancient. It was as follows: "I swear by Apollo the physician, by Æsculapius, by Hygeia, Panacea, and all the gods and goddesses, that, according to my ability and judgment, I will keep this oath and stipulation: to reckon him who teaches me this art equally dear to me with my parents; to share my substance with him, and relieve his necessities if required; to look upon his offspring upon the same footing as my own brothers, and to teach them this art, if they shall wish to learn it, without fee or stipulation; and that by precept, lecture, and every other mode of instruction I will impart a knowledge of this art to my own sons, to those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to no others. I will follow that system of regimen which, according to my best judgment, I consider best for my patients, and abstain from whatever is injurious. I will give no deadly medicine to any one if asked, nor suggest any such counsel. Furthermore, I will not give to a woman an instrument to procure abortion. With purity and holiness will I pass my life and practise my art. I will not cut a person who is suffering with stone, but will leave this to be done by those who are practitioners of such work. Into whatever house I enter I will go for the advantage of the sick, and will abstain from every voluntary act of mischief and corruption, and, further, from the seduction of females or males, bond or free. Whatever in connection with my professional practice, or not in connection with it, I may see or hear, I will not divulge, holding that all such things should be kept secret. While I continue to keep this oath inviolate, may it be granted me to enjoy life and the practice of my art, respected always by all men; but should I break through and violate this oath, may the reverse be my lot."

This oath has not always been administered to practitioners in modern times (though something equivalent to it was used in the Middle Ages, and especially in the school of Salerno); but every honorable and right-minded physician governs his private and professional life by its noble principles. It is the oldest and one of the best of the codes of medical ethics.

HIPPUS.—Spasmodic pupillary movement. See PUPIL.

HIRSCHSPRUNG'S DISEASE (Idiopathic Dilatation of the Colon).—This may occur at any period of life, but it is usually of congenital origin and is most frequent in male infants. Although mild cases may remain stationary, the disease generally progresses and terminates, in from a few weeks to many years, in death from peritonitis, toxemia, or pneumonia. The whole colon, or only a part, usually the sigmoid, may be involved. The bowel is greatly dilated, hypertrophied, sometimes elongated, often kinked, and frequently contains stercoral ulcers, which on healing may lead to stenosis.

Symptoms are obstinate constipation (the bowels may not move for weeks), sometimes alternating with diarrhea; emaciation; possibly convulsions or tetany; ballooning of the abdomen; visible, audible, and palpable peristalsis; foreshortening of the thorax; flaring of the costal margins; and interference with the action of the heart and lungs from pressure

Treatment is at first medical, viz., liquid diet, tonics, strychnin, colonic lavage, electricity locally, and abdominal massage. If these measures fail appendicostomy and daily irrigations of the colon, short circuiting of the colon by ileosigmoidostomy, or excision of the colon or its most affected part may be performed. In desperate cases right inguinal colostomy is indicated, more radical measures being adopted after improvement has occurred (Stewart).

HIRSUTIES.—Hypertrichosis; hypertrichiasis; polytrichia; trichauxis. That condition in which the hairs of the body are increased in number or size, or grow in unusual situations, or in normal situations in unusual length or number. See HYPERTRICHOSIS.

HIVES.—A name loosely applied to almost any papular eruption of the skin. In Great Britain the term is applied to croup, laryngitis, and to chicken-pox; in the United States it is limited to a transitory form of URTICARIA (*q. v.*).

HOARHOUND.—See MARRUBIUM.

HOARSENESS.—Harshness of the voice depending on some abnormal condition of the larynx or throat.—See DYSPHONIA, LARYNGITIS.

HODGKIN'S DISEASE.—See LYMPHADENOMA.

HOLADIN.—An extract of the entire pancreas, capable of digesting starch and proteids and splitting up fats. It is recommended in the treatment of indigestion. Dose, one capsule (containing 3 grains).

HOLOCAIN.—An efficient local anesthetic and germicide. Many observers report that it is superior to cocain in nearly all operations upon the eye. It has apparently little or no effect on the conjunctival vessels, iris, or ciliary muscle. The hydrochlorid is used in 1 percent solutions. Hotz says that it is more painful and irritating to the conjunctiva than cocain. Its antiseptic properties are greatly in its favor. It has been used with success in the treatment of suppurative keratitis.

HOMATROPIN.—Hydrobromid of homatropin, a derivative of atropin, has of late years been extensively used as a means of suspending the accommodation. (Note that *homatropin slows* the heart; *atropin quickens* it.) It is likely, to a great extent, to supplant all other mydriatics in ordinary refraction work, as, while equally efficient when used correctly, its effects last less than one-fourth as long as those of atropin, and about half as long as those of duboisin, and there is little danger of inconvenience from constitutional poisoning. Conjunctival hyperemia and a slight burning sensation usually follow its use, but are much less marked now than at the time of its first introduction, probably on account of improvement in the process of manufacture. Again, these can, in a great degree, be offset by the use of cocain. Homatropin, as a mydriatic and cycloplegic, is especially serviceable in office practice, in which it is often desirable that the

paralysis of accommodation shall not extend over 1 or 2 days. In such cases it should be prescribed:

℞.	Homatropin hydrobromid,	gr. j
	Cocain hydrochlorid,	gr. ss
	Distilled water,	℥ j.

Before refraction, 1 drop of this solution should be used in each of the eyes, 5 or 6 times, at intervals of 10 minutes. The accommodation usually returns by the end of the second day.

HOMESICKNESS.—See NOSTALGIA.

HONEY.—See MEL.

HOOK-WORM DISEASE.—Hook-worm disease is the most common of all of the serious maladies of the South. It occurs in the majority of people in many localities, while in others it is scarcely found at all. Associated almost always in its severest forms with poverty, it is peculiarly a malady to which the poor mountaineers and the equally poverty-stricken inhabitants of other portions are particularly susceptible. As might be expected from its African origin, the disease is

HOOK-WORM, NATURAL SIZE. The smaller is the male.

most common where the negro has been most numerous. Through ages of infection the black man has acquired an almost perfect racial immunity from the effects of the parasite, but this in no way interfered with the fact that he frequently harbors a considerable number of the worms. The negro coming in contact particularly with the poorer class of white persons, the disease was quickly transferred to the latter, and the parasite, sapping the life and vitality of its new host, for the most part prevented normal, mental and physical development, and precluded in many cases the possibility of further advance in life. As a consequence of this, particularly in extreme southern Georgia, and in the lower portions of neighboring southern states, there are up to this day communities of "dirt-eaters," who present the very lowest type of the white race in America. In such communities it is safe to say that practically the entire population is hook-worm diseased. A few miles away the large planter is probably himself entirely free from the infection; his bare-foot children may harbor a greater or less number of the parasites but are rarely or never badly infected, and subsequent to their adoption of shoes—no re-infection taking place, and the worms already in their intestinal tracts dying off—become entirely normal in a few years. So also is it true that in the village not far away the children, owing to the general use of the toilet, are but little infected. It is thus that we have in the same locality communities in which the percentage of hook-worm subjects would run well up into the nineties, and others where the disease practically does not exist. As Dr. Stiles has shown, very soon after the poor whites commence work in the cotton mills they begin to improve, and in a few years practically lose their hook-worm infection. Therefore, in the south, child-labor in mills is the greatest possible existing boon to this class, and instead of being condemned it should be encouraged in every possible way.

History.—As has so often been found where parasites of this class are concerned, members of the genus were first discovered in the lower animals. Goeze, in 1792, first described the parasite his observations having been made on the particular species of hook-worm that inhabits the intestinal tract of the common badger. Seven years later Froelich discovered a somewhat similar worm in the intestinal tract of a fox. He named the parasite "Haakenwurm," or "hook-worm." He it was also who originated the name "Uncinaria" the same being the zoological name for the genus in which this worm, along with many other allied species, is still included by most writers.

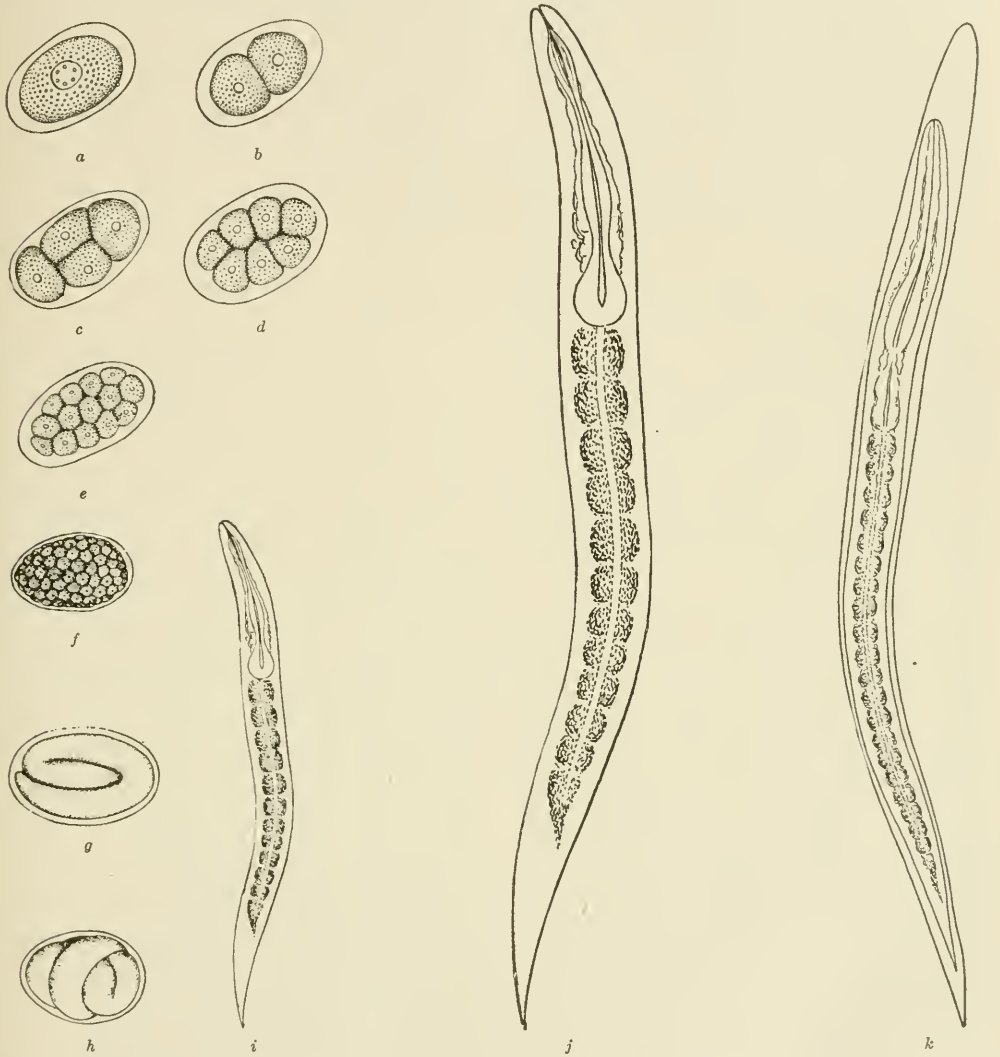
This worm was first observed as a human parasite in 1838 by Dubini, and six years later he described it under the name of Ankylostoma duodenale. This observer did not succeed in establishing thoroughly the relationship between the worm and its ill-effects, though he recognized the great probability of its evil influence upon its host. Ten years later it was, however, clearly demonstrated, by both Bilharz and Griesinger that the profound anemia so common in northern Africa and known as "Egyptian chlorosis," was unquestionably produced by the parasite. In 1879 it was shown that laborers working on the St. Gotthardt tunnel were almost all infected with the worm, and Perroncito, who discovered this fact, also demonstrated that the disease prevailed in the mountains of northern Italy to a considerable extent, being commonly called "mountain cachexia" or "mine anemia."

Following these observations reports became more numerous, until at the present time we have a vast literature on the subject, coming from almost every place on the globe, where the climatic conditions favor the development of the worm.

The first case of hook-worm disease in this country, where the diagnosis was definitely established, was that reported by Blickhahn in 1893. This was followed by publications from a large number of American observers, resulting during the next ten years in demonstrating beyond question that this disease was exceedingly frequent in the southern portion of the United States. It was shown in 1902, by Stiles, that the parasite commonly found in America differs in some minor particulars from those found in Egypt and in southern Europe, and this writer therefore gave, to what was supposed to be our new-world species of the worm, the name of Uncinaria Americana. In 1903 Stiles, on account of the peculiarities presented by the worm, as found here, proposed to make a new genus for it, and renamed it the Necator Americanus. It has been shown by Loos that this so-called American hook-worm is largely present in many of the negroes of southern Africa; and there can scarcely longer remain a doubt that it was brought over by slaves, and should therefore rather have been called Necator Africanus.

Natural History of the Parasite.—The hook-

worm belongs to the order of nematodes or round worms, being related to and much resembling the small "thread-" or; "pin-worm." The two parasites present marked differences, however, which may be detected by the naked eye of one well acquainted with their peculiarities; microscopically they differ still more. Like the pin-worm, the hook-worm is comparatively small, and in the the male. The former varies in length from 11 to 14.5 mm. (average 13.87 mm.); at their thickest portion they are from 0.41 to 0.60 mm. (average 0.509 mm.); the male is from 8 to 10 mm. in length (average 8.8 mm.); at their widest portions they are from 0.30 to 0.39 mm. (average 0.343 mm.). The worm tapers toward either end, and at the cephalic extremity both sexes have about



a, Newly-laid egg. *b*. Beginning segmentation. *c*. Egg, further stage segmentation; *d*. *e*. Advanced stage segmentation. *f*. Preceding formation embryo. *g*. Embryo in first stage. *h*. Embryo just before leaving shell. *i*. Embryo after leaving shell. *j*. Embryo several days old. *k*. Embryo covered by chitinous envelope in stage to infect.

perfectly fresh state the parasite is often of a pinkish-gray color; after death, however, it generally assumes a dull grayish tint. Unlike the pin-worm this parasite is not found except in extremely rare instances in the feces, and their presence in the stools therefore plays no part in making the diagnosis of the disease.

The Necator Americanus is comparatively small, the adult female being always larger than the same diameter (0.088 to 0.132 mm.). The neck of the parasite makes a rather abrupt backward curve as the head is approached, with the result that in order to see into its mouth the worm must be viewed from its posterior aspect. When examined with a comparatively low power of the microscope, the mouth is found to be somewhat ellipsoidal in shape with the long axis anteroposteriorly. The opening is surrounded by a con-

tinuation of the chitinous envelope that covers the body. Projecting into the cavity from its antero-lateral margins there are two plates, separated from each other in the median line, which are known as the "ventral lips." Posteriorly, there is a tooth-like projection in the cavity which is known as "dorsal conical tooth," and just posterior to this there is a single plate which is known as the "dorsal lip." At a still greater depth in the cavity there are found several tooth-like structures which subserve the purpose of grasping the mucous membrane of the intestines, which is sucked into the mouth of the parasite; the structures just referred to in the anterior portion of the cavity are known as "ventral lancets," while those that are situated farther back are called "lateral lancets." The ducts of the esophageal gland unite at the base of the dorsal conical tooth, and a common duct is formed which is conducted through this tooth and opens at its free extremity—furnishing a device for injecting a probably poisonous secretion of the glands just referred to, closely resembling a similar arrangement observed in the teeth of venomous serpents.

Back of the head, and in close proximity to the esophageal mouth of the worm there is a mass of glandular structures called "head glands;" these apparently differ somewhat from the esophageal glands that lie posterior to them, but with which they are intimately connected anatomically. Still further back on either side of the esophagus lie the cervical glands, the duct of which opens on either side of the parasite's neck at some little distance from the head.

The vulva of the female worm is situated on the abdominal surface somewhat anterior to the middle portion of the parasite's body. The anal opening in both sexes is on the ventral surface near the termination of the tail.

Eggs.—The eggs of this hook-worm appear to be somewhat larger than those of the old-world species, Harris having found from a large number of measurements that they vary in length from 57.5 to 80 μ and from 35 to 52.5 μ in diameter (the average being 66.52 μ and 42.53 μ respectively). The eggs, as encountered in the feces, are oval in shape, and are covered externally by an extremely thin shell which is perfectly transparent. Between the solid contents of the eggs and the capsule, there intervenes a clear space, which is doubtless filled with fluids. When the eggs are perfectly fresh some of them contain a single granular body within their centers, within which there is a nucleus. In most instances, however, as a result of rapid multiplication, there are a number of these cell-like structures. At the proper temperature and in the presence of moisture the granular bodies within the eggs rapidly increase in number, and in 24 to 36 hours completely fill the egg cavity; shortly following this the embryo takes form, and we find in the place of the pre-existing structures within the egg a minute snake-like worm, which exhibits more or less active movement. Quickly following this the capsule of the egg bursts, and the embryo is liberated, coming out tail first.

While it is true that the eggs of the pin-worm somewhat resemble those of the parasite in question, one acquainted with the peculiarities of both would have no difficulty in distinguishing between them. The former are decidedly smaller, their shells have a double contour, they are usually somewhat flattened on one side, and frequently contain live embryos. It is furthermore true that the eggs of the hook-worm are only seen in the rarest instances in the feces—even though the parasite may exist in great numbers in the intestine of the individual—and confounding the two is therefore almost out of the question.

Embryo.—There is nothing more curious than the development of the embryo and its subsequent invasion of the human body. In fact, the method of infection is so extraordinary that when it was first announced by Loos, scientific men of all classes received it with almost universal incredulity. However, in a short time the facts in connection with it were so clearly demonstrated that there could be no longer room for doubt.

There are certain conditions necessary for the development of the eggs of this parasite after they have passed from the infected individual. There must be, to begin with, a temperature sufficiently high. The eggs do not appear to hatch to any extent below 70° F. Harris found the most suitable temperature to be between 80° and 90° F., though growth may undoubtedly occur at a still greater heat. Quite as important as the proper temperature is the admission of oxygen to the eggs, which is brought about by the feces being washed over the surface of the ground by rains, and also, by the activities of the larvæ of various flies. It is also essential that the eggs remain moist; but if they are covered entirely by water, oxygen is excluded, and they undergo degenerative changes and die within a few days when the temperature is high. Thus the requisites are a summer temperature, admission of oxygen, and a certain amount of moisture. All three of these conditions are ideally present during a greater part of the year in the South. Under such conditions there may be observed within the eggs in 12 to 36 hours, a curious snake-like body, the "embryo," which soon forces its way through the thin shell of the egg, and then burrows into the neighboring earth. When the next rain occurs, or when dew-drops collect, this tiny little creature quickly finds its way into the water, where it remains (if the water does not dry up) until the development necessary for penetrating the human body is completed. When the dew-drops dry or the pool of water evaporates the embryo burrows into the moist earth, there remaining until a fresh down-pour of water beckons it to the surface again.

When the embryo emerges from the egg it has a length of from 350 to 400 μ but in a week or so it grows to a length of 600 to 700 μ with diameters at their widest portion of from 25 to 30 μ. The worm at this stage possesses the power of very active movement. Externally it is covered by a transparent chitinous membrane about 5 μ in thickness, through which the comparatively simple

structure of the internal portion of the parasite may be observed. In a few days after the larva is hatched the body recedes from its outer covering, and a second membrane is formed over the external surface of the worm. Between the outer covering and the second one formed internal to it there is a clear space within which the worm moves. The entire body is still capable of active movement, though this is never so active as before.

The body of the parasite now undergoes a change in form; from rhabditiform it gradually becomes filariform in appearance. During this period, (6 to 10 days), the embryo molts again—there being formed a second covering that detaches itself from the body of the parasite, and which may be seen within the outermost covering already referred to, as the latter is not usually shed off at once. At this stage the embryo is "ripe" and is ready to infect, but under *proper* conditions may live for months in dew-drops, pools of water or in the moist earth. It is capable of migrating to quite a distance as compared with its microscopic size, it having been shown that on the sides of moist tunnels the embryo may crawl up to a height of at least six feet. For a long time it has been known that, when these embryos were swallowed infection with the hook-worm results, but it was only a few years ago that Loos suggested the astounding probability that they may actually penetrate through the skin of the human being, and ultimately find their way to the intestinal tract. Shortly after this Bentley made the observation that hook-worm disease and ground-itch were both exceedingly common among the coolies of India, and that the earth in the neighborhood of their habitations simply swarmed with the embryos of the hook-worm. Exposing the skin of individuals to earth containing these immature parasites, he observed that this was followed by typical ground-itch, and that at the same time all of the embryos disappeared from the earth that was being applied. He therefore concluded that it was not improbable that ground-itch was due to some action of the hook-worm embryo. Still later Loos established by actual microscopic demonstration that the young of the hook-worm are capable of penetrating the skin of man and of animals, and he eventually showed that when inoculated on the skin of the dog they pursue the following extraordinary course. After quickly boring through the skin and deeper tissues, they work their way through the lymphatics into the general blood-current, or bore directly into the smaller blood-vessels. Moving with the blood-current they pass to the heart, and are thence pumped into the smaller vessels of the lungs; here they penetrate the air-sacs, and thence make their way into the smaller bronchial tubes, then the larger ones, and finally crawl from the trachea into the throat. They are then swallowed, and passing along with the food quickly reach the small intestine, where they immediately grasp the mucous membrane with their mouths, which, being especially adapted to sucking and hanging on to any tissues that they may find congenial, they hold on to without difficulty. The parasite grows rapidly and in six or eight weeks is fully mature, after which the females begin to lay eggs, and the curious life cycle begins over again. The average life of the parasite is not definitely known; probably it is not less than six or eight years, and in some instances even considerably longer. Some of these worms appear to cause much severer disturbances in the body than others, since it is found that some persons with a comparatively small infection of the parasites suffer much more than those who harbor a considerably greater number. This must be due either to some of the worms being more virulent than others, or to certain persons being more susceptible to their disease-producing power. It is generally believed that the parasite not only acts by sucking blood, but that it secretes a poison, which, being constantly injected into the mucous membrane of the intestine, is responsible for much of the damage.

Symptomatology.—As would naturally be inferred, hook-worm disease is most common in those who come in most intimate contact with the ground. As going barefoot is an almost universal practice among children of the South, they are the ones who suffer most. Exceptionally the disease is encountered in adults, and even in persons advanced in life. The vast majority of typical hook-worm subjects are children from three to four years of age to the time when they begin to wear shoes and cease to play on the ground. As the worm, however, unquestionably lives a number of years, young persons up into the twenties commonly show more or less clearly the results of the presence of the parasites, and their stools contain eggs of these worms.

As has already been said, in the majority of instances ground-itch is the first clinical manifestation of this affection. Where, however, the number of embryos entering the body is small, no perceptible results are seen on the skin. It is not improbable that quite a number of persons, particularly in later life, get the disease very slowly, only a few of the embryos entering the body at intervals during the summer months.

The most pronounced effect of the presence of the hook-worm is a profound anemia, indicated by a dry, harsh, pale, yellowish skin and bloodless lips. It is not uncommon to find the blood reduced one-half or two-thirds in richness, and as a consequence of this the unfortunate victim suffers a multitude of ill-effects throughout his entire body. One of the most notable consequences is that the boy or girl fails to grow—it being quite common to see a young man from fifteen to twenty years of age who has the appearance of not being more than eight or ten. The individual remains a child mentally as well as physically. The tissues are relaxed, as shown by the giving way of the abdominal walls, and abnormal protrusion of the belly. As the malady progresses there is more or less dropsy in severe cases, accompanied by shortness of breath and great weakness. Ulcers may develop on the front of the legs. The patient presents a sad, hopeless countenance, it being evident that he is suffering from some serious malady. Those affected with this disease

lack energy as other sick persons do, but they are not lazy.

Diagnosis.—This is readily determined by microscopical examination of the feces, as the eggs are, as a rule, very numerous, although where the number of the worms is small a more careful study of the specimen is necessary. In the laboratories of the State Boards of Health in the South, the services of a skilled microscopist can be secured free of cost. Before treatment is undertaken the feces should always be carefully examined for the eggs of the parasite, as otherwise mistakes will arise; for, while the disease is clinically very characteristic, there are other affections that much resemble it—notably chlorosis and chronic malaria.

Prophylaxis.—Those suffering from the malady should at once be treated, because, as has already been explained, they are sources from which the disease spreads to their associates, and even back to themselves. This treatment should be carried out as far as possible in the fall, winter and spring months, since to do this in the summer (the ground around the farm houses by this time swarming with the embryos) would often result only in temporarily freeing those affected by the parasite. The eggs do not hatch in cool weather, nor is it probable that the embryos survive the cold that accompanies the winter months in the greater portion of the South. As a consequence patients treated during this period could not reinfect the ground, and the parasites not living from one summer to the next the disease would be thoroughly eradicated. Where these precautions are not taken, great care should be exercised in preventing those living in localities known to be infected from coming into direct contact with dew-drops, pools of water on the ground, or moist earth. All should wear shoes, and children should not be allowed to play out of doors at some distance from the house. Of course the most important of all preventive means is to have a toilet, particularly for the children. Indiscriminate scattering of fecal material is responsible for the prevalence of this disease, and the most stringent rules should be adopted looking toward the correction of this great unhygienic nuisance. Not only does hook-worm disease (but other affections, such as typhoid fever and dysentery) spread as a consequence of this very common practice, and there is consequently no sanitary advance that would be of so much importance to our people as providing a properly constructed water-closet in every home, schoolhouse and church, and insisting on its being used. It is also of importance that the flies be completely excluded from the toilet, and we should therefore do away with the present methods employed in constructing them. The feces should be received into some proper receptacle completely protected from flies and all animals, and at proper intervals the contents should be carried to a suitable place and buried. Precautions of this kind are unquestionably more or less troublesome, but the time consumed would in no way compare with the suffering, invalidism, and death and pecuniary loss that result from the present indifference.

Treatment.—When the more highly organized animal parasites occur in the human intestine we have in several instances drugs that kill the infective agent without seriously disturbing the general health of the patient, and most happily the hook-worm is one of the organisms that is most easily destroyed and removed in this way. On the day before the treatment is to be begun the patient is advised to eat little dinner and no supper at all. Late in the afternoon he is given a full dose of calomel (2 to 10 grains, depending upon the age and strength of the patient). Castor oil is not generally advised as all oily substances dissolve and make more readily absorbable the thymol which is to be given on the following day, and might in this way cause unpleasant effects. If the calomel does not act freely during the night a full dose of Epsom salts in hot water should be given as soon as the patient wakes up the next morning. After the bowels have thoroughly acted, finely powdered thymol in capsule is then given—the quantity depending on the age and strength of the patient (the apparent age rather than that stated by the patient, since many of these unfortunates appear 6 to 10 years younger than they really are). The dose of thymol should be divided into two equal parts, the first half being given at once and the second at the expiration of an hour. Following the administration of the medicine the patient should be instructed to remain in bed, lying on the right side to more or less assist the drug to pass quickly into the intestine from the stomach. Harris suggests that the drug should be given in the following quantities:

Up to 5 years of age,	10 to 15 grains.
From 5 to 10 years,	15 to 30 grains.
Ten to 15 years,	30 to 60 grains.
Fifteen and over,	60 to 120 grains.

In advanced age the quantity should be somewhat less than during middle life.

The patient should be allowed no breakfast and no dinner on the day of treatment, and it is not wise for him to take more liquids than absolutely necessary. A cup of coffee once or more during the day is permissible, but nothing in the nature of food should be allowed. If the patient experiences no ill effects from the thymol, it is well to put off the administration of a laxative until four or five o'clock in the afternoon, at which time some saline should be administered in hot water. After the bowels have acted well the patient may be allowed to have food.

When the treatment is carried out faithfully in the way just described it is rarely necessary to repeat it. It is, however, well after a couple of weeks to again make a thorough examination of the feces, and should the microscope reveal the presence of eggs the treatment should be repeated, and this should be done over and over again until exhaustive examinations of the feces show by absence of the eggs of the parasite that all have been expelled.

Castor oil should not be used as a purgative on the day of treatment, as it might produce poisonous effects by dissolving the thymol and aiding its absorption; alcoholic drinks should not be taken

in any form, as they act in the same manner as castor oil. It cannot be too strongly insisted upon that the drugs that kill the hook-worm might, under certain circumstances, kill the patient, and it is of the utmost importance that these medicaments be given by an experienced physician.

There are still other drugs that are more or less employed for the purpose of killing this parasite, betanaphthol especially being used by many physicians. In doses of from 30 to 60 grains it is said to act quite as well as thymol.

Iron and tonics following the administration of the thymol are of no particular value.

The public should be especially warned against patent and proprietary medicines for hook-worm disease, as they all have as a basis thymol, betanaphthol or some other drugs with more or less poisonous properties, and are therefore unsafe in the hands of those unacquainted with their proper use.

HOOPING-COUGH.—See Whooping-cough.

HOPS (Humulus).—The dried strobiles of *Humulus lupulus*. Its constituents are a liquid volatile alkaloid named *lupulin*, a volatile oil, which consists in part of *valerol* and *trimethylamin*, the crystalline, bitter principle *lupulinic acid*, also wax, resin, and tannin. Except the last named, the constituents are most abundant in the glandular powder of the strobiles, which is named *lupulin*. Dose, 10 to 45 grains. It is a bitter stomachic tonic and feeble hypnotic, increasing the cardiac action. A poultice of hops is a favorite remedy for painful conditions and in inflammations. **H., Infusum,** unof., 1/2 of an ounce to the pint. **Fluidextractum H.** Dose, 5 to 15 minims. **Lupulinum,** *lupulin*, is the glandular powder separated from the strobiles, of bright, brownish-yellow color, aromatic and bitter taste. The volatile oil exists in the Lupulin grains, and contains *valerol*, which is changed by long exposure, giving a disagreeable odor to old hops. Dose, 5 to 15 grains. **Oleoresina Lupulini,** *oleoresin of lupulin* an acetone extract. Dose, 2 to 5 grains.

HORDEOLUM.—See Stye.

HORMONES.—Internal secretions. The name applied by Starling and Bayliss to "chemical messengers" from one organ to another which effect a correlation of the functions of the organs concerned

HOSPITAL GANGRENE.—See Gangrene.

HOT-AIR TREATMENT.—In the treatment of lumbago, acute sprains, particularly of the ankle-joint, hot air is commendable. In acute articular rheumatism excellent results may be obtained, and in stiff and contracted joints, it is of great value. In chronic joint affections and in open ulcerations due to infection, whether from the bacilli of tuberculosis or otherwise, passive hyperemia as advocated by Bier is preferable.

In experiments on animals the jet of hot air from a Holländer apparatus, directed upon the bleeding surface of a kidney, liver, or severed blood-vessel, will arrest the hemorrhage by the formation of an eschar commencing around the edges and gradually spreading over the entire surface, mechanically checking the flow, and Schneider concludes that it would be equally effective on man. The heat is only 39° C. at 5 mm. from the apparatus, and hence is not sufficient to injure the organ. For several reasons Schneider found steam less effective and less convenient, masking the field of operation, etc.

An apparatus for the treatment of joints consists of a cylinder-shaped oven, lined with asbestos, on the bottom of which rests a radiator to distribute the heat equally. Above the radiator swings a hammock, upon which the limb is placed for the bath of hot air. At one end variously shaped sleeves are attached to take in or cover any part of the body. The other end of the oven is detachable, so that in case of overheating it can be quickly removed and the temperature instantly lowered. Two dampers regulate the heat, and removal of the end is therefore rarely necessary. Wood alcohol, gas or electricity may be used to generate the heat. The part to be treated is thoroughly covered with double thicknesses of a Turkish towel or blanket to protect the skin from too intense heat radiation and to absorb the moisture from the profuse sweating that ensues. The sensations of the patient are the sole guide to the degree of temperature to be administered, stopping short of discomfort. Pain requires the lowering of the temperature by the dampers or removal of the end.

The duration of a bath is usually about an hour, unless special contraindications exist. Higher temperatures can be obtained after the second or third bath, but there is great difference in the degrees of heat tolerated. Two hundred degrees Fahrenheit may be easily reached, and 410° F. at the elbow has been employed. The average temperature is 300° to 350° F. At about 20-minute intervals the parts are thoroughly wiped dry to avoid the possibility of a superficial burn.

Generally, in acute and painful affections, baths of hot air may be given every day or every other day. Chronic cases are treated less frequently. In acute sprains, as of the ankle, the hot-air bath, pushed to tolerance, should relieve all pain; a firm bandage or stockinet is afterward applied to give support and to enable the patient to walk. In large effusions 2 to 4 daily baths may suffice to allow of bandaging and walking. The hot-air treatment of joints renders them flexible, so there is no tendency to contracture; and in contracted joints it softens up the adhesions, and manipulation immediately after each bath can be easily given. The temperature of the body is slightly elevated and the pulse and respiration slightly increased during the administration of a hot-air bath.

Frazier gives the following conclusions as to the physiologic effects of hot air: (1) Temporarily increased circulation, respiration and fever; (2) moderate local anesthesia; (3) loss of weight, probaby due to loss of water from the skin and lungs; (4) a decreased nitrogenous output; (5) the effects of hot-air baths are purely local in origin. See Bier's Hyperemic Treatment.

HOT-PACK.—In giving a **hot-blanket pack** a rubber sheet and 1 or 2 woolen blankets are placed upon the bed. A heavy woolen blanket is wrung

out of water at 110° F., spread upon the dry blanket, and the patient is placed upon it and wrapped in it like a mummy. The dry blankets and rubber sheet are wrapped over this, and the patient is allowed to remain in this pack from 1/2 to 2 hours. It is useful in suppression of urine.

In **hot wet pack**, instead of wringing the linen sheet out of cold water, as in the wet pack, it is dipped into water at 110° F., well wrung out, and spread upon the blanket, as in the cold pack. The patient is wrapped in this and allowed to remain for an hour. Then he is removed to the side of the bed upon which he is to lie, lightly rubbed over with a rough wash-rag that has been dipped into water at 65° F. and squeezed out by the hand, quickly dried, and left in place. This method is useful only in obstinate insomnia.

HOUSEHOLD DISINFECTION.—See Disinfection.

HOUSEMAID'S KNEE.—A bursitis of the prepatellar bursa in which thickening and enlargement of the bursa have ensued from intermittent pressure made upon it. It derived its name from its former frequency among housemaids. It is usually chronic, but may be acute. It causes great pain and swelling; it differs from inflammation of the synovial membrane by the swelling being most superficial, and in being in front of the patella, which is obscured by it: in inflammation of the synovial membrane of the knee the patella is thrown forward and the swelling is most prominent at the sides.

Treatment.—When simply enlarged, painting with the tincture or liniment of iodin, or strapping, will sometimes disperse it. Aspiration may be employed, but incision, removal of the fluid, and drainage with aseptic dressing is better. Rest, leeches, and blistering are other means of early treatment. When greatly thickened, or when solid, the bursa and sac must be removed by dissection.

HUMERUS.—See Arm, Shoulder.

HUMULUS.—See Hops.

HUNGER.—A condition marked by a sensation of emptiness of the stomach with intense desire for food. In hunger there is great uneasiness in the epigastrium, which becomes a sinking if prolonged, and is accompanied by insatiable thirst. If fluid is withheld, the thirst becomes the chief source of distress, the face becomes pale and cadaverous, and the eyes appear maniacal, When prolonged still further, there is failure of mental power, and sometimes delirium supervenes. When hunger is exaggerated, it is known as *bulimia*, as in diabetes mellitus. It may be temporary or permanent, and in the latter case it is obstinate, weakening, and unpleasant. It may occur alone or be a symptom of various diseases of the nervous system. It is common in hysteria.

Intense hunger of temporary duration is generally present in convalescence from acute disease. Hunger may accompany migraine, hypochondriasis, and exophthalmic goiter. See Anorexia, Bulimia, Fasting, Gastric Neuroses.

HUTCHINSON'S TEETH.—See Teeth in Diagnosis.

HUNTINGTON'S CHOREA.—See Chorea.

HUXHAM'S TINCTURE.—An unofficial preparation of cinchona bark originally compounded in 1788, and still used. Its composition is as follows:

℞.	Red cinchona,	ʒ iv
	Orange peel,	ʒ iij
	Serpentaria,	gr. lxxx
	Spanish saffron,	gr. clx
	Cochineal,	gr. lxxx
	Brandy,	ʒ xl.

Digested for 4 days, expressed, and filtered, Dose, 1/2 to 2 drams.

It is a most efficient bitter tonic in debility and convalescence from low fevers, but is too weak to be used in malarial poisoning. See Cinchona.

HYDATID.—A cyst with aqueous contents, formed by the larva of a small tape-worm, Tænia echinococcus, which in its adult condition is known to infest only the dog and the wolf, while the larvæ (hydatids) are of frequent occurrence in man and other mammals. Three principal forms of hydatids are recognized: viz., exogenous, endogenous, and multilocular. The first is rarely found in man, but is extremely common in the lower animals, while the second is most frequently developed in the human subject, the third kind being found only in man (Cobbold). The term hydatid is frequently also loosely applied to vesicular tumors and to cysts of many kinds. Hydatids are most frequent in the liver; but are found in almost any tissue, even in bone. See Liver, Worms.

HYDRAGOGS.—The most active of the drastic and saline groups of purgatives. They act by removing large quantities of water from the blood-vessels. Elaterium is the typical hydragog. The principal are elaterium, gamboge, potassium bitartrate, croton oil, salines in large doses—especially magnesium sulphate—and jalap. They are to be employed in general dropsy and in serous inflammations. Magnesium sulphate, being unirritating, is often employed to increase intestinal secretions and in acute enteritis and peritonitis. See Cathartics.

HYDRAMNIOS.—See Amnii, Liquor.

HYDRARGYRUM.—See Mercury.

HYDRARTHROSIS.—See Joints (Diseases, chronic).

HYDRASTIS (Goldenseal).—The dried rhizome and roots of *H. canadensis*. It contains three alkaloids, *hydrastin*, white and crystalline, soluble in alcohol and in ether, insoluble in water; *berberin*, yellow and crystalline, soluble in hot water and in alcohol, insoluble in ether; and *canadin*, white needles, present in very small quantity. From hydrastin oxidation liberates *opianic acid* and the artificial alkaloid *hydrastinin*, the hydrochlorid of which is official. Dose of hydrastis, 10 to 45 grains.

Hydrastis is a simple bitter and a stomachic tonic, but if long used, it will derange digestion and produce constipation. It is possessed of antiperiodic powers, and is considered alterative to the mucous membranes, cholagog, diuretic,

and antiseptic. Hydrastin produces effects on the nervous system somewhat similar to those caused by quinin. Tannic acid, hydrochloric acid, and the alkalies are chemically incompatible with preparations of hydrastis.

Therapeutics.—Hydrastis is chiefly used as a stomachic tonic, an antiperiodic, a mild laxative, and an antiseptic. It is an excellent remedy locally and internally in all forms of catarrh, especially that of the stomach, duodenum, gall-ducts, bladder, uterus, and vagina. Internally it is efficient in many glandular swellings, in chronic constipation due to a sluggish state of the liver, in chronic dyspepsia, and as a substitute for alcohol in dipsomaniacs when a catarrhal state of the stomach has been induced In gonorrhea, gleet, and chronic nasal catarrh it is locally employed with much benefit, also in syphilitic affections of the mouth, throat, and nares. As a local alterative and antiseptic application it is highly recommended for unhealthy ulcers and sores; cancerous ulcerations; mercurial and aphthous stomatitis; rectal fissure, fistula, and prolapse; internal and external hemorrhoids; cracks, fissures, and abrasions of the nipples; erosion and ulceration of the cervix uteri, and in conjunctivitis with mucopurulent discharge. In gonorrhea a very efficient injection is an infusion of hydrastis, 1 dram of the powdered root to 8 ounces of boiling water, or the fluidextract diluted in the proportion of 1/2 of a dram or 1 dram to the pint of water; but it should not be used until the acute stage has subsided.

Hydrastinin has long been known as a uterine vasoconstrictor. It is considered preferable to hydrastin on account of its stimulant action on the cardiac muscle. The hydrochlorid is employed in grain doses hypodermically, using a 10 percent solution. It has been used with great benefit in uterine hemorrhage and dysmenorrhea; also in metritis, endometritis, myoma, and pyosalpingitis. More recently it has been employed in the treatment of hydrophobia, strychnin poisoning, and epilepsy, in the latter case being given by the mouth in doses of 1/4 to 1/2 of a grain up to 2 grains daily, and with benefit in 4 cases out of 6.

Preparations.—**Fluidextractum H.** Dose, 10 to 45 minims. **Tinctura H.**—20 percent strength. Dose, 30 to 90 minims. **Glyceritum Hydrastis**—has of hydrastis 2, in glycerin 1, prepared by percolation with water and alcohol. Dose, 10 to 45 minims. **Hydrastin**—the alkaloid. Dose, 1/8 to 1/2 grain. **Hydrastininæ Hydrochloridum**—the hydrochlorid of an artificial alkaloid derived from hydrastin. Dose, 1/4 to 1 grain in capsule 3 or 4 times a day, or hypodermically in 10 percent solution. **Hydrastin** (unofficial) is an impure extract precipitated by hydrochloric acid from an alcoholic solution of hydrastis, and contains berberin, hydrastin, and resin. Dose, 2 to 5 grains.

HYDRIODIC ACID (Diluted).—Ten percent of hydriodic acid is used as a substitute for iodin and the iodids. As an alterative it is believed by some to possess all the powers of iodin while it is much less offensive to the taste and the stomach. It has been used with benefit in asthma and bronchitis. Dose, 5 to 15 minims.

Syrup of hydriodic acid contains about 1 percent of the absolute acid. Dose, 1/2 to 2 drams, well diluted.

HYDROA.—See DERMATITIS HERPETIFORMIS.

HYDROBROMIC ACID (Diluted).—Ten percent hydrobromic acid. A sedative. It is used as a substitute for the bromids, being less depressant, though more irritant to the stomach, than the potassium and sodium salts. Used as a solvent for quinin it prevents the untoward symptoms of the latter drug. Dose, 20 minims to 2 drams, well diluted.

HYDROCELE.—Hydrocele is an accumulation of serum in the tunica vaginalis testis.

Chronic vaginal hydrocele forms a smooth, ovoid, or pear-shaped swelling, more or less tense, completely concealing the testicle. There is no impulse on coughing, the cord above it is distinct, and the inguinal canal is free. It begins below, slowly extends upward, and may reach an enormous size; fluctuation is distinct (unless it is too tense), and in the vast majority of cases the swelling is translucent. There is no pain or tenderness, merely a sense of dragging on the loins, owing to its weight; but if firm pressure is made behind, on the lower part, testicular sensation is usually felt. It is absolutely essential to make out the position of the testis (it may have been inverted in its descent, so that it lies in front, or dragged in various directions by old adhesions), but this may be done with much less discomfort to the patient by examining the swelling with transmitted light. The patient should stand upright, with a light held on the side on which the hydrocele is; the back part of the scrotum and the other testicle should be grasped with the left hand and drawn down, so as to make the skin as tense as possible, and the light shaded off with the right, which at the same time keeps the penis out of the way. The red glare can be recognized at once, the testis appearing as a dark shadow. If there is any difficulty, a roll of paper may be used as a tube to keep off outer rays. Variations are not uncommon. Hernia or encysted hydrocele may be present. The shape may be complicated, owing to adhesions or sacculi; the fluid may have accumulated rapidly, with severe pain; translucency may be lost, owing to the addition of blood, and the walls may have become thickened from chronic inflammation. Old hydroceles are especially deceptive; they are often perfectly globular, like a hematocele, or malignant tumor of the testis; the walls are half an inch or more in thickness, with calcareous plates inside them, and the contents are milky and semisolid with fatty matter and cholesterin; they are perfectly opaque; there is no sense of fluctuation, and, even if they are tapped, it is difficult to get enough fluid out of them for purposes of diagnosis. Practically, they can only be distinguished by their history or by exploration.

Diagnosis. *Hernia.*—Unless it is strangulated, there is always an impulse on coughing; a hernia is never translucent, and the swelling always ex-

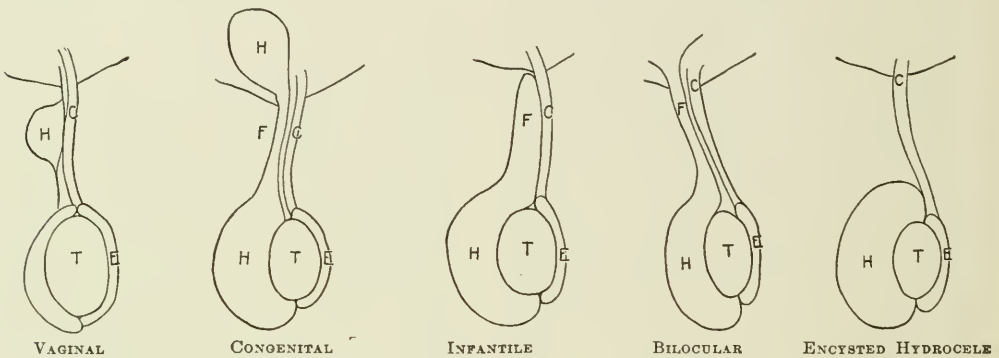
tends through the abdominal ring. An irreducible epiplocele associated with hydrocele may cause some difficulty, but if the swelling is grasped between the finger and thumb while the patient coughs, the impulse can be felt in one part and not in the other.

Hematocele and *tumors of the testis* are never translucent. Old hydroceles are, it is true, not translucent either, but in all of these exploration is essential.

Inflammatory Affections of the Testis.—Acute inflammation cannot easily be mistaken; chronic orchitis, on the other hand, attended with hydrocele (hydrosarcocele) may be very difficult to diagnose; the fluid invests the testis completely, and the state of the gland cannot be ascertained until this is withdrawn.

cysts, or a single one; and it may be immediately above the testis, so as almost to seem part of it, or in the inguinal canal, simulating a bubonocele. It is always translucent (when large enough) and tense, and it is distinguished at once by moving with the cord.

Encysted Hydrocele of the Testis.—Small cysts may be formed in the tunica albuginea, or late in life in the epididymis, but these are of no surgical importance; the former are very rare, the latter scarcely admit of recognition. A different kind is occasionally found attached to the epididymis, developed in all probability from a rudiment of the nonsexual part of the Wolffian body, and corresponding, therefore, to the parovarian cysts in the female. Usually it is single, and of no great size; but it may be multiple, or it may reach



Vaginal Hydrocele. Congenital Hydrocele. Infantile Hydrocele. Bilocular Hydrocele. Encysted Hydrocele of Cord.

Diagram of Various Forms of Hydrocele.—(*Stewart.*) *H.* Hydrocele. *T.* Testicle. *E.* Epididymis. *F.* Funicular process. *C.* Cord.

Congenital Hydrocele.—In this form the tunica vaginalis still communicates with the abdominal cavity. This is more common on the right side than on the left, and usually occurs in children, although it may be met with at any age. It is distinguished by the swelling disappearing when the patient lies down, and the sac is gently manipulated (some care is required, as the neck is usually long and tortuous); by an impulse on coughing (when the communication is sufficiently free); and by the variations in its size. It may not be associated with congenital inguinal hernia; the pressure of a truss is usually sufficient to procure obliteration of the neck.

Infantile Hydrocele.—Here the communication is shut off in the inguinal canal, but nowhere else, so that when the sac is distended, it forms a pear-shaped swelling, the smaller end of which extends up to and sometimes into the external abdominal ring. Old hydroceles of the tunica vaginalis testis occasionally irritate this, owing to the yielding of the upper part of the sac. It occurs in infants, but is by no means confined to them, and requires the same treatment as the ordinary form.

Encysted Hydrocele of the Cord.—In this form the communication is shut off in the normal manner above and below, but the intermediate (funicular) part of the serous sac is not obliterated. It may form a sausage-shaped swelling in the cord in front of the vas; or a chain of separate rounded along the cord and simulate encysted hydrocele developed from the tunica vaginalis. When small, its contents are clear and albuminous, effervescing with acetic acid, from the presence of alkaline carbonates. As it grows larger and presses upon the neighboring tubules, these not infrequently rupture into it, so that it becomes filled with spermatozoa. Sometimes these are still living when the cyst is tapped; more frequently they are dead and motionless, but their presence is almost certain when the contents are milky white and opaque (**spermatocele**). Occasionally cysts of this kind are associated with the common form, and sometimes the partition wall becomes so thin that a communication forms at last.

Treatment of Hydrocele.—**Congenital hydrocele,** whenever it appears, is a prolongation of the peritoneal cavity, and must be treated as such; a truss may be applied, and if it does not succeed, the neck may be ligated. Hydrocele (other than congenital) occurring in infancy usually gets well of itself. If it does not, lead lotion may be applied; or the swelling may be pricked (acupuncture) or tapped. Very few require anything more.

Later in life, if the tumor is of any size, it should be tapped. Occasionally it does not refill; much more frequently the fluid collects again, and if it is tapped a second time, comes back more quickly than before. Whether the patient should rest content with temporary relief of this character,

or undergo what is known as the "radical cure," must depend upon his age, the state of his health, his occupation, and the amount of inconvenience he suffers.

Tapping.—An ordinary trocar and cannula of small caliber is used, taking care that it is thoroughly cleaned and well oiled. The patient should be seated on the edge of a chair, with the knees separated, and the position of the testicle should be ascertained. The scrotum is grasped from behind with the left hand, so as to stretch the skin tensely over the swelling, and a spot is selected on the front (in all ordinary cases), between some of the large scrotal veins. The trocar is held in the right hand, the thumb or forefinger being placed on it about 1/2 of an inch from the point, so as to limit the amount of penetration, and entrance is effected with a quick and firm thrust. As soon as the point of the instrument is in the cavity, the hand should be dropped, so as to direct the point upward away from the testicle. The whole of the fluid should be removed and the little puncture covered with some dry lint. The patient should wear a suspensory bandage afterward until the dartos have recovered.

Acupuncture, piercing the sac with a harelip needle, and freely scarifying the interior, is chiefly suited to encysted hydrocele and the forms that occur in infancy.

Injection.—Tincture of iodin (1/2 of an ounce, with an equal quantity of water) is commonly used. The sac is emptied thoroughly, the fluid injected through a glass syringe (taking care that none enters the cellular tissue), and then, after being manipulated so as to bring it into contact with every part of the interior, allowed to escape again. Subacute inflammation at once sets in, with, in many cases, very severe pain, confining the patient to bed for some days. The skin becomes red, the sac refills, and even the testis may be affected. At the end of a week this should begin to subside, and in a fortnight the whole should have disappeared, and the sac should have resumed its normal size, merely leaving a little thickening at the back of the testis. Occasionally, even when cure is permanent, no visible change is produced in the sac; more often a few adhesions form; and sometimes the sac is completely obliterated. Failure occurs in at least one-third of the cases. Carbolic acid (20 minims in 2 c.c. of glycerin), corrosive sublimate (1 : 1000), and iodoform may be used instead of iodin. The pain is less severe; if the sac is a small one, it is not necessary to confine the patient to bed, and the results are as good.

This method is chiefly suited to small hydroceles of the tunica vaginalis that have not been tapped many times; it should not be employed if there is any reason to suspect chronic orchitis, if the walls of the sac are thick, if the size is large, or if the patient is old and broken down in health.

Incision.—The tunica vaginalis is laid open, the edges are sutured to the skin, and a drainage-tube is passed down to the bottom. This plan is uncertain; it necessitates confinement to bed, and sometimes it leaves a persistent sinus.

Partial incision, removing the parietal portion of the sac, is much more satisfactory. A free incision is made down to the tunica vaginalis, the sac emptied, and as much as is thought desirable cut away with scissors, avoiding large veins and leaving the covering of the epididymis and cord. No vessels require ligation; the wound is sewed up, a drain is inserted, and the dressings are arranged so as to obliterate the cavity and insure primary union. If enough is removed, the sac cannot refill; there is no pain afterward, and one change of dressings is usually sufficient. In old hydroceles with thickened walls this is the only method; but in many of these the patients are already aged and broken down, the tissues are badly nourished and prone to slough, the testis can hardly be isolated without bruising, and it is a question whether castration is not preferable. The risk is certainly less (Moullin).

HYDROCEPHALUS.—In its widest sense the term hydrocephalus embraces all accumulations of serous fluid within the cavity of the skull.

Varieties.—Internal or ventricular, or external (arachnoidean), edematous, etc., or congenital, acquired, symptomatic. Simple hydrocephalus is usually defined as that unattended by malformation of the brain. Scaphocephalus is the name applied to hydrocephalus limited to the lateral ventricles. Of 200 cases, Steiner found 100 internal, 80 edema of the pia mater, 10 external (between arachnoid and dura), and 10 were simple cerebral edema.

Acquired Hydrocephalus

Strictly speaking, hydrocephalus signifies water in the brain; but it is here restricted to the presence of a serous fluid in the arachnoid spaces, in the pia mater, in the ventricles, and in the brain substance (edema); characterized by the more or less sudden development of cerebral excitation, followed by depression and usually by death.

Etiology.—It is most common between the ages of 1 and 5, although it may occur at any age. "The predominance of the nervous system in the bodily conformation" is a strong predisposing cause. Among the exciting causes are unfavorable hygienic conditions, dentition, eruptive fevers, blows on the head, mechanic causes preventing the return of the blood from the venæ Galeni and the right sinus, compression of the jugular vein, diseases of the right heart, and Bright's disease.

Pathologic Anatomy.—The effusion may be limited to the ventricles, although there is usually considerable distention of the subarachnoid spaces and edema of the pia mater and neighboring portions of the brain, whence results more or less softening, especially around the ventricles. The choroid plexus is hyperemic, and may be the seat of minute extravasations.

Symptoms.—There are three varieties of acute hydrocephalus with characteristic symptoms: viz.:—*comatose*, *convulsive*, and *ordinary*.

The comatose variety, known also as "serous apoplexy," begins abruptly, with the phenomena

of apoplexy, the result of the sudden effusion. The pressure is usually so great on the medulla oblongata that it ceases to functionate, death resulting in a few hours, the patient rarely lasting several days.

The convulsive variety, the result of Bright's disease or of a general dropsy, is ushered in with headache, nausea, and vomiting, followed in a day or two by convulsions, passing into coma, which usually terminates fatally, although rarely a remission may precede death for a day or two.

The ordinary variety, the most common in children, begins with feverishness, headache, vertigo, photophobia, restlessness, nocturnal delirium, insomnia, twitching, and spasmodic contractions of the muscles and great hyperesthesia of the skin. Such symptoms continue for several days, when convulsions occur, followed by death, or by a continuance of the symptoms, followed by rigidity, stupor, and death.

The prognosis is unfavorable.

Treatment.—An attempt may be made to remove the fluid by diuretics and full doses of potassium iodid.

Congenital Hydrocephalus

An excessive accumulation of the cerebrospinal fluid—a cerebral dropsy—in the ventricles (*internal hydrocephalus*) or in the meshes of the pia mater (*external hydrocephalus*) or in both (*mixed hydrocephalus*), characterized by enlargement of the head and more or less pronounced nervous phenomena. It is a disease of infants or of very young children.

Etiology.—Imperfect or arrested development of the brain or of its membranes. Inflammatory changes in the ventricles and ependyma occur in the offspring of tubercular, scrofulous, or syphilitic parents.

Pathologic Anatomy.—Enlargement of the head is the chief external pathologic condition, although there is no constant ratio between the size of the head and the amount of fluid, the quantity varying from 1 ounce to 1 pint or more. The liquid is transparent, of a straw color, containing a small amount of albumin and chlorid of sodium. If the quantity of fluid is small, the ventricles are simply distended; if the amount is large, the optic thalami and corpus striatum are depressed and flattened, the roof of the ventricles thinned, and the foramen of Monro is greatly enlarged. The enlargement of the head may occur before birth and may impede or prevent natural delivery, or the head may be normal at birth and increase afterward. As enlargement progresses the bones are so thinned as to be translucent, the fontanels and sutures are widened, the lateral portions of the cranium project, the forehead bulges out over the eyes, and the orbital plates are depressed, forcing the eyes outward and downward producing a variety of exophthalmos; the head has an irregular, triangular shape, the base of the triangle being the top of the head. The scalp, being stretched by the pressure within, becomes tense and thin, and but scantily covered with hair; the veins which ramify in it are unusually prominent and large, and the entire head is elastic on pressure, because of the fluid beneath.

Symptoms.—The increased size of the head, with the emaciated condition of the child, who seemingly eats well, is what first attracts the attention. The head appears too heavy, the eyes are prominent and have a downward direction, the face is devoid of expression, old and wrinkled, the voice feeble; the mental development is not in keeping with the age. When the period for standing or walking arrives, the power is found wanting. The further history is but a continuation and exaggeration of this, until convulsions occur, which sooner or later terminate fatally.

The course of congenital hydrocephalus is usually slow, but progressively worse. The majority terminate within the first year; cases are recorded, however, of 10 and 15 years' duration.

Diagnosis.—In rachitis the volume of the head is increased, due in part, at least, to a deposit of calcareous matter on the exterior of the cranial bones. Rachitis may be mistaken for hydrocephalus in cases in which the amount of liquid is small. The differential diagnosis is based on the shape of the head—round in rachitis, square or triangular or with prominences in hydrocephalus—with the persistent downward direction of the eyes and the elasticity of the head on pressure.

Prognosis.—Unfavorable. Arrest of progress and even cures have been reported. Spontaneous cures are reported following the accidental discharge of the fluid; but such reports are exceptional.

Treatment.—The use of the finest aspirator needle to evacuate the fluid is fully justifiable. The proper situation for the puncture is the coronal suture, about 1 to 1 1/2 inches from the anterior fontanel. Firm but gentle compression of the cranium with adhesive-plaster strips should be made during the escape of the fluid and afterward. A few ounces of fluid only should be withdrawn at a time. The internal use of potassium iodid is recommended. All measures that tend to promote the constructive metamorphosis are to be used.

HYDROCHLORIC ACID (Muriatic Acid).—A liquid composed of about 32 percent of absolute hydrochloric acid gas, HCl, and 68 percent of water. It is colorless and fuming, of specific gravity 1.163, pungent odor, intensely acid reaction and taste, and is obtained by the action of sulphuric acid upon sodium chlorid, the resulting gas being carried through water, which dissolves it. It is sometimes used as a caustic. Hydrochloric acid stimulates the salivary secretions and promotes the alkaline digestive secretions. Given before meals in small doses, it relieves acidity of the stomach. If long continued, it may impair digestion. See GASTRIC NEUROSES, GASTRITIS. The dose of the dilute (10 percent) hydrochloric acid is 3 to 20 minims. See NITRIC ACID.

HYDROCYANIC ACID.—See CYANIDS.

HYDROGEN DIOXID (Peroxid).—It is a powerful oxidizing agent, detergent, antiseptic, and

germicide; and in contact with a suppurating surface it generates a white foam, the result of its action on pus. It is the basis of most hair-bleaching solutions.

Aqua Hydrogenii Dioxidi, *solution of hydrogen dioxid,* commercially known as peroxid of hydrogen, is a slightly acid, aqueous solution of H_2O_2, containing when freshly prepared about 3 percent of the pure dioxid, corresponding to about 10 volumes of available oxygen. It occurs as a colorless liquid, without odor. Slightly acidulous, producing a peculiar sensation and soapy froth in the mouth, and liable to deteriorate by age, heat, or protracted agitation. Dose, 1/2 to 2 drams diluted with 3 to 4 parts of water.

As a cleansing agent for foul wounds, ulcers, sores, and the like, it is highly efficient; and has been used with great benefit as a gargle or spray to the throat and nasal passages, in quinsy, croup, diphtheria, scarlet fever, ozena, and other morbid conditions of these parts. In diphtheria a 3 percent solution as a gargle at short intervals night and day, also given internally, has rivalled antitoxin in results. In colitis with dysentery, lavage of the intestine with a dilute solution thrice daily has proved efficient in cases where other approved measures had failed to make any impression. Used internally it imparts oxygen to the blood, improves digestion, relieves spasm of the respiratory apparatus, aborts the paroxysms of whooping-cough, and gives relief in the dyspnea of chronic bronchitis. It acts well in non-febrile cases of pulmonary tuberculosis by promoting digestion, palliating cough, and giving increased activity to chalybeate remedies, but is contra-indicated in advanced febrile cases, in which it only hastens the fatal termination.

HYDROGEN TEST.—See Gunshot Wounds (Abdomen).

HYDROMETRA.—See Hematometra.

HYDRONEPHROSIS.—A collection of urine in the pelvis of the kidney from obstructed outflow. The obstruction may be caused by an impacted calculus, a stenosed ureter, congenital deformities, or new growths. The cyst may be very small or enormous. Hydronephrosis is marked clinically by the presence of a tumor in the renal region, soft and fluctuating, and usually painless. **Intermittent hydronephrosis** is a form in which there is from time to time the occurrence of a free discharge of urine, with diminution in the size of the renal tumor; ordinarily, the retention is the result of twisting or kinking of a ureter.

Hydronephrosis is most frequent in women, and it may last for a long time if only one kidney is involved. Death occurs from uremia, from pressure on adjacent organs, or from rupture into the peritoneal cavity.

When bilateral, hydronephrosis is difficult to differentiate from ascites. The effects of the changes of posture are much less in the former condition, and the history and mode of origin of the affection are to be kept in mind. Hydatids may not be distinguished from hydronephrosis save by the history and the character of the urine, and tumors on both sides are unlikely to be hydatids. From ovarian tumor, the history, the position of the mass and its relations to the colon, and vaginal and rectal examinations must be remembered in differentiating hydronephrosis. Perinephritic abscess is distinguished from hydronephrosis by its being less hard and by the absence of pain and fever. Pus in the urine at one time or another, with rigors and pyrexia, characterize pyonephrosis. Hydatid vesicles in the urine demonstrate the nature of a cyst of parasitic origin.

Aspiration may effect an immediate cure, but generally the operation must be repeated. It is performed on the left side just below the last intercostal space; on the right side, midway between the last rib and the crest of the ilium. When repeated aspirations fail, nephrotomy must be performed and the kidney must be exposed, opened, drained and irrigated. Nephrectomy is indicated when the kidney is found extensively damaged and the other kidney is in reasonably good condition. If a permanent suppurating fistula exists, or ensues after operation, nephrectomy may also be advised. See Kidney (Surgery).

HYDROPERICARDIUM (Pericardial Dropsy).—The accumulation of water in the pericardial sac, minus inflammation; characterized by precordial distress, disturbed cardiac action, dyspnea, and dysphagia.

It is usually a part of a general dropsy, and is caused by nephritis, sudden pneumothorax, pressure of an aneurysm or other mediastinal tumor, disease or thrombosis of the cardiac veins.

The fluid may range in quantity from an ounce to 1 or 2 pints, and is of a clear yellowish or straw-colored serum, at times turbid or bloody, and of an alkaline reaction. If the amount of fluid is large, the sac is dilated, its walls are thinned by the pressure, and it has a sodden appearance.

Symptoms.—Dropsy of the pericardium is so generally associated with hydrothorax that the symptoms are but an aggregation of those attendant upon that condition, viz.: disturbed cardiac action, dyspnea, dysphagia, dry cough, and feeble circulation. The physical signs are exactly those of the stage of effusion of pericarditis, minus a friction sound.

Pericarditis with effusion and hydropericardium present nearly the same signs and symptoms, a differentiation being possible only by a history of the case and the symptoms of the attack.

The treatment depends upon the cause of the attack. If the amount of fluid in the pericardial sac is great, paracentesis will give relief.

See Heart-disease (Organic).

HYDROPHOBIA (Lyssa; Rabies).—Hydrophobia is a term popularly applied to the human disease consequent upon the bite of a rabid dog or other animal. Rabies is an acute infectious disease of animals, dependent upon a specific virus, and communicable to man by inoculation. All animals may have the disease, but it occurs most frequently in the wolf, the cat, and the dog, and is chiefly propagated by the latter, which is specially susceptible. The nature of the poison is as yet unknown; it has a special affinity for the

nervous system, and is found in the secretions, particularly in the saliva. The period of incubation in man varies from 6 weeks to 3 months. Three stages of the disease are recognized: A premonitory, characterized by depression and irritability, followed by a stage of great excitability and excessive sensitiveness to afferent stimuli, giving rise to intensely painful spasms, particularly of the oral and laryngeal muscles. The fact that the attempt to drink water will induce a spasm, making the sufferer dread the sight of it, gives the popular name to the affection. There may be rise of temperature. In the last or paralytic stage the spasms are succeeded by quiet and gradual unconsciousness, ending in death. The cerebrospinal system shows congested vessels, perivascular exudation of leukocytes, and minute hemorrhages, particularly in the oblongata (Gowers), and the larynx, trachea, and bronchi show acute hyperemia (Osler).

Hysteric or **pseudohydrophobia** develops in neurotic persons bitten by dogs, whether these are rabid or not. In the furious stage such an individual usually barks like a dog and attempts to bite himself and others. He can always be deceived by suggestion, and will thus display at one moment reflex excitement, and at the next an absence of it. He speaks often about the animal by which he was attacked, while in genuine cases this is rare. The temperature is the most valuable test, hysteric hydrophobia being an apyrexial affection. The pulse and respiration also show no quickening, as in true hydrophobia. The absence of true mental disturbance, the stationary character of the general symptoms, and the concurrence of hemianesthesia and other hysteroid symptoms help to differentiate spurious from true hydrophobia.

Treatment.—After the bite of a supposedly rabid dog or animal a constriction should be at once applied above the wound, and the bite excised or burnt with a hot iron. At the earliest moment possible the Pasteur treatment should be begun. The inoculations are preventive and protective for several years and are innocuous to the noninfected. The patient should be placed in a dark room, kept quiet and warm, and every draft of air excluded. Morphin must be used until the patient is brought under its influence, or rectal injections of potassium bromid and chloral may be given. The sensitiveness of the pharynx may be reduced by the local application of a 10 percent solution of cocain. Nutritient enemata and suppositories are to be given in order to avoid spasm in swallowing. The dog should not be killed but be confined and watched carefully to see whether signs of the disease develop. See Bites.

Pasteur's Method.—There is abundant proof that the specific virus of rabies is produced by a microorganism, though none such has yet been demonstrated by the bacteriologists. Pasteur discovered that the virus is most abundant in the spinal cord of the rabid animal and showed that its inoculation upon a healthy animal will produce the characteristic symptoms of the disease, also that the virus may be attenuated in virulence by drying the spinal cord containing it. He also found that by the repeated inoculation of viruses of increasing virulence an animal is rendered immune to rabies, whether the infection is introduced by the bite of a rabid animal or by any other method of inoculation. Upon these facts he founded his preventive treatment of this disease, which consists in the daily inoculation of the bitten person with emulsions of gradually increasing virulence, made from the dried spinal cords of rabbits that have died from inoculated rabies. By this procedure chemical substances (toxins), produced during the life of some specific organism and known to be inhibitory of its growth, are introduced into the system of the patient (V. Horsley). The period of treatment is usually 15 days, during which from 2 to 6 inoculations are administered daily with viruses of gradually increasing intensity; the number depending on the time which has elapsed between the infliction of the bite and the commencement of the treatment. This method received the unqualified endorsement of a special committee appointed by the parliament of Great Britain in 1887, the members of which included the most eminent surgeons and physicians of England. Statistics published by the New York Pasteur Institute state that during 5 years 658 cases were treated at that institution, with a mortality of 0.76 percent; and at the Paris Institute during the same period there were 7341 cases treated, with a mortality of 0.3 percent. The two sets together give 7999 cases treated, with a mortality of 0.34 percent. See also Quinin hydrochlorid; Urea.

HYDROPS.—See Edema.

HYDRORRHACHIS.—See Spina Bifida.

HYDRORRHŒA GRAVIDARUM.—A condition occurring occasionally in the pregnant woman, in which there is a periodic discharge from the uterus of thin mucus that accumulates as a result of hypertrophy of the uterine glands with excessive secretion. See Chorion.

HYDROSALPINX.—A distention of the Fallopian tube with a fluid substance, and its obstruction at the fimbriated extremity, caused by inflammation. It is frequently a result of gonorrhea. See Fallopian Tubes.

HYDROTHERAPY.—See Bath, Water, Heat, Cold, etc.

HYDROTHORAX. (Dropsy of the Pleura).—The effusion of fluid into the pleural cavities (bilateral), the result of a general dropsy from renal or cardiac disease. There is more or less clear serous fluid in both pleural sacs, compressing the lung. No signs of inflammation are present. The disease follows dropsy of the abdomen, and is marked by dyspnea, with signs of deficient blood aeration, both lungs being compressed. There is dulness over the site of the fluid, and vocal fremitus is absent. Auscultation shows absent vesicular murmur over the site of the fluid. The diagnosis is easily determined by the association of the symptoms with a general dropsy.

The treatment depends upon the condition causing the dropsy. Dry cups over the chest afford relief. If the symptoms of nonaeration of

the blood are severe, the fluid should at once be evacuated with the aspirator. See HEART-DISEASE (Organic), NEPHRITIS, PLEURISY, etc.

HYMEN, IMPERFORATE.—A congenital condition, the hymen not having an opening, and thus closing the vaginal outlet or inlet. **Abnormal forms of hymen** are: (1) *Bifenestrate*, or *hymen biforis*, with 2 openings; (2) *bilobate*, with 2 lobes; (3) *circular*, with a small foramen; (4) *cribriform*, with many holes; (5) *denticular*, with a serrate edge; (6) *double* (rare); (7) *fimbriate*, with fringed edges; (8) *horseshoe*, with its convexity downward; (9) *imperforate*; (10) *normal*; (11) *semilunar*, same as 10, or normal; (12) *hymen septus*, divided across by a slit; (13) *hymen subseptus*, covering only the anterior and posterior portions of the passage.

If overlooked until puberty, imperforate hymen may be a serious affection, as the vagina, uterus, and Fallopian tubes may become distended with retained blood and secretions. See HEMATOMETRA, FALLOPIAN TUBES, etc. If relief is not obtained, enormous distention may occur and the tubes or uterus may give way, setting up peritonitis.

Treatment.—The hymen should be divided, or a portion excised, before puberty. If distention has already taken place, perhaps the safest plan is to make a small opening and keep the parts aseptic and covered with iodoform dressings, which should be frequently changed. See VAGINA, VULVA, UTERUS.

HYOID.—See NECK (Injuries).

HYOSCYAMUS.—The dried leaves and flowering tops, collected from plants of the second year's growth, of *H. niger*, henbane. It should contain not less than 0.08 percent of mydriatic alkaloids, including *hyoscyamin*, isomeric with atropin, *hyoscin*, closely allied to atropin, and *atropin* (see BELLADONNA), the latter in very small quantity. Dose of hyoscyamus, 1 to 6 grains.

Scopola.—The dried rhizome of *S. Carniolica* (yielding not less than 0.5 percent of its alkaloids), contains the alkaloid *scopolamin*, which is chemically identical with hyoscin. Dose, 1/2 to 1 grain.

Therapeutics.—**Hyoscyamus** has similar action to that of belladonna, duboisia, and stramonium, except that it is the most calmative and hypnotic. It is more stimulant to the vasomotor system and to the cardiac accelerator apparatus than is stramonium. It has decidedly laxative and carminative effects on the intestines, and a very marked sedative influence on the urinary passages.

Hyoscyamin is considered identical with atropin in its effects on the motor apparatus and the circulation, including the heart and the vasomotor system, but having a less stimulant action on the central nervous system, producing symptoms of cerebral depression instead of garrulous delirium. It is less powerful than atropin as a mydriatic, and in a few cases it has seemed to diminish the respiratory rate. It is believed to be a hypnotic, though some deny that it possesses any soporific influence.

Hyoscin is a cerebral and spinal sedative, and a powerful hypnotic, directly depressing the higher functions of the brain, and affecting the heart but feebly. It especially affects the motor tract of the spinal cord and the cerebral cortex, slightly depresses the heart, but paralyzes respiration. It is free from irritant qualities and may be used hypodermically. Its habitual use brings on muscular paralysis and delirium of violent character. It is frequently used as a hypnotic by alcoholics and nervous subjects, and will probably be responsible for many deaths. As a mydriatic its reputation is doubtful, some observers claiming greater power for it in this respect than that of atropin, while others say that mydriasis may follow its use but is not always produced by even large doses. Severe toxic symptoms have followed the application of 4 drops of a 1 percent solution (equal to 1/25 grain) to the ocular conjunctivæ. In large doses hyoscin is a dangerous depressant of the respiration, but it may be used without unpleasant effects in medicinal doses. Whenever full doses are employed the respiration should be watched for several hours.

In every condition indicating the employment of belladonna hyoscyamus may be used. To relieve local spasm, when arterial relaxation exists or when there is pain, in whooping or nervous cough, in colic, in urinary incontinence, and combined with silver nitrate in chronic gastric catarrh, it is serviceable. Hyoscin is of especial value in nocturnal emissions and in spermatorrhea. It is contraindicated in the sore throat of scarlet fever. It will give sleep in the insomnia of heart-disease, but will tend to produce asthma rather than to relieve it. It is an uncertain remedy in nervous affections.

In simple watchfulness or insomnia:

℞. Extract of hyoscyamus,
Extract of conium,
Extract of opium, } each, gr. xx.

Divide into 12 pills. Give 1 every 2 hours.

In spasmodic affections:

℞. Tincture of hyoscyamus, ʒ ss
Cinnamon water, ʒ j
Simple syrup, ʒ ss.

Take at one dose.

In delirium tremens:

℞. Tincture of hyoscyamus, ʒ ij
Spirit of chloroform, ♏ xx
Camphor water, ʒ ij.

Take in 1 dose and repeat in 3 hours.

Preparations.—**Extractum H.** Dose, 1/2 to 1 1/2 grains. **Fluidextractum H.** Dose, 1 to 5 minims. **Tinctura H.**, 10 percent strength. Dose, 5 to 30 minims.

Preparations of hyoscyamus are very uncertain in strength and physiological activity. **Hyoscinæ Hydrobromidum**, colorless crystals, soluble in 2 of water and in 16 of alcohol. Nearly all of this salt

furnished by manufacturing chemists consists of scopolamin hydrobromid (Schmidt). Dose, 1/200 to 1/100 grain for the sane; larger doses, up to 1/30 grain, are used for the insane. **Hyoscyaminæ Hydrobromidum**, white, prismatic crystals, or a yellowish, amorphous mass, of tobacco-like odor, and acrid, bitter, nauseous taste; very soluble in water, soluble in 2 of alcohol. Dose, 1/200 to 1/100 grain. **Hyoscyaminæ Sulphas**, white crystals, or a white powder, odorless, of bitter, acrid taste; very soluble in water, soluble in 7 of alcohol. Dose, 1/200 to 1/100 grain; but higher doses are used for the insane.

Preparations of Scopola.—Extractum S. Dose, 1/8 to 1/2 grain. **Fluidextractum S.** Dose, 1/2 to 2 minims. **Scopolaminæ Hydrobromidum**, chemically identical with hyoscin hydrobromid. Dose, 1/200 to 1/100 grain.

HYPERCHLORHYDRIA.—See GASTRIC NEUROSES.

HYPEREMIA, BIER'S.—See BIER'S HYPEREMIC TREATMENT.

HYPERHIDROSIS.—See SWEAT-GLANDS, BROMIDROSIS.

HYPERMETROPIA.—See HYPEROPIA.

HYPEROPIA (Hypermetropia; Far-sightedness).—A condition of the refraction of the eye in which, when the accommodation is at rest, the focus of parallel rays of light transmitted through the eye is beyond the retina. See AMETROPIA.

Causes.—Hyperopia may be due to a lessening of the convexity of the refracting surfaces of the eye (*hyperopia of curvature*), change in the index of refraction of the dioptric media, or absence of the crystalline lens (*aphakia*). It is, however, most commonly due to a shortening of the antero-posterior axis of the eyeball (*axial hyperopia*).

Hyperopia may be looked upon as arrested development. Animals are, as a rule, highly hyperopic, and savages are generally more or less so. Children are usually hyperopic, and become emmetropic, or even myopic, while growing to maturity. Properly speaking, hyperopia is a failure of the eye properly to adapt itself for its uses in modern civilization; it is often hereditary.

The results of hyperopia on the ciliary muscle are quite noticeable. Excessive contraction produces abnormal development, particularly of the circular fibers, which become greatly in excess of the radial fibers. The continuous contraction may lead to tonic spasm, which is very difficult to overcome, and renders refraction without thorough mydriasis most unreliable.

Disadvantages.—Parallel rays of light do not focus on the retina, but form circles of diffusion, and hence a blurred image. Divergent rays impinging on the cornea form still larger circles of diffusion on the retina. The only rays that can focus exactly on the retina and give a distinct image are those rendered convergent to a certain degree by convex lenses. The eye contains a mechanism for overcoming its hyperopic defect. In order to render the rays more convergent, the anterior surface of the lens is made more convex by the continuous contraction of the ciliary muscle. In this way hyperopia, up to a certain point, varying with each individual, is involuntarily corrected. However, we can readily realize the result of a constant strain on the ciliary muscle. Nervous energy is consumed and the nervous equilibrium is disturbed, with the result not only of annoying local symptoms of pain, fatigue, and congestion, but also of more remote reflexes, such as headache, gastrointestinal disturbances, and many general neurotic disorders. As the correcting effort of the ciliary muscle is involuntary, the resultant annoying symptoms of eye-strain can only be relieved by atrophy or paralysis of the muscle, or by correction of the defect that necessitates the ciliary contraction.

Varieties.—Manifest, which is measured by the strongest spheric lens which, without mydriasis, gives the greatest acuity of vision. **Latent** hyperopia is that part of the total error which can only be revealed by mydriasis, as it is at all times masked by the accommodation. The younger and more vigorous the subject, the greater the amount of latent hyperopia. It is on account of the ever-present latent hyperopia in the eyes of persons less than 50 years old that it is necessary to paralyze the ciliary muscle in order to measure the full degree of hyperopia. The old classification of *facultative*, *relative*, and *absolute* hyperopia is too vague to be used.

Symptoms.—The objective symptoms are inconsiderable. The leading subjective symptoms are caused by the strain upon the accommodation, and may be grouped under the heading **accommodative asthenopia.** The patient will complain of inability to perform continuous near work: the letters and words are indistinct, and seem to run together. Headache and pains about the eyes are present. There is increased lacrimation and a tendency to chronic congestion of the conjunctiva. The local reflex symptoms may range from a slight palpebral conjunctivitis to intense blepharitis and even to granular lids. There may be such intense photophobia as to cause suspicion of retinal disease. There are remote systemic reflexes, such as headaches, nausea, indigestion, general neurotic disturbances, etc.

The distant vision is usually good, as the ciliary muscle is capable of overcoming a moderate defect. Hyperopia of a high degree or complicated with astigmatism markedly diminishes visual acuteness.

There is an intimate **connection between convergent strabismus and hyperopia.** It is likely that the associated movements of accommodation and convergence are controlled by the same center, or by contiguous centers acting automatically from long association. The increased strain on the accommodation causes extra innervation to convergence, which may result in permanent squint inward. Or, again, persistent stimulation of the adductors may weaken them, and thus produce divergent squint. Very often if a child is hyperopic to some extent, and unequally in the two eyes, to avoid the discomfort of a blurred or double image one eye is turned in and becomes amblyopic. It has been estimated that over three-fourths of the cases of convergent strabismus

are caused by hyperopia. We see, therefore, how very necessary it is to examine carefully the refraction of an eye beginning to converge in a child.

Hyperopia increases with age, on account of the lessening of the refractive power of the lens, caused by a change in its substance. At the age of 80 this lessened refractive power is quite apparent.

Diagnosis can be made with certainty only by the use of a mydriatic, although failure of accommodation and recession of the near-point incommensurate with age give strong reason to suspect hyperopia. The most important point in the diagnosis is the acceptance of a convex lens, and we usually estimate the full degree of hyperopia by the convex lens which gives the eye under complete mydriasis the best vision with the test-cards at 6 meters.

In the higher degrees of hyperopia the patient must choose between a small, more or less distinct, and a larger blurred image. As a rule, his choice is the latter evil, and to this end he will hold his book or instrument very close to his eye, simulating the action of a myope. In addition, the high hyperope complains of inability to see distinct objects, which makes another point of confusion with myopia. In casual examination of hyperopia with ciliary spasm, a weak concave glass may be accepted with relief. However, all confusion with myopia may be avoided by thorough mydriasis.

Besides the test-lenses, hyperopia is diagnosed and the degree estimated by the ophthalmoscope and the retinoscope. See RETINOSCOPY.

The treatment of hyperopia consists in prescribing correcting lenses. Having estimated the degree of defect, several points must be taken into consideration in prescribing glasses. It is taken for granted that the patient has been thoroughly under a mydriatic during the preliminary tests. When he comes back to the office for a prescription, it very often happens that we find at the post-mydriatic examination that a hyperope of a slight degree will not accept any of his correction, either for reading or for distance. In such case, if anisometropia is not present, and if the patient has complained of no asthenopic symptom and is apparently vigorous, we do not prescribe a glass, but tell him of his defect, and warn him of the ultimate results of eye-strain, urging him to come back at the first sign of trouble. It more often happens that a certain proportion, or even a full correction, is accepted for reading, but that all correction is rejected for distance; in such case, if there is no prominent asthenopic reflex, we prescribe only a reading-glass.

Prescription of glasses in hyperopia is a most important subject. No definite and dogmatic conclusions or rules are applicable in every case. The physician must study each case separately, and be influenced by the degree of defect, the muscle balance, the age of the patient, the constitutional condition, the asthenopic symptoms, and the occupation or habits of the patient.

It is very often necessary in young persons with strong accommodation to make considerable eduction from the full correction in order to obtain sufficient distant vision. Young and vigorous adults who have never worn glasses will not accept their full correction. In these cases the physician must be governed by his own judgment. As a general rule, we try to prescribe the highest convex lenses that allow sufficient distant vision; these are usually readily accepted for near work. If the patient is engaged in continual near work and complains of marked asthenopic symptoms, we order, for near vision, a large share of the full correction, and consider it advisable to blur slightly the distant vision. We explain to the patient that such glasses will not be satisfactory at first, but that the eye will gradually become accustomed to them, and that the glasses were not ordered to improve the distant vision, and may diminish it at first, but that the point in consideration is to effect easy near vision and to avoid eye-strain and its distressing consequences.

In cases of very high defect with enormous accommodative power weak lenses are at first ordered, and these are strengthened at short intervals until the full correction is approximated. It is surprising to note the rapidity with which the eye will accommodate itself to what was at first an unacceptable correction.

The muscle balance must always be tested before ordering glasses. In cases of orthophoria or exophoria we must reduce the correction in hyperopia to force the interni into action. The ideal hyperopic muscle balance in most office patients is about 2 degrees of esophoria with the Maddox rod, or orthophoria with the Stevens phorometer. Cases of higher esophoria need a strong correction.

In presbyopia and in cases in which a mydriatic has not been used we endeavor to order the full strength of the manifest refraction.

A final point is the **influence of the vocation.** We readily see that the musician and artist, to obtain the best acuity and accommodation at their working distances, will require a different correction from that of the copyist and engraver.

HYPERTRICHOSIS (Hirsuties; Hairiness; Superfluous Hair).—A condition characterized by excessive hair-growth, either as regards number or size.

Symptoms.—Hair may grow to an unnatural degree upon parts normally the seat of hair, as the mustache, beard, eyebrows, etc., or there may be an abnormal growth upon nonhairy regions. In the latter case the lanugo hairs of the part are hypertrophied. This is the condition so frequently seen upon the upper lip and chin of women.

Etiology.—The cause of hirsuties is obscure. Heredity is observed in the most extensive cases. The condition may be congenital or acquired; when acquired, it is apt to develop after the menopause. Diseases of the uterus and appendages may be causative in some cases. Cutaneous irritation or stimulation may also give rise to this condition.

Treatment.—The cases in which treatment is usually demanded are women with superfluous facial hair-growth.

Superfluous hair may be temporarily removed by *shaving, extraction,* or the use of *depilatories.* The sulphid of barium depilatory, recommended by Duhring, is one of the best:

℞. Barium sulphid, ℥ ij
Pulverized zinc oxid, } each, ℥ iij.
Pulverized starch, }

This is made into a paste with a little water and spread on the hairy region for 10 to 15 minutes. As soon as burning is experienced it should be removed, and should be followed by a bland ointment. Such applications must be repeated every few days, according to the needs of the case.

The only satisfactory treatment of hirsuties, however, is by means of *electrolysis.* This consists in the insertion of a fine needle into each hair follicle, and then turning on an electric current to destroy the hair papilla. The operation is somewhat painful, but nearly always within the limit of toleration.

Only stiff hairs are to be extirpated. The removal of downy or lanugo hairs is not to be attempted, as the result is likely to be unsatisfactory. The *operation* is performed in the following manner: A fine needle (iridoplatinum needle or a fine jeweler's brooch), held firmly in a specially devised holder, is attached to the negative pole of a galvanic battery. The needle is gently inserted into the hair follicle down to the papilla. The patient holds a sponge electrode (positive pole), and makes the current by bringing it in contact with the palm of the other hand. In 10 to 20 seconds a frothing occurs at the mouth of the follicle. The current is then broken by the release of the positive electrode, and the needle is withdrawn. If the papilla has been destroyed, the hair will come out on the slightest traction with forceps. If it remains firm, the operation must be repeated. A current of from 1 to 2 milliamperes is usually required.

A wheal-like elevation soon develops at the site of the operation, but disappears in the course of a few hours. Occasionally pustulation occurs.

To avoid *scarring,* attention should be paid to the following points:

(1) The use of a fine needle; (2) the avoidance of too prolonged a current; (3) the avoidance of too strong a current; (4) care not to operate at the same sitting upon hairs in too close proximity.

Hot water, calamin lotion, or a 1 : 1000 solution of corrosive sublimate, sopped on after the operation, lessens the inflammation and the tendency to suppuration and scarring. See ELECTROLYSIS.

HYPNAL (Mono-chloral-antipyrin).—A narcotic mixture of ANTIPYRIN and CHLORAL (*q. v.*).

Dose, 15 to 20 grains.

HYPNOTICS.—Remedies which produce sleep. In this wide sense the term includes the narcotics and the general anesthetics, but it is usually restricted to those agents which, in the doses necessary to cause sleep, do not disturb the normal relationship of the mental faculties to the external world (Brunton). Another definition of hypnotics is—that they produce sleep without suspending the consciousness of pain, narcotics doing both. Hypnotics may be subdivided into the following classes:

Pure hypnotics, which directly induce a sleep closely resembling the normal, without causing narcotic or other dangerous cerebral symptoms. The *bromids* are the type of this subdivision, but the list is constantly growing smaller as experience reveals toxic powers in the action of its members.

Narco-hypnotics, which induce sleep by direct depression of the cerebral functions and in larger doses are narcotic, suspending the consciousness of pain and producing coma. *Opium* is the type of this class.

Indirect hypnotics, which induce sleep by removing or suppressing any cause (not mental) which interferes therewith.

Hydrated chloral is undoubtedly the most efficient of all hypnotics. *Paraldehyd* is one of the most reliable and safe, but its sleep is transient, lasting only a few hours. *Sulphonmethane* and *sulphonethylmethane* are very efficient in some cases, but often fail entirely. *Ethyl carbamate* is feeble and uncertain, and the same may be said of *humulus* and some other agents which are not mentioned below. *Piscidia* is also somewhat uncertain in action, though its hypnotic and anodyne powers have proved very decided in many cases.

The chief hypnotics are as follows:

Pure Hypnotics.—Potassium bromid, sodium bromid, paraldehyd, sulphonmethane, sulphonethylmethane, veronal, ethyl carbamate, chloralformamid, hedonal.

Narco-hypnotics.—Hydrated chloral, chloretone, opium, morphin, narcein, hyoscin, duboisin, cannabis indica, pellotin, passiflora incarnata, piscidia erythrina, amylene hydrate, alcohol.

Indirect Hypnotics.—Antipyrin, acetanilid, acetphenetidin, strychnin, hydrocyanic acid, conium, gelsemium, ergot, digitalis.

Wilcox rejects the dangerous, unreliable and objectionable hypnotics, and retains four as amply sufficient for all ordinary cases of insomnia. These he classifies as follows:

As to Potency.—Paraldehyd, chloralformamid, pellotin, sulphonethylmethane.

As to Rapidity.—Pellotin, paraldehyd, chloralformamid, sulphonethylmethane.

As to not causing Habituation.—Pellotin, sulphonethylmethane, chloralformamid, paraldehyd.

As to Safety.—Chloralformamid, pellotin, paraldehyd, sulphonethylmethane.

For **Addiction to Hypnotics,** see LAMBERT TREATMENT FOR NARCOTIC ADDICTION.

HYPNOTISM.—The maintenance of interest in the subject of hypnotism must depend chiefly upon its relationship to practical medicine. If this can be shown of definite value, then will the study of conditions produced in hypnotic states continue to occupy the attention of scientific observers until practical results follow. If not, the psychologist and others may still utilize the interesting mental states thus exhibited for purposes of research and experiment.

The status of the subject at present is not established with sufficient clearness, though there is much evidence offered of a promising character to show that hypnotism is an important auxiliary to rational medical measures.

To define hypnotism is difficult, in view of the confusion wrought by the ignorance and bias of many of its most successful exponents. Even among the more intelligent students great diversity of view prevails as to the nature and causation of hypnotic phenomena. It is possible, however, to array certain items of belief common to scientific hypnotists, and thus present a fair concept of the state, and the art of producing them, and securing the results of suggestibility thus made possible. Hypnotism is a state of mind or a mental attitude, artificially induced, in which the powers of volition and action are altered, and during which it is possible to forcefully offer suggestions as to acts and thoughts not readily or willingly accepted at other times. The action of some of the brain centers, both sensory and motor, are arrested or suspended. It is practically necessary that the subject cooperate with the hypnotizer; it is gravely doubted whether it is possible to attain success otherwise. It is also necessary that the thoughts and acts suggested shall be free from evil or hurtful tendencies; at least so far as the subject is capable of interpreting these or their effects. In normal individuals it is not believed that the contrary is possible; they can, and usually do, resist evil suggestions in these states. It is admitted that those of a vicious or criminal bias might be influenced to commit follies or crimes under hypnotic suggestion, but most of the experienced observers have failed to meet with instances of obsession thus induced.

The hypnotic state is analogous to sleep, and it may be that hypnosis can be best explained in terms that also explain sleep. It is said by some to resemble the dormant state of a hibernating animal.

The elements of normal sleep consist of several factors: Cerebral anemia, fatigue of the brain-cells, accumulation in the tissues, and especially in the nervous structures, of poisonous waste products, which are eliminated slowly and imperfectly while the organism is active, but more promptly while at complete rest.

Finally, there is that special function of the nerve structures called "inhibition," whereby the action of a function or of an organ is directly arrested by the action upon it of another function or organ. This is capable of being rapidly induced and promptly removed. The element of inhibition is a conspicuous one in the hypnotic state. Heidenhain says: "Hypnotism is inhibition of the cells of the brain cortex which subserve consciousness and the intellectual processes." Again, the cells of the cortex subserve other functions than those of consciousness and intellection, and are also concerned in nutrition, secretion, and other vegetative activities. An undue or morbid attention to the organic processes disturbs the balances in the life of relation, and hypochondriasis results. Delbeuf says: "Hypnotism, by cutting off the intellectual life from the life of relation, enables the highest centers to assume cognizance of and to dominate the working of the organic functions." In this way perturbations in normal activities can be corrected.

Disease, according to Liebeault, implies an excess of nervous action in one direction and a deficiency in another. The hypnotist thus calls upon the patient to utilize his own forces and recover his normal equilibrium. Weakened faculties are thus capable of being developed, and latent powers brought into useful evidence. Hence persons of diseased or deficient faculties, of feeble volition, or of vicious tendencies are less, if at all, amenable to relief through suggestion.

The uses of hypnotism are undeniably distinct, though far from well defined. They serve only as a supplement or as an auxiliary to rational medical measures.

The basis of the state is suggestion, the condition of the hypnotized subject being a psychic one, in which the susceptibility to suggestion, and the ability to act upon it, are enormously increased. A practical explanation is that, whereas in ordinary states it may be, and usually is, more or less difficult to secure a complete attitude of attention, yet during the hypnotic state no matter how shallow, this is more possible. Moreover, as the state is reproduced on subsequent occasions, and as it grows deeper, and especially when the subject recognizes the wisdom and the suitability of the thought or act suggested, a more absolute obedience and persistent cooperation is induced.

When a diseased process is under consideration, an attitude is thus secured of calm receptive acquiescence, and in this the subject can be guided toward a cure. The cure is successful in proportion as this process is a mere functional derangement, evil or morbid fixed habits, or acutal structural disease. Again, an essential element in success is the degree of willingness or anxiety on the part of the subject to be relieved or cured. There is something of efficacy, perhaps, in the power of the individual hypnotizer to secure cooperation or to dominate the consciousness, but this is of small effect unless the thought suggested is a wholesome one, or consonant with the inclinations of the subject, be they good or bad. Evil acts cannot be induced in a clean consciousness, however much they may be aroused in one of unclean tendencies. The psychologic hypotheses, though interesting and suggestive, are difficult to understand or accept by the clinician; as, for instance, the "subliminal states" of Meyers, through which certain psychic powers are aroused over which normally we have little or no control.

The Production of Hypnosis (Hypnogenesis).—The effective influences may be mental or physical or both combined. Operators differ much in the methods employed, the results being similar, practically identical. All involve an "arrest of the flight of thought, concentration of attention upon one element, a restriction of the conscious field" (Newbold).

Only a small proportion of the subjects can be hypnotized on the first attempt—about 10 per-

cent. After repeated attempts (4 or 5 or more) it is claimed by competent observers that about 80 percent of average persons may be affected.

The suggestion to the subject that he shall go to sleep is the foundation for the process. A word of command occasionally, by some observers, suffices (Laria, Liebeault, Bernheim); usually after several attempts have been made, and following upon some form of strained attention.

The mental factor is always the most important, but it is practically necessary to supplement this by certain physical influences, such as sense stimulation, fatigue of attention, fixation of the eyes, monotonous or rhythmic sounds, etc.

Fixation of the attention and of the eyes are of equal importance. Some operators rely on movements of their hands, held parallel to the subject and some inches distant; these are called magnetic or mesmeric passes. Others, again, make use of such sense stimulations as touch or gentle pressure with the hands, or stroking of the limbs of the subject, particularly upon the skin. This involves the factor of warmth, and, possibly, also electric influences. The muscular sense may contribute to this effect, as the rocking of a child in the cradle; the whirling or spinning of the Dervishes; the dances of the Indians, Zunis, and other savage tribes; and also, similarly, the marching of soldiers. The waking of the subject from hypnosis (dehypnotization) is usually readily effected, oftentimes spontaneously, by a command or touch; or, if the sleep is a very deep one, by a wave of cold air, the use of a fan, or sprinkling the surface with water.

If a time limit is set by suggestion the waking can readily then be effected with remarkable accuracy. If left alone, the subject usually wakes up after a variable time. He may remain asleep for hours, or even days, but these are probably instances of trance, and more common in hysteric subjects. The hypnotic drowsiness has a tendency to pass into normal sleep.

Most normal persons are hypnotizable. The subjects of hysteria are not more readily affected than others. In them the spirit of contradiction may inhibit obedience, and a fixation of the attention on other ideas than their own ailments is not readily obtainable, and to cure them repeated and patient efforts are, as a rule, required. Again, if they become hypnotized, sometimes a trance is induced somewhat difficult to control. Insane persons are most resistant; so are stupid ones, and those mentally excitable. The best subjects are those who are capable of fixing their attention and people accustomed to obedience. Young children are not readily susceptible.

Hypnotic states differ much from each other in character as well as degree. Many fanciful subdivisions are made, but three stages are recognized (Forel): (1) Drowsiness, in which the patient can resist only by an effort; (2) hypotaxy, in which obedience is obligatory; (3) somnambulism, a profound condition of sleep characterized by loss of memory on waking of what has occurred in the state of hypnosis. There is no clear line between any of these stages; gradual transitions are everywhere to be found.

The possibilities of hypnotism may be briefly enumerated to lie in the restoration of normal functions, to remove false impressions upon the consciousness, to correct bad habits of thoughts or acts, to restore self-control, to correct evil tendencies or appetites, and to relieve painful states. When it is estimated how much of so-called diseased conditions reside in a combination of these physical factors, along with varying degrees of organic or structural damage, it will be seen that if the former is eliminated, much of the latter is not only endurable, but the disability practically ceases.

That hypnotic suggestion is oftentimes capable of producing this beneficent effect there is an overwhelming mass of evidence to show. In so far it can be said to be a valuable auxiliary to medical practice. How permanent or far-reaching is this effect cannot be accurately stated as a general proportion or in the individual instance. That valuable effects are thus wrought, and perfect ones, has been very frequently demonstrated, and in some instances cures were effected after unavailing efforts by the ablest physicians and many years of their unceasing intelligent endeavor. The results obtained are oftentimes as much a surprise to the physician as to the patient or to his former advisers. That there are dangers is true, but they are not large nor deterrent nor greater than accompany many measures fully indorsed. The worst of these is the danger of subjecting the operator to the accusation of being a humbug, thus deterring many wise men from using an agency capable of the largest good.

Hypnotic anesthesia is not valueless. Pain may be relieved thereby in operations for strabismus, single or double ankylosis of a joint, excision of exostosis of the great toe, and teeth extraction, and other minor operations. The chief objections to this kind of anesthesia are the difficulty and uncertainty in inducing primary hypnosis, the number of preliminary attempts often necessary, the immoral aspect, the fact that the process can never be generally used, and the fact that perfect anesthesia cannot be obtained readily by hypnosis. Its advantages are that when deep hypnosis with anesthesia has been once brought about it can be repeated at any time, and it is not necessary to repeat the hypnotic process, a verbal order to sleep being sufficient; the patient is not obliged to abstain from food or to make other necessary preparations, the nervous apprehension can be removed by suggestion, the process is pleasant, is free from danger, can be kept up indefinitely, can be stopped immediately, the patient can be placed in any position required without risk and will alter that position at command, and gags and other apparatus are not required. It is of especial value in throat operations and in labor, where muscular influence can be increased or diminished; there is no tendency to sickness during or after the operation, and pain after the operation or during subsequent dressing may be prevented and the rapidity of the healing process be frequently increased.

HYPOCHLORHYDRIA.—See Gastric Neuroses.

HYPOCHONDRIASIS.—A form of mental unsoundness closely allied to melancholia, of which it often forms the initiatory stage. It is characterized by a morbid anxiety relative to the physical health, the patient observing himself with restless care, magnifying trivial departures from perfect action of his organs, and becoming absorbed in precautions regarding them and his state of health. It is a chronic disorder, which may attach throughout life, rendering it shorter in length and sadly diminishing it in utility and happiness.

In melancholia there is a tendency to suicide, while in hypochondriasis a strong desire for life exists and impels the subject to endless search for the cure of his ailment. He delights in consulting medical men and entering into minutest details. The melancholic often despairs of relief, and the description of this condition is often confused, frequently incoherent and unintelligible. The prognosis is more favorable when hereditary tendencies are less marked, and the liability to mental strain or shock and to sexual and alcoholic excesses is minimized, and the change from a life of activity to one of forced or uncongenial leisure is most gradual.

Moral treatment is alone of any influence in most cases. Relief of the conditions—such as anemia, gouty manifestations, fecal accumulations, intestinal catarrh, hemorrhoids, or syphilis—should be obtained. Alcoholic and sexual excesses must be shunned, and travel, especially under congenial and judicious companionship, and the encouragement of regular, definite, and useful employment for both the attention and the physical powers, are most potent means of relief. Ridicule is rarely or never of service. See NEURASTHENIA.

HYPODERMOCLYSIS.—The infusion of saline solution under the skin. See INFUSION, TRANSFUSION.

HYPODERMIC MEDICATION.—The introduction of drugs, in concentrated form into the subcutaneous connective tissues, to produce a rapid or powerful effect, to medicate tissues locally, especially nerve-trunks, to avoid disturbance of the alimentary canal, and for economy.

The ordinary hypodermic needle has a barrel of the capacity of 20 minims. For the administration of the antitoxin of diphtheria the capacity runs as high as 100 minims. The cap, nozzle, and piston consist ordinarily of nickeled metal or silver, while usually the barrel is of metal or glass. The packing is of leather or of wash-leather, and should always fit tightly. The minims are marked on the piston. A simple sliding motion, and not a screw action, is to be given the piston. After use, the instrument should be boiled, tepid antiseptic water should be drawn into the needle and ejected, and a fine wire drawn through the needle itself and left there to keep the canal patent and clean. The best and most recent hypodermic syringes are made wholly of glass.

The medicine should be in solution, of neutral reaction, freshly prepared, the usual menstruum being distilled or sterile water. The most suitable localities for the injection are the external aspect of the arms and thighs, the abdomen, back, and calves of the legs. On the external portion of the thigh an area 2 inches square exists over which the insertion of a fine hypodermic needle is not felt. Solutions should have (1) as high solvent power as possible, (2) be as permanent as possible and not deteriorated by keeping, and (3) be unirritating. Carbolic acid, boric acid, camphor, and other substances may be used to prevent development of organisms.

The advantage of hypodermic injection is great, but it has its limitations. Hypodermic injection of such drugs as Epsom salts, or such powerfully irritating and depressing ones as colchicin and cantharidin, further no useful end.

The method of application is most important, and pain in most instances can be avoided. The area should first be cleansed and rendered aseptic, and, of course, the needle is to be aseptic. For this purpose it may be boiled or dipped in carbolized oil or some unirritating antiseptic. Some drugs, like ergot or ergotin, inevitably give more or less pain when administered hypodermically, but careful manipulation will reduce this to a minimum. Local ill effects from hypodermic medication are chiefly pain, phlegmonous swellings and consequent abscess, slight bleeding, or ecchymosis. Certain parts of the body should be avoided: *e. g.*, regions where subcutaneous cellular tissue is scanty, such as the skin over the tibia, parts of the cheek, forehead, etc. It is well to avoid the neighborhood of large vessels, and, unless special influence is desired, the nerve-trunks, as well.

The classic practice of pinching up a fold of the integument before inserting the hypodermic needle is entirely wrong both in theory and in practice. It is never done by persons who habitually use this instrument on themselves, and they are admittedly the most expert of all operators in this line. It increases the liability to local soreness, and often produces bruises and ecchymoses which might be avoided by following the method described below.

After nearly filling the syringe with the solution to be used, the needle, if separate, should be screwed on tightly; and with the instrument held in a vertical position, point uppermost, the excess of solution over the amount required should be ejected, thus expelling air bubbles and filling the needle itself. A site having been selected where there is no danger of penetrating a vein or an artery, the needle should be quickly inserted at a right angle with the surface, and carried on into the subcutaneous tissue for fully one-half its length. It should be held steadily, and not moved around, so as to avoid injuring the tissue. The piston should be pressed down slowly, and when the injection has been delivered, the needle should be quickly withdrawn, and no attention paid to the few drops of solution which may follow it. Only the very finest needles should be used, except in cases in which the patient is struggling and liable to break the needle by his movements. The point of the needle should be perfect and its surface highly polished. It is far better to use a new

needle every day than to risk one's reputation for skill on a blunt-pointed and rough-surfaced instrument. Potter has injected a strychnin solution in this manner on some 300 patients during three years, 3 and 4 times daily in the same upper arm for a month in each case, without having produced any more serious result than a hyperemic zone around some punctures in a very few instances. If the solutions are freshly prepared with clean water, the needles sharp, clean, and bright, and the injections delivered *beneath* the skin, and *not into it*, there is no danger of producing abscesses, or even indurations, with the agents ordinarily employed in this manner.

The hypodermic syringe has been responsible for drug addiction in many instances, therefore it should never be placed in the hands of patients and the physician should be most careful when ordering drugs such as morphin, cocain, chloral.

Compressed tablets for hypodermic use are prepared by the prominent manufacturers, and are furnished in glass tubes containing from 20 to 25 tablets each. They are very small, are entirely free from any foreign material, are sufficiently soluble, and are put up in short tubes which can be carried in cases to fit the vest pocket. The tablets may be readily dissolved in a teaspoon at the bedside, or in the syringe itself if the instrument has a screw-hole large enough to admit the tablet before screwing on the needle.

List of HypodermicTablets.—A regular supply of hypodermic tablets includes the agents named in the following list, though many others are prepared by the manufacturing chemists:

Aconitin (crystals), 1/500 gr.; apomorphin hydrochlorid, 1/10 gr.; atropin sulphate, 1/200, 1/100, 1/50 gr.; caffein sodiobenzoate, 1/2 gr.; cocain hydrochlorid, 1/8, 1/4 gr.; codein phosphate, 1/2, 1/4, 1/8 gr.; coniin hydrobromid, 1/100 gr.; colchicin, 1/30 gr.; corrosive sublimate, 1/30, 1/60 gr.; corrosive sublimate and urea, 1/25 gr.; digitalin (soluble), 1/100 gr.; duboisin hydrochlorid, 1/100 gr.; ergotin, 1/4 gr.; gelsemin hydrochlorid, 1/50 gr.; hyoscin hydrobromid, 1/100, 1/50 gr.; hyoscyamin, 1/100, 1/50 gr.; morphin bimeconate. 1/3, 1/4, 1/6 gr.; morphin sulphate, 1/8, 1/4, 1/3, 1/2 gr.; morphin and atropin No. 1 (morphin sulphate, 1/8 gr.; atropin sulphate, 1/200 gr.); morphin and atropin No. 2 (morphin sulphate, 1/4 gr.; atropin sulphate, 1/150 gr.) nitroglycerin, 1/200, 1/100, 1/50 gr.; physostigmin sulphate, 1/100 gr.; picrotoxin, 1/50 gr.; pilocarpin hydrochlorid, 1/3 gr.; quinin chlorhydrosulphate, 1 gr.; scopolamin hydrobromid, 1/100 gr.; sodium arsenate, 1/10 gr.; sodium nitrite, 1, 1/2, 1/4 gr.; spartein sulphate, 1/30 gr.; strychnin nitrate, 1/100, 1/60, 1/40 gr.; strychnin sulphate, 1/100, 1/60, 1/30, 1/20 gr.

HYPOGLOSSAL NERVE, LESIONS. — The hypoglossal is the motor nerve of the tongue, and supplies also the depressors of the hyoid bone and the hypoglossus and geniohyoid of the elevators. It arises from the medulla oblongata beside the olivary body. Its cortical center is probably the lower part of the ascending frontal gyrus or the root of the third frontal convolution. It is subject to paralysis and spasm.

Etiology.—(1) *Cortical disease* is frequently responsible for paralysis of the tongue on the opposite side, as is seen in the numerous cases of hemiplegia associated with this condition. The same accident occurs when the fibers between the cortex and the nucleus in the medulla are invaded. Apoplexies and other causes of compression, softening, thrombosis, and embolism are agencies operating to this end. (2) *Nuclear disease* is another cause. It is usually degeneration, rarely sudden softening; the former as a part of bulbar palsy and locomotor ataxia, and the latter from vascular obstruction. The effect is almost always bilateral, the nuclei being so close together that it is scarcely possible to involve one only, although such isolated result has occurred in sudden cases, and, rarely, in slow ones, as in tabes and general paralysis. (3) *Infranuclear disease* may operate at various sites: (*a*) Within the medulla the root-fibers may be invaded by a tumor or by softening. (*b*) Outside the pons the fibers may be damaged by the products of meningitis, simple or syphilitic, and by new formations.

The nerve may be compressed in its foramen by outgrowth of bone. Outside the skull the nerve is compressed by tumors, by inflammatory products, or injured by disease communicated from caries of the upper cervical vertebræ, and by penetrating wounds. Hence, the spinal accessory often suffers coincidently, and there is paralysis of the palate, occasionally of the vocal cords, with or without wasting of the trapezius and sternomastoid. The hypoglossal may be the seat of neuritis (Tyson).

Symptoms. Hypoglossal Paralysis.—This is motor only. When there is supranuclear disease, in addition to the palsy of the tongue there is hemiplegia, but no wasting of the tongue, which is protruded toward the affected side, nor change in electric reaction. In nuclear disease the lesion is apt to be bilateral palsy. The tongue lies motionless in the floor of the mouth, and speech and deglutition are seriously impaired. Mastication is interfered with, mainly because the tongue cannot regulate the position of the food, the proper muscles of mastication being intact. There are atrophy and reaction of degeneration. The mucous membrane is thrown into folds. The condition is likely to be a part of a bulbar palsy. In infranuclear disease only one nerve is affected; there is wasting, with reaction of degeneration, and fibrillary twitching. Speech is not much impaired, nor swallowing.

Spasm.—Spasm of the tongue as an isolated event is very rare. It may be unilateral or bilateral. It commonly occurs as a part of some other convulsive affection, as epilepsy or chorea, or spasm of the facial muscles. It may also occur in hysteria. In the biting of the tongue in epilepsy the organ is thrust between the teeth by spasmodic contraction of the genioglossus and caught by the jaws through a spasm of the masseters. Spasm of the tongue occurs in some forms of stuttering, the spasm often preceding the explosive utterance of words. In other cases there are various protrusions and

deviations of the tongue, produced in some instances by irritation of the fifth nerve, variously induced: it may be, by a carious tooth. The spasm may be clonic, the tongue being thrust in and out many times in a minute, at others more slowly. It may be associated with facial spasm. It may occur during sleep.

Diagnosis.—This is generally easy. If there are hemiplegia and palsy, but no wasting of the muscles of the tongue, no reaction of degeneration, the lesion is supranuclear. If there is paralysis of the tongue on the one side, and of the limbs on the opposite, there is probably a unilateral lesion in the medulla below the nucleus. When the disease is on the surface of the medulla, the paralysis is commonly unilateral, and is associated with paralysis of the corresponding half of the palate and vocal cord, because of the involvement of the spinal accessory.

Prognosis.—The prognosis is usually unfavorable, because the lesion is incurable.

Treatment.—The treatment embraces that of the disease producing it. The symptom of lingual paralysis may be treated with electricity—with an electrode in the shape of a tongue depressor. The treatment of spasm has been by sedatives, including bromids, by iodids, and by electricity.

HYPOPHYSIS.—See Pituitary Body.

HYPOPYON.—See Cornea.

HYPOSPADIAS.—See Penis (Deformities).

HYSTERECTOMY.—The uterus may be removed by way of the abdomen or through the vagina.

Abdominal hysterectomy may be complete or the womb may be amputated at the internal os. Unless the uterus is removed on account of malignant disease, supravaginal amputation of the uterus is to be preferred.

The steps of this operation are as follows: An incision is made in the median line of the abdomen, 4 or 5 inches in length. The ovarian artery is ligated in the top of the broad ligament, about an inch from the pelvic wall; a second ligature secures it at the uterine cornua. The round ligament, with its artery, should next be ligated about 2 inches from the uterus. Similar ligatures should then secure the opposite ovarian artery and round ligament. The broad ligament should now be divided as far as the uterus, cutting on the inner side of the ligature on the round ligament. The peritoneum covering the anterior and posterior surfaces of the uterus is now divided transversely at a point a little above the internal os and stripped well down toward the vaginal vaults.

The uterine arteries are now ligated close to the cervix, care being taken to avoid the ureters, which pass about 3/4 of an inch from the cervix at this point. The uterus is then amputated by a wedge-shaped incision through the cervix.

The cervical canal is now sterilized with a solution of bichlorid of mercury (1 : 500), and the flaps of the cervix are brought together by 3 or 4 interrupted sutures. The stump of the cervix is now covered by bringing together the reflected layers of peritoneum, and the broad ligaments are closed by interrupted sutures. The remaining steps of the operation consist of the toilet of the peritoneum and closure of the abdominal wound.

Vaginal hysterectomy may be performed for the relief of cancer or any tumor which is sufficiently small to pass through the vagina.

The steps of this operation are as follows: The cervix is seized with a tenaculum and drawn downward and forward. A transverse incision is made through the posterior vaginal vault, and Douglas' pouch is opened. The cervix is now drawn backward and the uterovesical pouch is opened. The broad ligaments are next secured in successive portions by forceps, and the uterus is cut away. A light gauze pack is now introduced in the upper part of the vagina. The tampon and forceps are removed at the end of 48 hours. The uterus may also be removed by a combination of the vaginal and abdominal methods.

HYSTERIA. Definition.—Hysteria may best be defined as a psychoneurosis. The psychic element is the essential one, but it is difficult to limit or define it. Perhaps the best conception of hysteria is by regarding the disease as a state in which the various normal associations of the mental, sensory, and motor centers of the brain are interrupted, and in which there is seen, as a consequence, a vast array of purely temporary deliria, accompanied by functional lesions of the sensory and motor tracts. This leads to curious mental reactions, such as emotional and intellectual disorders, with convulsions, and to paralyses of motion and sensation.

Causes.—Hysteria has many well-recognized causes. Among these the most prominent is *heredity*. The disease is engrafted usually on a neurotic stock, and this ancestral base may have been prolific, not only of hysteria itself, but of other nervous disorders, such as insanity, epilepsy, and neurasthenia. Briquet found 25 percent of neurotic relations among 351 hysterics, but only 2 1/2 percent among nonhysteric patients.

Next to heredity, *trauma* is the most important cause of hysteria. It acts more potently in men even than in women, especially in association with alcoholism. It is also active in children. It is especially important from a medicolegal standpoint, as such cases closely simulate organic disease. Trauma is especially likely to cause the so-called permanent stigmata of the disease, in contradistinction to the paroxysmal form. It is unusually active when associated with shock or fright, as in severe accidents.

Eye-strain is a very frequent cause of hysteria, pseudo-epilepsy, hystero-epilepsy and similar nervous disorders.

Acute and chronic diseases of various kinds may act as exciting causes of hysteria. It thus happens that hysteria is sometimes a complication of organic disease, and hence may seriously confuse the diagnosis. Among the diseases causing hysteria are the exhausting and febrile diseases, those entailing pain and anxiety, and those that cause fright. Hysteria has been noted in cases of epilepsy, in organic nervous disease, such as tabes, and in syphilis. It has also been seen in the puerperium.

Emotional and moral shock is a potent cause of hysteria. Fright, disappointment, shame, anxiety,

and grief may all act thus. The sight of some frightful accident, the loss of a near relative, disappointment in love, a threatened disgrace, and pecuniary embarrassment may be mentioned. Religious excitement, especially among the ignorant, has long been known as a cause of hysteria.

The various *toxemias* may cause hysteria. Among these are states of chronic poisoning from alcohol, tobacco, lead, mercury, and bisulphid of carbon. In fact, any poison that lowers nerve tone may be supposed to have a hysterogenous quality.

Errors in education may lead to hysteria; especially in children. Overindulgence, and the morbid excitement of the emotions, as by unhealthy fictional literature, as well as excessive severity and cruelty toward children, may cause the disease.

Occurrence.—Hysteria prevails extensively and is not confined to any race or country. It is seen in men as well as in women; and children, contrary to the belief of former years, are distinctly prone to it. It has even been described in the lower animals. The tendency to it diminishes toward middle life. In women, according to some French statisticians, it is most common about the twentieth year. In the Paris hospitals hysteria is even more common in men than in women.

Symptoms.—The symptoms of hysteria are usually divided into the *paroxysmal* and *interparoxysmal*. This is done for convenience of description, but the distinction is also of clinical significance, because the two classes of symptoms are by no means always found in the same patient.

By the **paroxysmal symptoms** are meant those that are convulsive in character. A certain proportion of hysterics, but by no means all, are subject to fits. These fits have quite a definite character, sufficiently so to admit, if they are carefully studied, of a complete differentiation from epileptic and other convulsions. Following the method of Charcot, the hysteric fit is best analyzed and studied by dividing it into 4 stages. But, beforehand, it is necessary to recognize that the hysteric convulsion is usually preceded by prodromes. These are mental, and are marked by change of character, depression of spirits, moodiness, irritability, and emotional excitability. These prodromes are sometimes recognized by the patient, and may also be apparent to friends and attendants who are familiar with the case. Disturbance of sleep and of digestion may also appear. The fit itself is usually ushered in with an *aura*. This may be an intense, circumscribed pain in the head, called *clavus*, or pain in the ovarian region, or the sense of a ball rising in the throat—the well-known *globus hystericus*. Other prodromes or auræ may consist of various motor and sensory disorders, which are likely to remain even after the fit, and are, hence, appropriately described among the interparoxysmal symptoms.

The hysteric fit may, as just said, be divided into 4 periods.

The first or epileptoid stage begins as a tonic convulsion. The body is stiffened out, usually in opisthotonos, and all the muscles of the limbs are rigid. The eyes are set, either crossed or in conjugate deviation. The teeth are clenched, the breath labored or arrested, the pulse quickened. This tonic soon merges into the clonic spasm. In this latter the muscles are convulsed in a way very similar to that of true epilepsy. During the whole of this first stage the consciousness is obtunded, but not often entirely lost, and sensation is much impaired or even abolished. The tongue is not bitten, no bodily injury is sustained, and there is no involuntary discharge of urine or feces. As the clonic spasm gradually relaxes, the patient lies supine, with closed and tremulous eyelids, noticing little or nothing, or perhaps passing into a slight apparent sleep. In mild cases this first or epileptoid stage may constitute the whole of the attack, and thus the case may closely simulate epilepsy.

The second stage is called the period of grand movements, or *clownism*. In this the patient throws the body into various extravagant movements and positions. Some of these are apparently purposive, and all of them are disordered and without system. Such movements, of great variety and violence, have characterized some of the epidemics of hysteria that have occurred in the past, especially during the Middle Ages, and in more recent times under the influence of religious excitement.

The third stage is one of passionate attitudes; it is a sort of dramatization. The patient acts in response to an emotional or even a delusional state of mind. This and the preceding stage are only well marked in cases of extreme severity. The two stages may be merged into one, in which the patient seems to be in a sort of frenzy, portraying a greatly disordered state of the intellect and emotions.

The fourth or last stage is one of delirium. The motor excitement subsides, and the patient remains for a while in a semiconscious state, marked by emotional disturbance, especially sadness accompanied by tears. It must be understood that the hysteric fit is not always clearly subdivided as described here, but that abortive or undeveloped attacks may occur which present various modifications and combinations of the symptoms described. In severe cases profound modifications of paroxysmal hysteria occur, most prominent being somnambulism, catalepsy, and trance.

The interparoxysmal symptoms of hysteria are sometimes called the **stigmata.** They occur between the attacks, or even, in many cases, quite independent of convulsions. In fact, they are often seen in patients who never present the paroxysms. They are of first importance because they simulate organic diseases. They may be sensory, motor, visceral, and psychic.

The sensory symptoms of hysteria may be anesthesia, hyperesthesia, or paresthesia.

Anesthesia is very common, and should always be searched for. It may be a complete hemianesthesia, a monoanesthesia, or an anesthesia in spots. The hemianesthesia is complete from crown to sole, and involves the mucous surfaces of the eye, mouth, and nose. In some cases it can be transferred from one side to the other. The

monoanesthesia may involve an arm or a leg. It is usually sharply demarcated at its upper limit at a right angle to the limb—hence presenting the form of a gauntlet or a stocking. The anesthesia in plaques, or spots, may present a great variety of forms, the various anesthetic areas being scattered over the surface without regularity of size or distribution.

Hyperesthesia is of next importance. Intense pain, limited to a small area on the head, is common. This is the symptom called **clavus**. Hyperesthetic zones, especially over the ovaries, and along the spine and under the floating ribs, are common. Pressure upon these may induce a fit in susceptible patients, and, *per contra*, may abort a paroxysm. Intense neuralgic pain in the breast or in a joint may closely simulate the effect of organic disease. This is seen in hysteric joints.

Paresthesia is closely allied to hyperesthesia, but is not common in the disease.

The special senses may become anesthetic in hysteria. Amaurosis may exist in various forms. The most common is a contraction of the visual fields and alterations in the color field. Complete blindness is occasionally seen, and in very rare instances a homonymous hemianopsia. Hysteric deafness has been reported, and abolition of taste and smell, especially on the anesthetic side in hemianesthesia, may be present.

The motor symptoms of hysteria may assume the form of paralysis, contracture, tremor, or incoordination. *Paralysis* is common. It may be a hemiplegia (often accompanied by hemianesthesia), a monoplegia, a paraplegia, or even, very rarely, a universal palsy. Any form of paralysis may be accompanied by contracture, but in some cases the palsied limb is flaccid. There may be slight wasting, and in some cases a characteristic blue edema. The deep reflexes may be increased, and even ankle-clonus has been claimed to be present. The duration is sometimes very prolonged. The onset may be sudden, following one of the causes already mentioned, especially trauma or an emotional shock.

Contracture is common, and may be most obstinate. There is usually some loss of power, but the two states are not necessarily associated. Pressure on a nerve-trunk may induce an attack, sometimes accompanied by a hysteric fit.

Tremor is an important symptom. It is usually of a vibratory kind (from 8 to 12 vibrations to the second). Sometimes it is coarser and more like an intention tremor. It may be caused by trauma or shock, and is sometimes seen in toxic cases (as from alcohol, lead, or mercury).

Incoordination, or astasia abasia, is an occasional symptom. In severe cases the patient can neither walk nor stand. In others the gait is extremely disordered, without true paralysis. The patient, on sitting or lying, has control of the movements, and may even be able to progress on "all fours."

The visceral and internal disorders of hysteria are numerous. Among them may be mentioned aphonia, vomiting, coughing, hiccuping, rapid respiration, yawning, tachycardia, vasomotor disturbance, distention of the bowel and phantom tumor, pyrexia, and anuria. A free discharge of limpid urine is common after a fit.

The psychic symptoms of hysteria may be classed together as presenting the common characteristic of morbid suggestibility. The hysteric patient is usually highly susceptible to unwholesome impressions, these varying according to the mental characteristics of the individual. It must not be forgotten, however, that hysteria is a genuine disorder, and not one of simulation and mere perversity. This psychosis is not incompatible with mental and moral traits of a high order.

Diagnosis.—Hysteria must be distinguished from the innumerable diseases which it more or less simulates. Among these are epilepsy, paralysis from organic disease, and affections of the sense organs. It must not be confused with malingering or with other mental disorders, especially paranoia. In one sense hysteria does not simulate exactly any disease. It is an affection *sui generis*, with its own unmistakable stigmata, and is to be recognized by a careful study of these. See Epilepsy.

Pathology.—Hysteria, being a psychoneurosis, has no recognizable gross anatomy. It doubtless depends upon a faulty state of the functions of the higher brain centers. The attempt to explain it by any mechanic theory (as by the motility of the neurons) has not been generally received with favor. The nutrition of the brain-cells may be impaired in some cases, but the exact pathology of the disease is obscure, just as the exact mechanism of all brain states is obscure.

Treatment.—The successful treatment of hysteria requires, more than all other affections, the use of **suggestive therapeutics.** The practitioner must aim to gain a mental ascendancy over his patient. This requires tact, moderation, and a thorough appreciation of the essential features of the disease. Errors of refraction should be carefully corrected by the proper lenses. As strictly subsidiary agents may be mentioned hydrotherapy, electricity, massage, isolation, diet, and sustaining drugs. The rest cure is indicated in severe cases. Depressing or sedative drugs should be used with the utmost caution, and in most cases not at all.

I

ICE.—Ice is refrigerant and analgesic. It constricts the caliber of small vessels, and thus acts as a hemostatic, antisecretant, and antiphlogistic. Pieces of ice held in the mouth allay the sensation of thirst. Small lumps can be slipped between the lips of a sleeping infant in acute angina, and the little patient be kept comfortable by the inflamed structure being thus bathed with cold water. Hemorrhages from the mouth, throat, and nose, and even from the lungs, are indirectly controlled by allowing pieces of ice to dissolve in the mouth. Cold, wet compresses are useful applications to be made to the skin of the neck when disposition to recurrent catarrhal pharyngitis is marked.

The local application of cold, by contracting the walls of the blood-vessels and diminishing nervous irritability, is a powerful and valuable agent in the treatment of acute inflammations of the eye. It is most useful in traumatic cases and in high grades of conjunctivitis, notably the gonorrheal form. It may be applied dry, by means of small ice-bags, or by cold water being passed through coils of metallic or rubber tubes; but wet applications are more convenient and are generally efficient. The simplest apparatus consists of a bowl of iced water, or, better, a lump of ice, by the patient's side, and some pledgets of lint or linen. The latter should not be folded more than once, and should be changed every few minutes, as, if left on too long, particularly if their thickness prevents rapid evaporation from the linen fold, the surface next the eye becomes warm and an alteration of heat and cold is produced, which may do more harm than good. The application should be continuous, since vascular reaction follows the removal of the cold. Care should be taken not to continue this treatment too long. The sensations of the patient are generally a very safe guide, and it is not well to insist upon a continuance of the application when it ceases to be agreeable. As a rule, cold should not be used when there is a tendency to slough.

Obstinate vomiting is often checked by swallowing fragments of ice. Ice is applied to the head in cerebral congestion, to the spine in chorea, etc., locally in hemorrhoids, bubo, orchitis, and to the uterus in postpartum hemorrhage. Ice-bags placed along the spine in epilepsy when the circulation is sluggish, the hands and feet always clammy and cold, will restore warmth, relieve headache and symptoms of incipient paralysis. Ice in a bag may often be employed beneficially as an anodyne in inflamed ovary or testicle.

In dysentery, when the lower part of the colon is affected, the local use of ice sometimes has an almost marvelous effect. The whole aspect of a very severe and alarming case, in which the symptoms indicate that the colon is affected high up, may be changed in a single hour by the continuous use of ice suppositories. While it is not necessary to have the pieces of ice entirely regular in shape, care should be exercised that no sharp edges are left. The suppositories should be rapidly used, one being put into the rectum every 3 or 5 minutes, so as to get, for at least 1/2 of an hour to 1 hour, the effect of the continuous application of cold.

Ice is used directly or in one of the following ways:

Ice-bag, a bag of waterproof material, filled with ice, for application to any part of the body. **Ice-cap,** a bladder or rubber cap filled with pounded ice for application to the head in case of congestion. **Ice-cot,** a bed cooled by ice, so as to reduce the temperature of the patient. **Ice-cradle,** a device that consists in the suspension, over a febrile patient in bed, by means of iron frames or barrel-hoops, of a number of zinc buckets kept half filled with ice and inclosed in a light covering. The patient is covered with a muslin sheet and provision is made for the circulation of pure air in the cradle. The temperature of the patient is to be taken at least every 4 hours, and if it falls to 100°, the apparatus is to be removed. If a sense of chilliness appears, hot bottles are to be applied to the feet. **Ice-poultice,** or **ice-compress,** an application of broken ice used for local refrigeration. See COLD.

ICHTHALBIN.—Ichthyol albuminate occurs as a greenish-brown powder, odorless and almost tasteless, insoluble in water but soluble in alkaline solutions. It contains 75 percent of ichthyol, and is used in syphilis, also in scrofula with a lowered condition of nutrition. Dose, 15 to 30 grains thrice daily.

ICHTHARGAN.—Silver ichthyolate. A compound of ichthyol and silver, claimed to contain 30 percent of metallic silver and 15 percent of sulphur in organic combination. It is reported to combine the bactericidal action of the silver salt with the penetrating and antiphlogistic action of ichthyol. Solutions of 1 in 2000 to 1 in 500 are used in gonorrhea. It is freely soluble, is claimed to be more strongly bactericidal than silver nitrate and far less toxic.

ICHTHOFORM.—Ichthyol formaldehyd. A dark-brown odorless powder. It is recommended internally in intestinal sepsis and externally in endometritis, in ozena, and in wounds, ulcers, etc. Dose, 10 to 30 grains.

ICHTHYOL.—Sodium sulphoichthyolate. A preparation obtained from certain varieties of fossiliferous shale occurring in the Tyrolese Alps. It has a characteristic bituminous odor and taste. It is a good antiphlogistic, and has proved efficient in eczema and psoriasis, and in rhinology, ophthalmology, and gynecology. It is freely soluble in

water, feebly so in alcohol and ether, but mixing with fats in all proportions. **Sodium ichthyolate** is the form usually employed for internal use, and may be given in the dose of 2 to 10 grains. It is best prescribed in pills and capsules.

Ichthyol is of real service in skin-diseases, such as chronic eczema, acne, urticaria, prurigo, lupus, and keloids. To cover its disagreeable odor, oil of citronella should be added, somewhat as follows:

℞.	Ichthyol,	ʒ ij
	Lard,	ʒ j
	Oil of citronella,	gtt. xv to xxx.

In erysipelas an ointment of 20 percent strength may be employed, or a watery solution containing one dram to the ounce may be painted on by a camel's-hair brush. It is very efficacious in the pain and swelling of the joints in acute rheumatism, during and after the attack. The ointment to be here used should have the strength of 30 parts of ichthyol to 70 of benzoinated lard. Ichthyol combined with mercurial and belladonna ointments is also beneficial in this condition. To remove lymphatic enlargements, and in the treatment of bruises, sprains, and chilblains, and in the various inflammatory affections of the female genital organs, such as ovaritis, endometritis, and parametritis, it is peculiarly valuable. It is remarkably efficacious in removing periuterine and pelvic exudations.

Ichthyol possesses marked advantage in the treatment of diffuse inflammation of the external auditory meatus and auricle. A 20 percent strength with cosmolin base is admirable in ulceration of the septum and of fissure at the edges of the nostril. In the proportion of 1 grain to 6 ounces of lime-water ichthyol has been recommended in the treatment of purulent rhinitis. Its derivatives: sodium, calcium, ferric and lithium ichthyol and ichthermol or mercury ichthyolate have the actions of their constituents.

ICHTHYOSIS (Fishskin-disease; Xeroderma).

Definition.—A congenital chronic hypertrophic disease, characterized by dryness and scaliness of the skin and a variable amount of papillary hypertrophy.

Symptoms.—Two forms of the disease are distinguished—ichthyosis simplex and ichthyosis hystrix.

Ichthyosis simplex is the common variety encountered. There may be merely dryness and harshness of the skin, with fine, furfuraceous scaling (*xeroderma*). Frequently, however, the disease is more marked, exhibiting variously sized reticulated scales, which may be small and thin or large and thick, resembling fish-scales. Upon the arms and legs the epidermis forms diamond-shaped or polygonal plates, bounded by the natural furrows of the skin.

Ichthyosis hystrix is a rarer and more severe variety. It is characterized by papillary hypertrophy, showing itself clinically as irregular or linear, corrugated, warty or spinous, horny patches.

Ichthyosis simplex involves more or less the entire body surface. It is most marked, however, upon the extensor surfaces of the arms and legs. Ichthyosis hystrix affects only limited areas of the skin, such as the arm, neck, axilla, umbilicus, etc.

The course of ichthyosis is extremely chronic. The disease begins usually in the first or second year of life, increases in severity until adult age is reached, and then remains stationary, thus continuing throughout the patient's lifetime.

Ichthyosis is markedly influenced by the seasons. It is always worse in cold than in hot weather. In the spring and summer, when perspiration is increased, great improvement takes place.

The disease is not inflammatory, and there is, as a rule, no itching. It is, however, not infrequently complicated by eczema.

Etiology.—Ichthyosis is a congenital disease, although it does not, as a rule, manifest itself before the first or second year. A hereditary influence exists in many cases.

Pathology.—The pathologic process consists of a hyperplasia of the cells of the corneous and mucous layers of the epidermis. The papillary layer of the corium is in many cases also hypertrophied.

Diagnosis.—The characteristic features of ichthyosis are: The harsh, dry skin; furfuraceous scales and polygonal plates; the localization of the eruption; the history and the absence of inflammatory symptoms.

Prognosis.—The prognosis is unfavorable as to cure. Considerable relief, however, may be afforded by proper treatment.

Treatment.—Internal treatment is of little or no value. External treatment is to be solely relied upon. This has for its object the removal of the epidermal scales and the softening of the skin with unguentous substances.

Baths are of great value, and are to be employed frequently. Either a simple warm bath or an alkaline bath (sodium bicarbonate, 4 to 8 ounces to bath) may be used. In mild cases frequent bathing, followed by the inunction of some oily or fatty substance, will be all-sufficient. For this purpose petrolatum, lard, olive oil, oil of sweet almonds, diluted glycerin, etc., may be employed. A simple and efficient inunction consists of:

℞.	Lanolin, Petrolatum,	} each,	ʒ j.

In severe cases the following plan is advised: Friction with soft soap twice daily for 4 or 5 days, followed by a bath and the inunction of a simple ointment.

Iodid of potassium in ointment form has been highly spoken of:

℞.	Potassium iodid,	gr. xx
	Glycerin,	ʒ j
	Lard,	ʒ j.

In ichthyosis hystrix caustics, the Paquelin cautery, or the knife may be necessary to remove the hypertrophic tissues.

ICTERUS.—See JAUNDICE.

IDIOCY.—See INSANITY.

IDIOPATHIC DILATATION OF COLON.—See HIRSCHSPRUNG'S DISEASE.

IDIOSYNCRASY.—Any peculiar and not obviously correlated reactions against external influences exhibited by any individual. It is not to

be confounded with "constitution," which is the foundation of the individual—his powers, capacities, and organizations—nor with temperament. Any single peculiarity of an individual is commonly spoken of as "an idiosyncrasy." It may be mental or physical, innate or acquired, permanent or temporary. Instances of idiosyncrasy are found in those who swoon at the sight of blood or of beet-root, horror and fainting induced by the odor of roses or apples, etc. In another group the higher nerve-centers play no part, the phenomena being of reflex production or due to direct poisoning of the system or organs. For instance, eggs, honey, sugar, or fish may produce gastric pain, nausea, or vomiting; strawberries may be a violent poison to some, producing shock; convulsive spasms may be excited by the odor of musk or civet; asthma may be aroused by the smell of ipecac.

There are cases in which minute doses of opium or belladonna may poison some persons, while in others enormous doses may be taken with impunity. The causes of innate idiosyncrasies are, for the most part, unexplained. Imaginary idiosyncrasies are found in those who, held by prejudice or misled by fancy or unsound judgment, declare that particular foods or medicines disagree with them. It is usually possible to evade such obstacles and assertions by tact, undermine them by argument, or dissipate them by firmness.

IGNIPUNCTURE.—A method of cauterization employed in the treatment of certain forms of hypertrophy by the introduction of platinum needles heated to whiteness by the electric current.

ILEUM.—See Intestines.

ILEUS.—See Intestinal Obstruction.

ILIUM.—See Hip-joint.

ILLAQUEATION.—A method of changing the direction of misplaced cilia, by withdrawing them, by a noose, through an opening in the adjacent tissue of the lid. Unfortunately, the eyelashes frequently regain their abnormal positions by reason of their own elasticity. See Eyelids.

ILLEGITIMACY.—See Legitimacy.

ILLUSION.—A deception, false appearance, or mockery, sometimes used synonymously, but incorrectly, with hallucination. Illusion denotes the erroneous conception by the mind of some external object—a false interpretation of an actual perception. Illusions are consistent with sanity. Expectant attention at the moment an external object is perceived exerts a subtle influence upon the observer or auditor. It falsifies to an alarming extent the experiments of scientific and especially medical men; but these are not symptoms of insanity. Illusions arising from the exaggeration or perversion of internal sensations constitute the prominent symptoms of the hypochondriac.

IMBECILITY.—See Insanity.

IMMOBILITY.—Absolute rest. It is one of the most potent factors in healing. It is a fundamental and generally applicable surgical principle, especially in the treatment of bruises, wounds, sprains, and fractures, and in articular diseases. Repair is in direct proportion to rest, and the nearer rest is to immobility, the more perfect the repair. Physiologic position and equable pressure contribute to immobility, and mechanic contrivances are, as a rule, essential. Molds and splints are the most useful forms; bags of sand, shot, and water, together with weights, pulleys, and springs, are means employed. Molds of millboards, gutta-percha, paraffin, starch, dextrin, potassium silicate, plaster-of-Paris, and strips of wood and metal are materials used. Wire molds and successive strips and layers of bandages may be used to immobilize a part. Gum, starch, or chalk may be added over the layers of the apparatus in process of construction. Rigid molds and splints may be usefully combined with suspension to secure immobility. See Fractures, Dislocations, Chest, etc.

IMMUNITY.—Immunity may be described as the condition or state of an individual who is nonsusceptible to a given disease. (This applies equally well to animals.) Human beings are, practically speaking, immune to certain diseases of animals and *vice versâ*. If, however, man or animal is subject to a change of environment, or suffers in some way to lessened body resistance, naturally resistant subjects may be infected with certain diseases. The exact cause (or causes) of this phenomenon is unknown; but there are various theories which in a way, make certain phenomena appear intelligible.

There is strictly speaking no such thing as an **absolute immunity.** While certain animals appear under natural conditions to be nonsusceptible to diseases, yet when they are placed in an unfavorable atmosphere or the quantity of food is cut down, or their general condition is in some way interfered with, they can be readily infected with the bacterium or parasite of that disease to which they are ordinarily immune.

Natural immunity does exist, and is evidenced by man being immune to such diseases as hog cholera or swine plague, and animals being naturally resistant to small-pox, scarlet fever, etc.

Active immunity is where an animal or human being is rendered nonsusceptible to certain infections, by injections of living or dead bacteria, toxins, nonvirulent cultures of bacteria, or cultures attenuated by injecting them in the presence of an antiseptic. These inoculations are begun in small doses and repeated at stated intervals until no symptoms follow injections of massive doses. **Passive immunity** can be brought about by the injection of antitoxic or antimicrobic sera. (These sera are obtained respectively, from an animal immunized against a toxin and one immunized against a bacterium.)

What is spoken of as **acquired immunity** is a condition brought about in an individual, who has passed through a given disease (as small-pox, scarlet fever, measles). All diseases do not confer immunity upon an individual who has had one attack of that disease; some really predispose to other attacks as for example, pneumonia, erysipelas, diphtheria, rheumatism, etc. Vaccinia is generally recognized as variola in the cow and when a person is successfully vaccinated with cow-pox he passes through a modified form of the disease (varioloid).

As to the **theories of immunity,** most of these set forth that some substances or bodies (which the Germans refer to as "antikorpers" or antibodies) are formed in the individual; and these are antagonistic to the bacterium or to its toxin.

One of the oldest suppositions was the **exhaustion theory.** This had for its basis the hypothesis that, while the disease lasted in an individual, something was gradually being exhausted which made the soil or pabulum unsuitable for another invasion and foothold of that infective agent.

Another theory was that of **retention** in which it was maintained that something inimical to the infective agent was retained in the body and thus a second attack was not brought about. The **humoral theory** was one in which it was believed that the humors of the body exhibited bactericidal properties against the infective agent.

The **theory of phagocytosis** as put forward by Metchnikoff has for its basis the fact that different white cells of the blood (polynuclear and large lymphocytes) as well as somatic cells (endothelial cells and fixed connective tissue cells) exhibit an engulfing process in which bacteria are taken in by these cells, and destroyed. He claims that the destruction of bacteria is due to substances elaborated by the granules of the white blood-cells, which act as a ferment, and thus digest them. The polynuclear leukocyte or microphage elaborates what is called microcytase, and the large lymphocyte or macrophage elaborates macrocytase. The endothelial and fixed connective tissue cells also exhibit this digesting action, but the substances have not been so thoroughly or completely studied as those of the leukocytes.

The so-called **lateral chain or side chain theory of Ehrlich** is one which has received the greatest consideration. Ehrlich sets forth, that each cell has (theoretical) side chains, whose function it is to assimilate some suitable food stuff. Each of these processes is specific for this particular substance and will not unite with any other. Even in health these side chains are present and are constantly being produced, cast off, and reproduced in the same way that other structures of the body are. As an example of the action of the specificity of these side chains, let us imagine a cell provided with side chains for tetanus, cholera, diphtheria and typhoid fever. Suppose the individual is attacked with diphtheria. As soon as the disease manifests itself and the toxin of the **bacillus diphtheriæ** has commenced to act on the system, the side chains for this particular food stuff (toxin) unite with the molecules of toxin. As the union is complete the side chain is thrown off into the circulation, having neutralized by its union the molecules of the toxin. None of the other side chains of this cell unite with **this toxin,** but if the patient is taken ill with any of the other diseases mentioned, the poisons will be acted upon and neutralized by the specific side chains, exactly as in diphtheria.

A lack of, or an overabundance of, specific side chains may explain the nature of natural immunity.

These side chains have also been referred to as **receptors** on account of their combining affinity for foodstuffs. They have been grouped under three heads according to their action. The first group has a single unsatisfied combining group and fixes or unites molecules of simple constitution; the second group has a combining group for the food molecule and another group which is active or zymotoxic, leading to some physical change; and the third group relates to those having one action of the food molecule and another which fixes a ferment in the fluid medium around an **amboceptor.** Now an amboceptor is a product or substance which is produced in the body of an animal which has been gradually immunized against a certain bacterium or a cell of any type. When the serum of such an animal is brought in contact with the cells against which it was immunized, it will cause a destruction of these cells. This is due to the interaction of two substances—the **amboceptor** or **immune body** and the **complement.** This latter substance is contained in white corpuscles normally and the process of **cytolysis** does not take place unless the complement is present. Complement can be destroyed by heat which makes an **inactivated serum,** but can be **reactivated** by the addition of serum of an animal of the same species.

This theory seems in harmony with the action of antitoxins as well as many of the antisubstances.

Bordet's test of the detection of human blood may also be explained by this theory. A rabbit is inoculated with human red blood cells, at first in small dose and later with gradually increasing doses. After a certain time, the animal is sacrificed. Its serum is separated and is brought in contact with human red cells. In a very short time, **hemolysis** takes place and precipitation of the broken down red cells occurs, indicating a specific action. If this serum is brought in contact with the red cells of another mammal no reaction takes place.

Where stains (upon clothing, implements, carpets, etc.) are suspected to be human blood, these are dissolved in normal salt solution and brought in contact with this humanized rabbit serum. If a positive reaction occurs (hemolysis and precipitation) the stain can be said almost certainly to be human blood, while if a negative reaction takes place (no hemolysis) the stain may have been of rust or the blood of some other animal.

In the development of any antibody all that is necessary is the repeated injection into a guinea pig or other animal, of the material or cell against which it is to be used.

The injection of a toxin will generate an antibody for this toxin (antitoxin); thus the injection of the typhoid bacillus will generate an antibody which will destroy the typhoid bacillus; injection of liver or muscle tissue will produce an antibody to these substances. In other words, the reaction is specific, the typhoid antibody will not destroy any other bacillus; the antitoxin of diphtheria will not neutralize or destroy any other toxin, etc.

The production of these antibodies (antisera) is a great help in the identification of certain species of bacteria by the so-called agglutination tests or

serum diagnoses. See Serum Therapy and Vaccine Therapy.

IMPETIGO.—An acute inflammatory skin-disease characterized by one or more pea-sized or finger-nail sized, discrete, rounded, and elevated firm pustules, unattended, as a rule, by itching or other subjective symptoms. The pustules are rounded, with thick walls, and are surrounded by areolæ. They appear suddenly, and come out one after another during the first week of the attack, attain full size, and then undergo absorption or crusting. No scar or pigmentation follows. The disease is likely to occur in children.

Impetigo contagiosa is an acute, contagious, inflammatory disease of the skin, characterized by discrete, flat, superficial vesicles or blebs, which rapidly become pustular and dry upon the skin as thin crusts. The eruption is most common upon the face and hands. The lesions begin as flat vesicles or blebs, which, in the course of 24 hours, become vesiculopustular or pustular. Rupture soon occurs, the exudate drying upon the skin as thin, wafer-like crusts, which appear to be "stuck on." The edges of the crusts become detached, curl up, and the crusts drop off, exposing to view reddish spots which soon fade. The lesions at times show a tendency to umbilication. A coalescence of neighboring pustules may occur, leading to the formation of patches of considerable size. In severe cases there may be slight febrile disturbance. Itching is slight or absent. Occasionally the eruption takes on a circinate form.

The affection is chiefly seen in poor children. It is likely to accompany pediculosis capitis, as the result of scratching. Epidemics of contagious impetigo are not uncommon in institutions for children. The affection is caused by inoculation with the ordinary pus microorganisms, particularly the staphylococcus pyogenes aureus. The chief characteristics are the discreteness, superficiality, and autoinoculability of the lesions. The affection may be cured in a week or ten days, or, indeed, may get well spontaneously.

Treatment.—The crusts are removed with soap and warm water, after which the following ointment may be used:

℞. Ammoniated mercury, gr. x to xl
Petrolatum, ʒ j.

Impetigo herpetiformis (*herpes pymœicus*) is a very rare disease of the skin, characterized by the formation of superficial miliary pustules that may be discrete, but are usually closely set. The contents of the pustules are at first opaque, but become greenish-yellow, and dry up into dirty-brown crusts. The disease spreads until the whole surface is covered with swollen, crusted, and excoriated patches. It develops first on the inner side of the thighs, and about the groins, navel, breasts, and axillæ, and is mainly seen in pregnant women. The termination is fatal, as a rule.

IMPOTENCE.—Lack of power, applied especially to male incapacity of procreation. It is variously qualified as *atonic*, when due to spinal or central exhaustion; *paralytic* or *paretic*, when the impulse that leads to the performance of the function is abolished; *psychic*, when due to fear, bashfulness, or mental disturbance; *symptomatic*, when due to some drug or to a disturbance of the health.

Psychic impotence results from undue predominance of the cerebral inhibiting centers. Irritable impotence results from undue excitability of the nervous centers. Paralytic impotence results from injury, disease, or degeneration of the nervous centers. Irritable impotence is most common, and occurs after habitual masturbation or excessive venery. The semen is ejaculated before penetration has been effected, and the erection speedily subsides.

Aphrodisiacs determine blood to the penis and urinary organs and cause morbid erections without any voluptuary sensations and desires. The most common aphrodisiac is cantharides. In atonic conditions of the organs 10 to 15 minims of the tincture of cantharides may be given for a short time every 3 or 4 hours. Diluted phosphoric acid, phosphate of iron, strychnin, and ergot of rye are used in impotence. Cold douches to the genitals are of great value. Electricity is a remedy of some efficacy in certain forms of impotence. Interrupted currents passed in two directions—from the perineum to the glans penis, and from the groin along the spermatic cord to the testicles—may be used. The results are often disappointing. Special treatment is required in cases due to injury. Abstinence and hygienic measures are to be used in connection with electricity.

℞. Fluidextract of damiana, ʒ ijss
Tincture of nux vomica, ʒ vj
Compound tincture of cinchona, enough for ʒ iv.
Make into a mixture. Give a teaspoonful 3 times daily after eating.

℞. Zinc phosphid, gr. vj
Extract of nux vomica, gr. xx.
Make 40 pills. One pill 3 times a day.

See Nocturnal Emissions, Sterility.

IMPREGNATION.—The result of the union of the ovum and the spermatozoon. This may occur in the uterus, tubes, or ovaries. Impregnation is most likely to occur during the first 10 days after menstruation; it is least likely to occur between the fourteenth and twenty-first days. See Fetus, Pregnancy, etc.

INCOMPATIBILITY.—The relation between medicines that renders their admixture unsuitable. This incompatibility may be *physiologic*, *chemic*, *physical* or *therapeutic*. In the first case the incompatibility may be unintentional or intentional.

Chemic incompatibility generally results from neglect on the part of the prescriber of the most common chemic reactions, such as that:

1. Acids tend to combine with bases and to form salts.

2. Weak acids or bases are displaced from their combinations by stronger ones, so that salts in solution, when brought together, generally exchange their radicles, especially if by doing so an insoluble compound can be formed.

3. A salt in solution is easily decomposed by a

strong alkali if the salt is one having a weak or volatile base.

4. A substance in solution may be decomposed by another without precipitation, the product being soluble in the solution.

5. Alkaloidal salts are precipitated from their solutions by the addition of fixed alkalies, their salts, or salts which produce insoluble compounds. Oxids of the fixed alkalies decompose salts of the metals proper and those of the alkaloids precipitating their bases; but the base may be soluble in an excess of the alkali.

6. Tannic and gallic acids and vegetable substances containing them precipitate albumin, alkaloids, and most of the metallic oxids, and form inky solutions when brought into contact with the persalts of iron. Tannic acid precipitates gelatin.

7. Glucosids are incompatible with free acids or emulsin.

Insoluble Salts.—The following more or less insoluble salts will be formed whenever the materials of which they are composed are brought together in solutions: The hydroxids, carbonates, phosphates, borates, arsenates, and tannates of most earthy and heavy metals and alkaloids, and the metallic sulphids; the sulphates of calcium and of lead and the subsalts of mercury; the chlorids, iodids, and bromids of bismuth, silver, lead, and subsalts of mercury; the iodids of quinin, of morphin, and of many other alkaloids.

Table of Precipitant Solutions (Potter).

The following table shows the most important instances of solutions which mutually precipitate each other, the letter P meaning "forms a precipitate with," and S. =solutions:

Solutions of—	Alkaloidal S. (Generally).	Metallic S. (Generally).	S. of Lead Salts.	S. of Silver Salts.	S. of Calcium Salts.	S. of Magnesium Salts.	S. of Albumin.	S. of Gelatin.
Alkalies	P	P	P	P	P	P	...	...
Tannic acid	P	P	P	P	....	....	P	P
Carbonic acid and carbonates.	P	P	P	P	P	P	...	...
Sulphuric acid and sulphates.	....	....	P	P	P	....	...	...
Phosphoric acid and phosphates.	P	P	P	P	P	P	...	...
Boric acid and borates.	P	P	P	P	....	....	...	...
Hydrochloric acid and chlorids.	....	....	P	P	....	....	...	...
Hydrobromic acid and bromids.	....	....	P	P	....	....	...	...
Hydriodic acid and iodids.	P	....	P	P	....	....	...	...
Sulphids	....	P	P	P	....	....	...	...
Arsenical preparations.	....	P	P	P	....	....	...	...
Albumin	....	P	P	P	....	....	...	...

Explosive compounds result from the admixture of powerful oxidizing agents with substances which are readily oxidizable. The most important members of these two classes are as follows:

Oxidizers.—Chlorin and its oxids, free hydrochloric acid, nitrohydrochloric acid, chlorates, hypochlorites, chromates, chromic acid, permanganates, nitric acid, nitrates, bromin, bromates, iodin, iodates, silver oxid, peroxids (dioxids).

Oxidizables or Combustibles.—Phosphorus, hypophosphites, sulphur and sulphids, glycerin, sugar, alcohols, oils, ether, tannin, cork, charcoal, creosote, dry organic substances, powdered iron and zinc, arsenic trioxid, cyanids, oxalates; ferrous, mercurous, and stannous salts.

Explosions have resulted from mixing fluidextract of uva ursi with certain samples of spirit of niter, chromic trioxid with glycerin, potassium permanganate with glycerin, nitric acid with glycerin, silver nitrate with creosote, silver oxid in pill with extract of gentian, potassium chlorate with glycerin and tincture of ferric chlorid. Calcium chlorid triturated with sulphur in a mortar has exploded; so also has calcium or sodium hypophosphite when triturated alone. Tincture of iodin with ammonia forms a high explosive, especially when triturated in the presence of water. Catechu and potassium chlorate have exploded in the mouth from the friction of a dry toothbrush. Hydrogen peroxid is peculiar in that it acts both as an oxidizer and as an oxidizable agent. It reduces oxidizable substances, and is itself reduced, and is, hence, incompatible with all the substances mentioned above. Nitrites may act in the same way under favorable circumstances.

Poisonous compounds may be formed by the admixture of many substances in solution, such as:

Potassium chlorate with potassium iodid in solution together do not react at ordinary temperatures, but in the system they evolve a poisonous agent, probably potassium iodate.

Potassium chlorate with syrup of ferrous iodid liberates iodin from the iodid in the warm stomach, causing severe gastric irritation, perhaps gastritis of dangerous degree.

Dilute hydrocyanic acid or potassium cyanid with calomel forms the bichlorid and bicyanid of mercury, both virulent poisons; with metallic hydroxids, carbonates, subnitrates, or subchlorids, cyanids of the metals are formed which are even more poisonous than the acid itself in its usual diluted form.

Pharmaceutic incompatibility differs from chemic incompatibility in the absence of chemic action, and is generally produced by adding one substance to another which, through difference in solubility, causes a precipitation of solid matter or a separation of part of the liquid. The separated constituents may be active, and hence important; or inert, and therefore unimportant.

Instances of this are the addition of an acid to a quinin and licorice mixture, resulting in precipitation of the glycyrrhizin (relied on to cover the taste of the quinin) by the acid; or the use of quinin, tincture of ferric chlorid, and licorice together; or the prescribing of solutions of chloral and potassium bromid with an alcoholic preparation, the

choral separating at the top as an alcoholate; or the neglect to prescribe acacia, or some other emulsifier, in mixtures of an alcoholic fluidextract of a resinous body with an aqueous preparation. When a fluidextract is diluted with a liquid differing in composition from those used in the fluidextracts, the gum, albumin, resin, and mucilage often separate. Water is the solvent for albuminous, gelatinous, gummy, and saccharine bodies and for a large number of inorganic salts. Alcohol is the solvent for volatile oils and resins, gum-resins, resinoids, balsams, and all drugs containing these as their active principles.

Instances of pharmaceutic incompatibility:

Resinous tinctures or fluidextracts with aqueous solutions.

Tincture of guaiac with spirit of nitrous ether.

Compound infusion of gentian with infusion of wild cherry.

Compound infusion of cinchona with compound infusion of gentian.

Essential oils with aqueous liquids in quantities exceeding 1 drop to 1 ounce.

Fixed oils and copaiba with aqueous liquids (except excipients).

Tinctures made with alcohol with those made with diluted alcohol.

Alcoholic tinctures and fluidextracts with aqueous preparations.

Spirit of nitrous ether with strong mucilages.

Infusions generally with metallic salts.

Therapeutic incompatibility arises when two agents are administered together which oppose each other in their action on the human system: as, for instance, belladonna in any form with physostigma. But in many cases physiologic antagonists are designedly prescribed together, one as a guard against the action of the other, as in the hypodermic administration of morphin guarded by atropin. See ANTAGONISM.

The dangers of incompatibility may in great measure be avoided by the use of the utmost simplicity in prescribing.

The subject can only be briefly considered here, but the following **simple rules** of Potter may help the burdened memory of the student and the practitioner.

Never use more than one remedy at a time, if one will serve the purpose for which you are prescribing.

Never use strong mineral acids with other agents, unless you know exactly what reaction will ensue. They decompose salts of the weaker acids, and form ethers when combined with alcohol. Never combine free acids with hydroxids or carbonates.

Select the simplest solvent, diluent, or excipient you know of, remembering that the solvent power of alcohol and of water for their respective substances decreases in proportion to the quantity of the other added.

Generally, do not combine two or more soluble salts; for such salts in solution, when brought together, usually exchange their radicles, thereby forming an insoluble compound.

Never prescribe a drug with any of its tests or antidotes.

Never prescribe a glucosid—as santonin, colocynthin, etc.— in combination with free acids or with a substance containing emulsin, as these agents will decompose it.

Aconite should be ordered in water alone; mercuric chlorid by itself, in water, or in simple syrup. The latter drug is incompatible with almost everything, even the compound syrup of sarsaparilla being said to decompose it.

Potassium iodid decomposes most of the metallic salts, and is one of the drugs which are best administered along.

The following-named substances are incompatible with so many others that it is best to always prescribe them alone; they are best given in simple solution: Alum, dilute hydrocyanic acid, dilute nitrohydrochloric acid, sulphuric acid, mercuric chlorid (corrosive sublimate), iodin and iodids, syrup of ferrous iodid, potassium permanganate, potassium acetate, potassium bromid, tartar emetic, tincture of guaiac, morphin acetate, morphin hydrochlorid, quinin sulphate, liquor calcis, liquor potassii hydroxidi, liquor potassii arsenitis, liquor ferri nitratis, tinctura ferri chloridi, zinc acetate, iron and quinin citrate, free chlorin in solution, tannic and gallic acids.

Silver nitrate and lead acetate and subacetate, though incompatible with almost everything, may be combined with opium, the latter forming therewith a compound which, though insoluble, is therapeutically active as an astringent and anodyne lotion. Silver nitrate with creosote forms an explosive compound.

Tannic and gallic acids, and substances containing them (as the astringent bitters), precipitate albumin, alkaloids, and most soluble metallic salts. They may be prescribed with the protosalts of iron, but not with its persalts. Calumba is the best vegetable tonic to use with ferric salts, as it contains neither tannic nor gallic acids. Tannic acid precipitates gelatin.

Iodin and the soluble iodids are incompatible with the alkaloids and substances containing them; also with most metallic salts.

Alkalies neutralize free acids and precipitate the alkaloids and the soluble nonalkaline metallic salts. Oxids of the alkalies decompose salts of the metals proper and salts of the alkaloids, precipitating their bases; but the base may be soluble in an excess of the alkali.

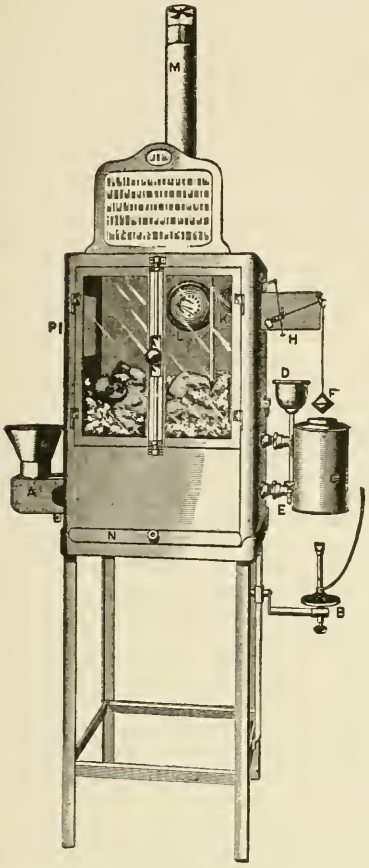
Resinous tinctures or fluidextracts—*e. g.*, tinctura cannabis indicæ—when combined with aqueous solutions, should always have acacia or some other emulsifying agent added, to prevent the separation of the resin, which otherwise will be deposited on the sides of the bottle or will float on top of the mixture.

Tincture of digitalis should be mixed with aqueous or syrupy solutions, for in such cases precipitation or decomposition of the active principles may occur. This tincture is injured by admixture, and is best administered on sugar or dropped on a piece of bread.

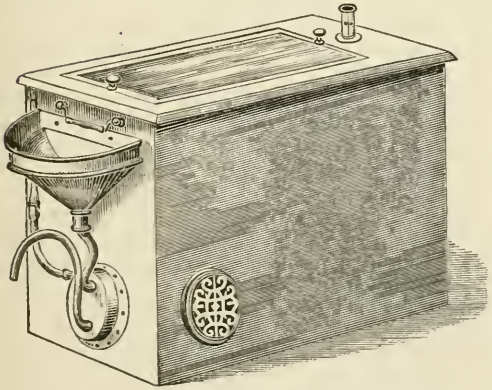
INCONTINENCE.—Inability to control the evacuation of the feces or the urine; involuntary evacuation. This term is sometimes used as a

synonym of venereal indulgence and lewdness. See Defecation, Urine (Incontinence), etc.

INCUBATOR.—An apparatus devised for the purpose of rearing premature children. It consists, essentially, of a box large enough to contain the child, the interior of which can be heated, and thus kept at a uniform temperature of 86° to 90°F.

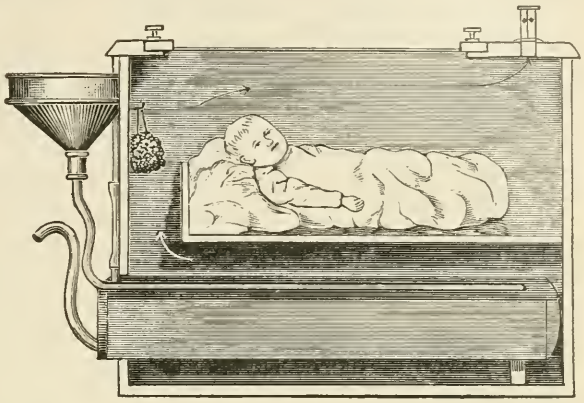


Lion Couveuse.

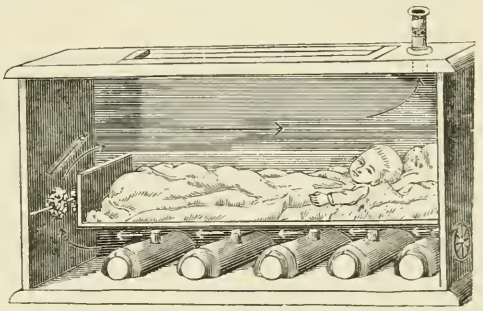


Auvard's Couveuse (Exterior View).

The best incubator is probably the **Lion couveuse**, which is self-regulating. **Hirst's modification of Auvard's**, is so constructed that the air is kept constantly pure and the humidity normal. A very good substitute can be made in a few moments by taking a baby's bath-tub, putting in it several layers of cotton-wool and a number of bottles filled with hot water. Into the tub the child is placed, well protected by a blanket, the bottles as they become cool being refilled with warm water. **Crede's incubator** consists of a copper tube made with double walls, between which water at the desired temperature may be kept, and withdrawn by means of pipes and stop-cocks. In **Tarnier's incubator** the temperature is somewhat similarly kept at 86° to 88° F. by water compartments.



Auvard's Couveuse (Interior View).



Tarnier's Incubator or Couveuse.

INDIAN HEMP.—See Cannabis Indica.

INDICAN.—See Urine (Examination).

INDIGESTION.—See Gastric Neuroses, Gastritis, Enteritis, etc.

INEBRIETY.—See Alcoholism.

INFANT, CARE.—After the cord has been ligated and cut, the eyes should be cleansed with a saturated solution of boric acid, after which, if there is any vaginal discharge from the mother, 1 to 2 drops of a 1 percent solution of silver nitrate should be instilled in each eye. The mouth should also be gently cleansed, for which may be used a soft cloth and boiled water.

The baby should be oiled to remove the vernix caseosa, and then bathed in water at 100° F., carefully dried, and the cord dusted with a powder of salicylic acid 1 part and starch 19 parts, or with powdered boric acid or bismuth subnitrate, and dressed with sterile cotton or gauze.

Bathing.—For the first 10 days, or until the cord has separated and the stump dried, a full tub bath should not be given, warm water and a soft cloth or sponge being used without disturbing the dressing over the cord. After this a daily bath should be given in water at 98° F., which may be cooled in 6 months to 95°, and in 1 year to 90°.

Clothing.—A wide flannel bandage should be applied rather snugly about the abdomen and the child dressed in a soft, well-fitting flannel shirt, a petticoat suspended from the shoulders, and woolen stockings, over which is placed the ordinary dress.

After being dressed, the child should be laid in a crib in a quiet, darkened room, and covered with a woolen blanket.

Hot-water bottles should be placed about it if the extremities are blue or cold.

Diaper.—The napkin or diaper for a baby should be made of Canton flannel or stockinet, as these are more absorbent than the cotton material generally used. They should not be hemmed.

Dusting-powder should be freely used in all the folds of the skin to prevent chafing. This is especially important in very fat babies. Starch, talcum, stearate of zinc, etc., may be used for this purpose.

Outing.—In summer the infant may be taken out-doors when 1 week old; in the fall or spring at 1 month; and in winter, on pleasant days when not windy, at 3 months of age.

Sleep.—The new-born infant should sleep about 22 hours out of a possible 24; gradually diminishing this until at 2 years the child should sleep at least 12 hours of the day, and at 3 not less than 11. Sleep is largely a matter of habit with young children, and they cannot be too early inducted into correct habits in this matter. The infant should sleep consecutively from 11 P. M. to 5 A. M., whether nursing or not. It should also have a morning nap from 12 to 2 P. M., for which purpose the child should be undressed and put to bed with unchanging regularity: if possible, in a room set apart for that purpose, with temperature 64° to 70°.

Ventilation.—Steam-heated apartments, slovenly help, and the exigencies of the modern dwelling have much to do with our enormous infant mortality in all large cities. No child, nor adult either, for that matter, can remain well and breathe the vitiated air of a single room. Such poisoned air makes the mother nervous, neurasthenic, and nagging, and works even more injury upon a tender infant. From 240 to 300 cubic feet of space should be the minimum permissible for each person in a living- or sleeping-room, and some arrangement should be made by which at least 600 cubic feet of vitiated air should be withdrawn from such rooms every hour, for each person.

Care of Premature and Feeble Infants.—In the care of premature infants all authorities concede the points to be: (1) To secure a temperature of 95° F., or slightly lower, about the child; (2) to conserve its strength; (3) to nourish the child.

The second point in the care of premature infants is the conservation of their strength. The infant, exhausted by the long or difficult labor, is too often called on to endure the ordeal of a rigorous bath, rather than to be allowed the needed rest. A gentle rubbing of the skin with warm sweet oil softens up the vernix caseosa so that it can be easily wiped away and leaves the skin clean, soft and pliable and the child not in the least exhausted by the process.

The costumes of incubator babies should be as abbreviated as possible, to do away with all unnecessary handling—a diaper of cheese-cloth and a small shirt being sufficient. Cheese-cloth diapers are far less bulky and more absorptive than any other, and are more quickly dried, so that the mistake of putting a damp diaper on a baby is less likely to occur. Small shirts, as a covering to the cotton, are necessary, as the infants soon pull out the cotton, and may swallow it.

The whole problem of feeding infants becomes more difficult of solution as one deals with a premature child. If the mother has, after 3 or 4 days, a good breast of milk which flows readily, and the child will suck, this is the ideal arrangement; but even then an uncertainty exists as to how much food the child gets; it tires so easily that it stops nursing often from exhaustion rather than from satisfaction. Then, too, such long times spent at the breast are a source of exposure to the child, though surrounded by hot bags and well protected; the quantity taken is also uncertain; it is well not to wait to see it lose weight before using artificial food. See INFANT FEEDING, MILK (Modified), MODIFIED MILK.

The Administration of Drugs to Children.—The matter of administering medicine to children is one of great importance, and the study given this subject by Dauchez is full of suggestion. In the therapeutics connected with childhood the more simple the prescription, the more concise, the freer it is from odor, and the smaller its volume, the better it will be accepted.

In prescribing, therefore, it should not be forgotten:

1. That the substances most easily administered are the tinctures and alcoholic extracts, in the form of drops (aconite, digitalis, belladonna, laudanum, etc.), mixed with sweet liquids, as black-currant syrup, Malaga wine, currant syrup, prune-juice, orange-juice, licorice, coffee, and sometimes distilled water. Certain powders that are very active may be mixed in small doses with soups which the children take as daily food; thus may be used scammony, bismuth, magnesia.

2. That powders, on account of the minute quantity which it takes for a dose, are valuable forms for the administration of drugs to children (scammony, jalap, calomel, santonin, etc.); these can be placed on the child's tongue and are easily swallowed by taking a sip of water.

Further, the elixirs, the biscuits (scammony), the pastils (lactate of iron), the chocolate (iodids), the electuary (honey and syrup of althea), mixed with sulphur, with senna (1/2 to 2 drams), magnesia, (1/2 to 2 1/2 drams), confections, and syrups can be used in pharmacy to mask the taste of drugs according to the special liking of the child.

One should avoid using prescriptions containing over 5 drams, 1 ounce, or 2 ounces; at least, not over this amount should be administered in 48 hours to a child of 8 to 10 years of age.

In prescribing very powerful drugs it is well to avoid danger by prescribing them always in solutions of known percentage.

3. In prescribing poisonous drugs certain rules should be observed. Although there is no positive rule in this matter, the dose for a child under 5 years should be 1 to 1 1/2 drops of a tincture or alcoholic extract for each completed year (?), and always in fractional doses up to 6 and 8 years.

Active substances (belladonna, opium, nux vomica, etc.), should be prescribed for children under 5 years in doses ranging from 1/12, 1/6, to 1/4 grain, and in an amount of fluid varying from 5 to 10 drams, and divided into teaspoonful or dessertspoonful doses in the 24 hours. The number of teaspoonful or dessertspoonful doses given in 24 hours should be carefully calculated.

4. In giving very active drugs to very young children it is generally best to write out the name and amount of the drug fully, and not in figures, and to state at the top of the prescription that it is for a very young child, and that the drops should be counted.

In certain cases where the tolerance and docility of the child are not good, recourse may be had to certain medicaments that are capable of being absorbed through the skin or mucous membranes, such as fumigations of naphthalin, tar, benzoin, carbolic acid, creosote, balsams, resins, etc., inhalations of oxygen, eucalyptol, turpentine, tincture of iodin, and camphor.

INFANT, DEVELOPMENT.—A child should be able to hold up its head by the fourth month, to sit up by the seventh month, to walk by the twelfth to fourteenth month, to talk from the twelfth to the eighteenth month.

Closure of Fontanels.—Posterior, second month; anterior, eighteenth to twentieth month.

Weight and Size (Average).

	Weight.	*Height.*
At birth,	7½ pounds.	20 in.
At 6 months,	16 pounds,	25 in.
At one year,	20 pounds.	29 in.
At 2 years,	26 pounds.	32 in.

The height of girls is about the same as boys—the weight usually about 1 pound less.

It is important to weigh a baby frequently, at regular intervals, as this is the best means of judging if it is being properly nourished.

The following table, taken from Holt, shows the **relative increase in weight** for boys and girls, for each from 1 to 16 years:

Age.	Boys.	Girls.
	Pounds.	*Pounds.*
Birth	7.55	7.16
Six months	16.00	15.50
Twelve months	20.50	19.80
Eighteen months	22.80	22.00
Two years	26.50	25.50
Three years	31.20	30.00
Four years	35.00	34.00
Five years	41.20	39.80
Six years	45.10	43.80
Seven years	49.50	48.00
Eight years	54.50	52.90
Nine years	60.00	57.50
Ten years	66.60	64.10
Eleven years	72.40	70.30
Twelve years	79.80	81.40
Thirteen years	88.30	91.20
Fourteen years	99.30	100.30
Fifteen years	110.80	108.40
Sixteen years	123.70	113.00

The increase in the length of the child's skeleton is most rapid during the earlier months of its life, decreasing with each year up to the fifth in about the following ratio: First year, 16 to 20 cm. (5 to 7 inches); second year, 10 cm.; third year, 7.5 cm.; fourth year, 6.5 cm.; and during the fifth year to the sixteenth or eighteenth year there is a yearly increase of 5 cm. (1 1/2 inches); after the eighteenth year this growth decreases to 3 to 4 cm. per annum until the full growth is attained, between the twentieth and twenty-fourth years.

Growth is retarded by poor nourishment, impure air, and certain diseases of nutrition, such as scrofula, etc. On the other hand, certain exanthemata and other as yet unknown conditions have the power at times of greatly accelerating growth; but such rapidly growing children are apt to become feeble, and require especially good food, much rest, and relief from their studies.

INFANT FEEDING.—Upon the food which an infant receives depends not only its present growth and nutrition, but also, perhaps, its future development and health.

The very high mortality during the first year may be traced in a large proportion of cases to nutritional disorders, the result of improper feeding.

To insure any measure of success in rearing an infant the food must be adapted *in quantity* to the capacity of the stomach, which varies according to the age, weight, and condition of the child; *in quality* to its digestive powers and to the requirements for growth and nutrition; and *in intervals of feeding* to certain rules allowing time between feedings for digestion to take place and for the digestive organs to rest.

As in that of adults, the elements of infants' food are proteins, fats, carbohydrates, mineral salts and water. In infants the relative proportions must differ from that required for older persons, because they cannot assimilate certain forms of food, and because provision must be made not only for the natural waste of the body, but for the enormous growth which takes place the first year, the child nearly trebling in weight.

The proteins, which are furnished by the casein and other albuminoids in milk, replace the continual nitrogenous waste of the cells of the body.

The fats, which are furnished by the cream, prevent the nitrogenous waste and add to the body weight.

The carbohydrates, furnished by the sugar, are partly converted into fats, and thus increase the weight. They are also an important aid to the proteids in being a source of body heat.

The mineral salts, freely furnished in milk, are more important in infancy than in later life, owing to their aid in building up the osseous system. They also aid in promoting cell formation.

The water is necessary to dissolve all the other constituents of the food so they may be more readily acted upon by the weak digestive organs of the child. It is needed also in large quantities for the rapid elimination of waste products.

In proportion to weight an infant requires six times as much water as an adult, and cool sterile water should be given it to drink from time to time.

In feeding infants three methods are available: *Breast feeding,* either by mother or nurse; *mixed feeding* (a combination of the breast and bottle); *artificial* or *bottle feeding.*

Breast Feeding.—Of these three methods the first, when practicable, should always be followed, but to procure the best results certain rules should be observed. The child should be put to the breast in 1 or 2 hours after birth, and once in 4 or 6 hours for the first 2 days. While the nourishment secured from the breast at this time is but slight, it is all the child requires, and suckling accustoms the mother to nursing, aids uterine contraction, and rids the breasts of colostrum, which is all that is secreted at this period, and which, besides furnishing sufficient nourishment for the child, also acts as a laxative.

After the second or third day, when the milk appears, the child should be nursed at regular intervals, as given in the following table:

Age.	Intervals.	Number of Feedings in 24 Hours.	Number of Night Feedings.
From birth to 4 weeks...	2 hours.	10	1
From 4 to 6 weeks.....	2 hours.	9	1
From 6 to 8 weeks.....	2½ hours.	8	1
From 2 to 4 months....	2½ hours.	7	0
From 4 to 10 months...	3 hours.	6	0

The breasts should be kept clean, and after each nursing they should be washed with a solution of boric acid. The child should be allowed to nurse about 15 minutes, but not allowed to remain at the breast longer than 20 minutes, and should not be allowed to go to sleep while nursing. It is best to nurse alternately from each breast. The mother should hold the nipple between her fingers to regulate the flow of milk.

Symptoms of Inadequate Nursing.—A temperature of 102° to 104° F. the first week, without other signs of disease, indicates insufficient nourishment. Other symptoms are: No gain in weight, irregular and unhealthy appearing stools, restless sleep, frequent fretfulness or crying, and nursing a long time without being satisfied. In these cases the cause may be found to be: Milk poor and scanty; milk good, but scanty; milk abundant, but of poor quality. By regulating the diet and habits of the mother these conditions may, in most cases, be corrected. Nursing by the mother should not be attempted under the following conditions: If she is tuberculous; if there were, during parturition, complications, such as septicemia, convulsions, or nephritis, or if she is epileptic, choreic, syphilitic, or very weak and delicate.

A child will seldom do well on the breast longer than 9 months, and at the longest 1 year; but children should not, when possible to avoid it, be weaned during hot summer weather, or during a period when the teeth are being erupted.

Weaning should always be done gradually. By giving the bottle with diluted milk at certain times or by occasionally giving water to drink by the bottle the child will become accustomed to its use, and take to it kindly when the breast is given up. In cases when sudden weaning is necessary it should be remembered that the food given at first must be much weaker than that required for a child the same age who has been accustomed to the bottle.

Wet-nursing may, under certain circumstances, be advisable, but the difficulty of securing a reliable and healthy nurse and the success with which a child may be reared when properly fed artificially make the occasions rare when it is both advisable and possible to employ a wet-nurse.

Mixed feeding may be resorted to in any case in which the milk supply of the mother is deficient or when the drain upon her health is unduly great. It is especially often necessary during the first few weeks when slow convalescence causes the milk to be insufficient.

In all cases of mixed feeding the same care should be taken that the food is properly prepared and adapted to the child's needs as in cases exclusively bottle-fed.

Artificial Feeding.—In human milk is furnished the best nourishment for infants, and it meets all the requirements for a perfect food; therefore, in the selection of an artificial food it is necessary to secure one which contains all the elements, and those as nearly as possible in the same proportions, as found in mothers' milk. Cows' milk meets one of these requirements, as it is composed of the same constituents, but, however, not in the proper proportions to meet the requirements. Fortunately, it is not difficult by certain simple methods to change the proportions of the different ingredients until they resemble those of **human** milk, and thus secure a food which the child can easily digest, and which will afford proper nourishment.

The following table shows the essential points of difference between milk from the two sources mentioned:

	Human Milk.	Cows' Milk.
Reaction	Alkaline.	Acid.
Specific gravity	1031.	1029.
Fats	4 percent.	4 percent.
Sugar	7 percent.	4.30 percent.
Proteids	1.50 percent.	4.00 percent.
Salts	0.20 percent.	0.70 percent.
Water	87.30 percent.	87.00 percent.
Bacteria and other foreign matter.	Usually none.	Always more or less.

The fats are the only ingredients which are alike; of the others, in cows' milk the proteins must be greatly reduced, the sugar increased, the salts reduced, the acidity overcome, and, as far as possible, the bacteria removed. See Milk (Modified, Sterilized, and Filtered).

Practically, outside of milk laboratories fitted up for the purpose, it is impossible to deal in exact percentages; and in home modification it is only possible to prepare a diet which is approximately correct, but by beginning with a modification low in proteids and fats, and gradually increasing these elements, it will not be difficult to furnish the child with proper and sufficient nutriment.

Some infants have such feeble digestive powers that they will require the greatest care in their feeding, and it will be necessary to try a number of variations before a suitable diet may be found. Care should be taken in these cases not to give too strong food at first, well diluting the milk, and, if found necessary, peptonizing it before feeding. See Milk (Peptonized).

It is well to feed an infant the first 4 to 6 weeks upon a modified whey diet, which is also found to agree well with those who are in a weak and debilitated condition from any cause.

Whey is prepared as follows: To 1 pint of fresh, lukewarm milk is added 1 teaspoonful of essence of pepsin or liquid rennet. This is stirred for a moment and then allowed to stand until firmly coagulated; the curd is then broken up with a fork and the whey strained off through coarse muslin. The whey should be diluted with water before administering, and, except when fed to those with very feeble digestive organs, should have cream added to it to increase its strength, after which it may be rendered still more easy of digestion by peptonizing.

Formulas.—The following recipes will serve as guides in the preparation of a diet suitable for an average healthy baby of the age given. These may be varied to suit the individual case by adding more milk or more cream, or by further diluting with water, as indicated by the condition of the child.

In every case before being administered the mixture should be sterilized, Pasteurized, or, for the reasons mentioned, preferably filtered, and warmed to 98° to 100° F. See Milk (Filtered.)

Formula No. 1 (for a child 1 week old):

℞. Cream, ℥ ij
Whey, ℥ iij
Lime-water, Water, each, ℥ ij.

Feed every 2 hours.

Formula No. 2 (age, 4 to 6 weeks):

℞. Cream, Whey, Water, each, ℥ ss
Milk-sugar or cane-sugar, ℥ ss
Bicarbonate of sodium, gr. v.

Feed every 2 1/2 hours.

Formula No. 3 (age, 2 to 3 months):

℞. Cream, ℥ ss
Milk, ℥ j
Water, ℥ jss
Sugar, ℥ ss to j
Bicarbonate of sodium, gr. v.

Feed every 2 1/2 hours.

Formula No. 4 (age, 4 to 5 months):

℞. Cream, ℥ j
Milk, ℥ ij
Water, each,
Sugar, ℥ j
Bicarbonate of sodium, gr. x.

Feed every 3 hours.

Formula No. 5 (age, 6 to 8 months):

℞. Cream, ℥ j to ij
Milk, ℥ iv
Water, each,
Sugar, ℥ j to jss
Bicarbonate of sodium, gr. x.

Feed every 3 hours.

In some cases condensed milk will be found to agree well with a child, but it is too rich in sugar and deficient in fats, and while infants fed upon it may become fat, they are apt to develop rickets or scorbutus. This fault may, in a measure, be overcome by adding cream to each feeding. Condensed milk should be diluted from 6 to 12 times with water, according to the age of the child.

It is necessary that the bottle be sterilized by boiling before each feeding; that the nipple should be turned inside out and scrubbed 2 or 3 times a day, and, when not in use, kept in a solution of borax or bicarbonate of sodium; that a long nursing tube be not used, as it cannot be kept clean; and that the bottle be held for the baby and not laid in the crib for it to suck at will.

To insure success in artificial infant feeding, as well as in breast feeding, certain rules in regard to the amount, the intervals, and the manner of feeding must be observed. The following table gives the intervals of feeding and the amounts

necessary for an average healthy child. The latter must be altered in certain cases, as a small child will take and require much less food than a larger one of the same age:

GENERAL RULES FOR FEEDING

Age.	Intervals (Hours).	Number of Feedings in 24 Hours.	Number of Night Feedings.	Number of Ounces at Each Feeding.	Total Number of Ounces in 24 Hours.
1 week.....	2	10	1	1	10
2 weeks....	2	10	1	1 1/2	15
4 weeks....	2	9	1	2 1/2	22 1/2
6 weeks....	2 1/2	8	1	3	24
8 weeks....	2 1/2	8	1	3 1/2	28
3 months..	2 1/2	7	0	4	28
4 months..	2 1/2	7	0	4 1/2	31 1/2
5 months..	3	6	0	5 1/2	33
6 months..	3	6	0	6	36

Symptoms of Inadequate or Improper Feeding.—Abnormal stools, colic, vomiting, and no gain, or a gain in weight of less than from 4 to 8 ounces a week, show that the food is not properly nourishing the child.

Excess of sugar is liable to give colic, and thin, green, and very acid stools. Fats in too large quantities often cause regurgitation and vomiting, and diarrhea with fat in the stools. Excess of casein gives colic, and usually constipation, and the presence in the stools of hard white curds. See Milk, Modified Milk.

INFANTILE DISEASES.—The ordinary exanthems and other infantile and children's diseases are considered under their special headings.

INFANTILE SPINAL PARALYSIS.—See Paralysis, Infantile Spinal.

INFANTILE SYMPTOMS.—On account of the inability of the physician to obtain subjective information, objective symptoms are of the greatest value in the diagnosis and treatment of infantile diseases. For this reason the various signs of importance will be considered separately.

The Cry.—On inspecting an infant the characteristic features of the cry are important in making a diagnosis. A child will cry from discomfort, hunger or thirst, pain, brain-disease, habit, anger, and from weakness or exhaustion.

The cry of pain is constant and loud; it is most frequently caused either by colic or earache; if from the former, it is more paroxysmal, and is likely to be accompanied by drawing up of the legs and squirming movements of the body.

The condition of uric acid infarction in young babies frequently gives rise to violent attacks of crying, which are especially severe when the urine is being passed.

The cry of hunger or thirst is very similar to that of pain, but is at once relieved if food or drink is given; this will also relieve the cry of indigestion, but for a very short time only, when the pain will begin again.

In anger or habit there will be a loud and violent cry, but it may usually be quieted by diverting the child's attention or humoring it in its whims or desires. The hydrocephalic cry from brain-disease is a shrill shriek, which is quieted suddenly and is repeated at intervals.

The cry of weakness or exhaustion is feeble and whining, and may be almost constant.

A nasal tone is noticed when there is obstruction in the nostrils; a loud, brazen cry in spasmodic croup; and a hoarse cry is syphilitic or catarrhal laryngitis.

By their cry babies also express their discomfort, which may arise from improperly adjusted clothing, a cramped position, wet diapers, cold feet, and from being tired or sleepy.

On the other hand, in certain diseases, as in severe pneumonia or pleurisy, there is an unwillingness to cry, on account of interference with the function of respiration.

In carefully observing an infant's physiognomy much valuable information may be gained as to the nature of its ailments, and from the condition of the countenance the physician may be able, in many cases, to detect the existence of disease, and perhaps determine its location.

The following general rules have been found useful as a guide in this practice:

The face of a healthy sleeping child wears an expression of perfect repose; the eyelids are closed, lips slightly parted, and a faint sound of regular breathing may be heard, though there is no movement of the nostrils.

Incomplete closure of the eyelids and exposure of the whites of the eyes show pain. Twitching of the lids, with perhaps oscillation of the eyeballs or squinting, marks the approach of a convulsion. A smile during sleep signifies abdominal pain or colic, and chewing motions of the mouth, gastrointestinal disturbance. Dilatation of the alæ nasi shows embarrassed respiration, as in severe lung affections.

When awake and passive, the face of a healthy infant indicates little but a wondering observation; but with the onset of disease the picture is altered, and an expression of anxiety or of suffering appears, the features become pinched, and lines are seen about the eyes and mouth.

Pain sets its mark upon the countenance most of all, and, by noting the part of the face which is most changed, it may be possible to fix the seat of the disease.

As a rule, the upper third of the face is modified in brain affections, the middle third in diseases of the chest, and the lower third in abdominal lesions. Contraction of the brows shows pain in the head; sharpness of the nostrils, pain in the chest; and drawing of the upper lip, pain in the abdomen.

Lividity of the lips and eyelids is seen when the blood is imperfectly aerated, and a faint purple tinge about the eyes and mouth when the circulation is weak

An earthy tinge of the face indicates gastrointestinal disorders; a waxy pallor, kidney disease; and paleness is noticed in any acute or chronic disease.

A flush on one or both cheeks is seen in inflammation of the lungs or pleura. Puffiness of the eyelids and fulness at the bridge of the nose are indications of dropsy from nephritis.

In marasmus the face has a peculiar appearance, the skin is wrinkled and of a leaden color, eyes large, the lips pallid and drawn so as to leave the mouth partially open and the chin projecting, and altogether the expression is that of a sickly aged person. The pupil of an infant varies frequently, but is usually dilated during health when awake, but often closely contracted when asleep, dilating again rapidly when the child awakes. The occurrence of fixed or permanent contraction or dilatation of the pupil indicates cerebral irritation.

Positions of an Infant Indicating Disease.—In a healthy sleeping child the position of the body is graceful, easy, and motionless. With the onset of disease, accompanied by pain, the infant is restless, and tosses about in bed. With the onset of some of the acute diseases, as measles, influenza, etc., on the other hand, the child often lies for hours in a drowsy state.

As a general rule, the following conclusions hold good: Sleeping with the head thrown back and the mouth open, and perhaps snoring, is a sign of enlarged tonsils or adenoid growths. The tendency to "sleep high" indicates cardiac or lung affection. "Sleeping cool" (kicking the clothes off) and sweating, especially of the head, indicate rickets. Boring the head in the pillow and opisthotonos are noticed in cerebral diseases.

Persistent lying on the face is an evidence of photophobia. Frequent carrying of the hand to the head, ears, or mouth shows headache, earache, or pain from dentition, and frequent rubbing and picking the nose is an indication of gastrointestinal irritation.

The existence of colic is shown by writhing movements of the body, drawing the legs up and down, and clenching the hands. When the thumbs are drawn in, the palms of the hands and the fingers clasped over them, or if the toes are strongly flexed or extended, a convulsion may be expected.

The feces, with an exclusively milk diet, should have a bright mustard-yellow color, be of the consistence of ointment, feebly acid, and contain about 85 percent of water, white flecks of fat, calcic lactates, traces of bilirubin, intestinal epithelial cells, and mucous bacteria. These bacteria have not yet been fully studied and differentiated, but the bacterium lactis aërogenes and various micrococci seem to be fairly constant. One hundred parts milk diet should produce about 3 parts of feces, on an average.

Meconium is the name given the dark-green feces first passed by the new-born child, from their resemblance to inspissated poppy-juice. Meconium is viscid, odorless, feebly acid, and consists of partially digested amniotic fluid, epidermal cells, fine hairs, cholesterin crystals, and intestinal epithelial cells, but contains no products of decomposition nor bacteria when first voided.

Urine is secreted *in utero* and is voided both before and often during the act of birth. The kidneys are relatively large at birth, and often show a peculiar reddish discoloration of their papillæ, produced by a deposit of uric acid crystals and urates, especially well marked in those children whose supply of oxygen has been deficient at birth. This is the so-called uric acid infarct, and is of little pathologic significance. The *quantity* of urine increases rapidly for the first 5 days; after that more slowly. At first it averages from 12 to 13 ounces (417 c.c.); after 2 years it reaches 15 ounces (500 c.c.), rising to 18 or 19 ounces (600 c.c.) at 4 years. The specific gravity of the urine increases up to the tenth day; after that it slightly diminishes. Average specific gravity, 1005 to 1010. The urine of early life is often turbid, dark, and acid; later it becomes clear straw yellow, and generally neutral in reaction. The excretion of urea is relatively less in children than in adults, and still less, relatively, are the phosphates. The same is true of chlorid of sodium.

Anuria, or retention of the urine, in the new-born not infrequently unduly alarms the mother or nurse. Frequently urine is voided during birth, and the fact escapes the attention of the nurse, and, on the other hand, there may be suppression for 12, 24, or even 48 hours, without any subsequent injury to the child. In these latter cases, when no malformation can be detected, the existence of uric acid infarcts in the kidneys may be suspected. Even these rarely give rise to calculi, though it is possible that they may, unless they are early dissolved away by the free use of warm sugar-water, which is the only thing that should be used, except an occasional hip-bath, in the place of the gin, sweet spirit of niter, marshmallow, or parsley tea so often administered to these unfortunate infants. All such drugging invariably gives rise to indigestion and flatulence.

Temperature at birth is 99° F. (37.7° C.), falling in a few hours a degree or more Centigrade (37.7° to 36.2°), but rising again within 36 hours to about its initial height. The temperature in a young child is best taken in the anus or vagina; and it should be remembered that comparatively trifling causes in infants may produce relatively great variations in temperature, especially through depressing agents. In general, the temperature rises during the forenoon, reaches its highest point in the afternoon, begins to sink about six, and reaches its minimum in the early morning hours, shortly after midnight. It should also be remembered that in very young children the temperature may be high (105° to 106° F.) without necessarily grave results, except in those predisposed to eclampsia.

Significance of Variations of Temperature.—Lowered temperature is found in anemia, profuse hemorrhage, collapse, death agony, and sclerema neonatorum, hydrocephaloid, and in children prematurely born. In early infancy there is no absolute relation between organic lesions and the

height of temperature observed, for high fever, great restlessness, and even convulsions may disappear quickly, and leave absolutely no lesions behind (Bouchut).

A temperature above 100° F. (37.8° to 38° C.) during the first 4 days of life is pathologic. The same is true of rise of temperature during sleep.

The morning and evening differences in temperature in the fevers of children are, as a rule, greater than in the adult.

High febrile heat with sudden chilling of the extremities is one of the frequent phenomena of fever in very young children.

Flatulence is one of the young child's most frequent ailments. The evacuation of wind or the passage upward of sour-smelling eructations generally affords temporary relief. Such children are very irritable, from the pains being repeated at every meal, and especially annoying at night, when the child is apt to be feverish and seized with fits of screaming. At such times the feet are cold, though the bowels, hands, and cheeks, are hot. The appetite, generally, is ravenous, the child eating everything that is offered it, but nevertheless continues to waste and suffer from various intercurrent ailments, such as nettle-rash, strophulus—red and white gum—thrush, "inward fits," diarrhea, aphthæ, bronchitis, etc.

The treatment of infantile flatulence and colic consists, first, in the immediate relief of its agonizing pain, and, secondly, in the removal of its cause, which usually must be sought for either in indigestion or malaria. See Colic (Infantile).

Constipation is one of the minor and more frequent ailments even of very young infants. It arises both from errors in feeding and from the relatively pouch-like condition of the colon in children under two years of age. This is often aggravated by a mild degree of gastric or intestinal catarrh, which coats the feces with mucus, and thus interferes with peristalsis. Constipation is never to be neglected in the hope that nature will bring matters around all right after a time, but, on the contrary, every effort should be made to encourage, and, if necessary, mechanically assist, a daily motion from the bowels until the child is two years of age, after which the anatomic cause of the child's constipation rectifies itself.

Treatment.—In very young children nothing is better than a daily warm oil or soapy water enema, or a small glycerin suppository. Milk of magnesia may be added to the nursing-bottle p. r. n., and for older children Starr recommends:

℞ Resin of podophyllin, gr. ss
Alcohol, q. s. to make a solution
Syrup to ℥ iij.
One dram once or twice daily.

This can be recommended as efficient, but is often obstinately refused, even on sugar, by some children.

In such cases cascara cordial may be substituted with good results, remembering that if persevered in, eventually a proper habit is established.

Under no circumstances, except by the positive order of a physician, should a young child be allowed to remain constipated over 36 hours.

Diarrhea.—See Diarrhea (Infantile).

Vomiting in Infants and Children.—Regurgitation and vomiting are of frequent occurrence in infancy, owing to the vertical position and cylindric shape of the stomach at this period of life. Nursing babies who are healthy in every respect often vomit habitually, the milk thus thrown up being unaltered or but slightly curdled, as it has been in the stomach but a short time. This form of vomiting is caused by the infant taking from the abundant breast more than it needs and more than it can digest. It may be caused by a reflex act, the stomach being overloaded, or by moving the child or making pressure over the stomach, and it is not accompanied by any violent effort or retching. This form of vomiting does not so commonly occur in bottle-fed babies, as they are less often fed an overabundance. The treatment consists of diminishing the quantity of food taken, removing the child from the breast as soon as its hunger is satisfied, forcing it to take the milk slowly, and keeping the child quiet for some time after it has nursed.

Vomiting is nearly always present in cases of acute gastric indigestion both in infants and children. It is usually preceded by fever, comes on some time after feeding, and the material vomited is sour and offensive. It may cease after the contents of the stomach have been thrown up, or serum, mucus, or bile may be vomited for some time subsequently.

The treatment consists of rest for the stomach by withholding all food for 12 to 24 hours, or longer if the symptoms continue, the administration of small pieces of ice, calomel 1/12 of a grain, with sodium bicarbonate 1 grain and bismuth 5 grains, or equal parts of lime-water and compound tincture of cardamom in teaspoonful doses, with later the institution of proper feeding, if it had previously been faulty.

Other causes of vomiting are acute intestinal obstruction, general peritonitis, certain nervous diseases, or tumor of the brain, and meningitis. Vomiting is one of the most frequent symptoms to mark the onset of the acute infectious diseases. Certain children will persistently vomit substances not agreeable to them.

Convulsions.—See Convulsions (Infantile).

Paralysis.—See Paralysis (Infantile).

INFILTRATION ANESTHESIA.—This is produced by the local ischemia, the pressure to which the tissues are subjected, the lowered temperature from the cool injection, and to the direct action of the contained drugs. The materials required are a good hypodermic syringe and the following solutions: **Schleich's solutions** for infiltration anesthesia: *No.* 1, *Strong*, has of cocain hydrochlorid 3 grains, morphin hydrochlorid 1/2 grain, sodium chlorid 3 grains, distilled water, sterilized, 27 drams, of which 6 drams may be used during one operation. *No.* 2, *Normal*, cocain hydrochlorid 1 1/2 grains, morphin hydrochlorid 1/2 grain, sodium chlorid 3 grains, distilled water, sterilized, 27 drams, of which 3 1/2 ounces may be

used at one operation. *No.* 3, *Weak*, cocain hydrochlorid 1/6 grain, morphin hydrochlorid 1/2 grain, sodium chlorid 3 grains, distilled water, sterilized, 27 drams, of which a pint may be used at one operation. (Schleich's solution). Two drops of a 5 percent phenol solution should be added if the solution is not fresh. Two other solutions are recommended, one containing double the quantity, the other one-tenth the quantity, of cocain. The very strong solution is used for inflammatory lesions, the weak for prolonged operations. The needle is introduced almost parallel with the skin, into the malpighian layer, a drop pressed out, and successive injections are made along the line of, or area in which, anesthesia is desired. After the skin is anesthetic, the subcutaneous tissues may in like manner be infiltrated. When pain ensues in the operation, it is due to the fact that infiltration has not been thorough. When the first small area has been anesthetized, a sufficient number of new circles adjoining the first may be made, and the adjacent skin can thus be painlessly infiltrated and the fluid forced into the tissues. Fasciæ, muscles, and peritoneum can be anesthetized in this way. The anesthetic influence lasts for about 20 minutes. If a longer time is required than this, infiltration may be repeated. See Cocain.

INFLAMMATION.—A condition of nutritive disturbance characterized by hyperemia, with proliferation of the cells of a tissue or an organ, and attended by one or more of the symptoms of pain, heat, swelling, discoloration, and disordered function.

"Inflammation is the succession of changes which takes place in a living tissue as the result of some kind of injury, provided that this injury be insufficient immediately to destroy its vitality." (Sanderson).

"Inflammation is the reaction of the tissues to local injuries calling forth protective and reparative measures; an imperfect pathologic adaptation often leading to consequences that are dangerous *per se*, and defeat its purposes" (Hektoen).

Vascular and circulatory changes are essential in inflammation, but in nonvascular tissues these changes occur in the neighboring tissues, whence nutritive materials are obtained.

The first phenomenon of inflammation is dilatation in capillaries, venules, and arterioles, resulting in acceleration of the blood-current and active hyperemia. This is followed by a retardation of the circulation, oscillation and stagnation of the blood-currents, exudation of liquor sanguinis, migration or diapedesis of corpuscles, changes in the perivascular tissues, and by the formation of embryonic tissue. The inflammation may extend by continuity or contiguity, by the blood, or by the lymphatics, and terminate abruptly at an early stage, by delitescence, by resolution, by new growth, or by necrosis or death of the inflamed part.

The predisposing causes of inflammation comprise those conditions which lower the general angility, such as old age, cardiac and vascular demrevaetnt, alcoholism, plethora, gout, syphilis, rheumatism, tuberculosis, diabetes, Bright's disease, anemia, and diseases and injuries of the nerves. The exciting causes are mechanical, such as blows and wounds; chemical, such as strong acids or alkalies, stings of insects, and bites of animals; thermal, either heat or cold; and bacterial. The effort, on the part of certain authors, to establish the dictum that inflammation is always caused by microorganisms, has not been successful. It must be emphasized, however, that by far the most important factor in surgical inflammations is infection.

The symptoms are divided into local and constitutional. They vary with the cause, the seat of the disease, and the constitution of the patient.

Local Symptoms.—Discoloration or Redness.—This depends upon hyperemia and determination or afflux of blood to the part; it is most marked in highly vascular tissues. It is not always a necessary accompaniment of the inflammatory process; it is not well marked in inflammation of muscular or fibrous tissues. There is no discoloration when the brain or nerves are inflamed. When there is biliary derangement, there is tendency toward a yellow color. The discoloration is most marked at the focus of the morbid action; it varies in intensity from a slight flush to a deep purple, and it may be circumscribed or diffused. Redness is not always a sign of inflammation; to be of value in diagnosing a case it must be permanent, not transitory, and is to be taken in connection with the other signs of inflammation.

Heat, which can be detected by the surface thermometer, is always present, no matter how deeply situated the disease may be. It is due to an increased flow of blood, to friction against the walls of the vessels of the part, and to cell proliferation. The inflamed part is a heat-producing area, thus causing fever by overheating the blood. The two symptoms always present in inflammation are heat and disordered function.

Tumefaction or Swelling.—This is due to capillary engorgement, effusion of liquor sanguinis into the perivascular structure, and tissue metamorphosis or cell proliferation. The amount of swelling varies with the nature of the tissue inflamed; in dense tissue, such as bone and cartilage, there is very little swelling; it is most conspicuous in parts where there is an abundance of lax connective tissue. When a serous or synovial membrane is inflamed, the effusions are poured into the cavities which they form. The swelling may be soft, and pit on pressure, resulting from inflammatory edema or it may be hard, when it is due to fibrinous exudation. This condition may prove beneficial by unloading the blood-vessels, or it may do harm by cutting off the blood supply or by causing an obstruction, as in edema of the glottis and stricture of the urethra.

Pain is usually felt at the seat of the morbid action, but in exceptional cases it is experienced in parts remote from the disease; hence it does not always point out the situation of the inflammation: as, for example, in psoas abscess, latent pneumonia, coxalgia, and vesical calculus. Pain sometimes suddenly ceases in a part, which is a

sign of commencing mortification, unless this condition is due to the influence of opiates previously administered. Pain is more violent when the covering of an organ is affected than when an organ itself is inflamed: as, for example, in pleuritis and peritonitis.

The causes of pain are compression, stretching, irritation, and disorganization of nerves; it is variable in degree. Its character varies: it may be sharp and lancinating, as in inflammation of serous membranes; acute and throbbing, as in formation of pus; dull and heavy, as in periosteitis; annoying, as in toothache; sickening, as in inflammation of the testes; itching, as in affections of the skin; or burning and scalding, as in gonorrhea.

Pain in inflammation comes on gradually, is persistent, aggravated by pressure and muscular contraction, and is fixed; there is febrile disturbance, accompanied by redness, heat, and swelling. The pain of spasm comes on suddenly, is intermittent, relieved by pressure; is not fixed, there is no fever, and it is not accompanied by redness, heat, or swelling. The pain of neuralgia is paroxysmal and intermittent, is aggravated by pressure, and, like that of spasm, is not fixed, and is unaccompanied by fever, redness, heat, or swelling. In very dense tissue the pain is throbbing, which, in a great majority of cases, denotes the formation of pus. Pain is aggravated by the dependent posture of the part.

Functional Disorder.—In inflammation there is increased sensibility: as, for example, in carbuncle, boil, whitlow, etc.; impairment of special function, as when the eyes, nose, and larynx are affected; increased irritability, due to reflex muscular phenomena as in cystitis, gastritis, dysentery, etc.; and derangement of the secretions, as when the skin, liver, kidneys, etc., are attacked.

Constitutional Symptoms.—In mild cases there is no general constitutional disturbance; but if the inflammation is at all severe, the condition known as **fever** will ensue. The one sign characteristic of fever is elevation of temperature, and it is an index to the morbid action. Fever generally manifests itself about 24 hours after the local inflammation is established; it is generally ushered in with a chill, or what is termed a *rigor*. Although the patient feels cold, if his temperature is taken, it will be found to be above normal. A succession of chills denotes sudden increase of temperature. It continues to rise, and, after a varying interval, the patient feels excessively hot; then a profuse perspiration may break out, the temperature fall more or less, and the rigor is over. As a rule, the temperature of the rectum and of the vagina is one degree higher than in the axilla. The temperature in the morning should be taken between the hours of 7 and 9 o'clock, and that of the evening between 5 and 7 o'clock.

Another set of symptoms depends on the scantiness of the secretions of the body. The tongue becomes furred and unclean, there is a great thirst, want of appetite, the bowels are constipated, the urine is less in quantity and high colored, the skin is hot and dry, the respiration and heart's action are increased. Nervous complications arise; the patient is languid and complains of severe headache, which may be followed by a confusion of ideas, going on to delirium.

The treatment of inflammation requires, first of all, removal of the cause, followed by local and constitutional measures. In the **local treatment** of inflammation remedies serviceable at one stage may be harmful in another. Rest and elevation are suitable to all stages, and always indicated. In cerebral concussion rest is to be obtained by quiet, darkness, the avoidance of stimulants and meat, by the application of ice to the head, and by the use of purgatives to prevent reflex disturbance. Splints and bandages are of service to secure rest in fractures, inflamed joints, and strains. Elevation of a part relieves swelling and tension. An inflamed hand should be placed in a sling, and an inflamed foot raised on a pillow, etc.

Cold is an agent that requires seasonable and cautious application. It is of most service in the prevention of inflammation or its extension, and in controlling the process in the early stages. Its action should be continuous, as intermittent application tends to increase the inflammation. In the form of an ice-bag, Leiter's tubes, or by irrigation with ice-cold water, cold is early serviceable.

A cooling lotion, consisting of alcohol 1 part and water 1 part, or saltpeter (nitrate of potassium) 5 parts, chlorid of ammonium 5 parts, and water 16 parts, is recommended, care being taken that the temperature is not kept below 45° F. The cold lotions may be contained in ice-bags.

The effect of cold applications is very powerful in the treatment of inflammation; it restores the tonicity of the capillaries by contracting their caliber, thus retarding effusion into the surrounding structures; it reduces the temperature; it arrests tissue metamorphosis and promotes diffusion of the effused materials into the vessels; it relieves tension and pain by restoring the equilibrium of the vessels. See Cold, Ice.

Heat and moisture cause a free flow of blood to the part, and are most serviceable when inflammation has been fully established or suppuration is threatened.

Local blood-letting relieves the inflamed part and tension, and is often of great benefit when not applied over the part, as in leeching behind the ear, or over the temple in inflammation about or in the eye. See Leeching.

Bier's Stasis Hyperemia.—Bier's method of damming back the venous blood in a limb is achieved by applying an elastic bandage round the limb well above the inflamed part, just so tightly as to cause the limb to become a bluish red and a little swollen. But the extremity must not be allowed to become blue and cold, the pulse must continue to be well felt, and the patient must not feel pain. Often this method has failed through lack of familiarity in the technic. See Bier's Hyperemic Treatment.

When the inflammation is fully developed, the indications are to abate swelling and promote absorption. To this end are employed: (1) Compression; (2) the local use of astringents and sorbe-

facients; (3) the douche; (4) massage; and (5) intermittent heat.

Compression supports the vessels and enables them to take up the effusion and stimulates the lymphatics. It is especially serviceable when much swelling exists. It should not be employed too tightly, nor applied to a limb circularly, but laterally or between splints. The fingers and toes are indicators of the deleterious effects of compression.

Astringent and sorbefacient means consist of the use of solutions of lead acetate, tincture of iodin, silver nitrate solutions, and the employment of mercurials, ichthyol, etc. Lead-water solutions are usually mixed with laudanum in a mixture called lead-water and laudanum, and employed cold or hot. It is made as follows:

℞. Tincture of opium, Solution of lead acetate, } each, ʒ j
Water, O j.

It is best applied by soaking flannel or some absorbent material with the solution and laying it on the inflamed part. It is not used in the treatment of open wounds.

Tincture of iodin is usually employed by painting it on or around the inflamed area with a camel's-hair brush, several coats being applied at one time. It is of especially great benefit when repeatedly applied to inflamed glands, muscles, and joints. It is not employed in treating open wounds. Silver nitrate is of particular use in treating mucous membranes of the throat, mouth, and genital organs. It may be employed in various strengths, according to the condition.

Ichthyol is used mostly in ointment form, in a strength of from 25 to 50 percent, with lanolin. It is to be rubbed on the inflamed part several times daily. In skin-diseases, synovitis, frostbite, bubo, chilblain, and other conditions it is of value. Oil of citronella, 20 minims to 1 ounce of ointment, may overcome the disagreeable odor.

Mercurials are chiefly employed in the form of blue ointment, pure or diluted. It is spread upon lint and applied over a joint, gland, tendon, etc. In periostitis and in chronic inflammations this mercurial is most serviceable, alone or in combination.

The *douche* may be employed by means of water poured from a height upon the inflamed part, or by having the water flow through a tube. Either hot or cold water may be used, or they may be alternated. This plan of treatment is particularly useful in chronic inflammation of joints and tendons. In pelvic inflammations hot vaginal douches are much employed.

Massage is of particular value in chronic inflammations, and is to be employed when rest is discontinued and active function is to be restored. It strengthens local nervous control and promotes the movement of blood, lymph, and other tissue fluids.

Intermittent heat is employed in the restorative process, and stimulates the reparative processes, as well as relieving tension.

When suppuration threatens, heat, in the form of (1) fomentations, (2) poultices, (3) water-bath, and (4) dry heat, is indicated. A fomentation is made by wringing out a piece of flannel dipped in hot water, applying it to a part, and covering with waxed paper, oiled silk, or protective. Ten to twenty drops of turpentine may be sprinkled on the flannel. Steam may be employed instead of hot water. The water may contain some antiseptic, such as carbolic acid or corrosive sublimate. Poultices are usually made of flaxseed meal or slippery-elm bark, but arrow-root, starch, bread and milk, potatoes and turnips, are also used. Lint soaked with hot water and covered with some impermeable material may be employed. Opium, 2 grains to 1 ounce of poultice mass, may be added to relieve pain. An antiseptic poultice is made by dipping gauze into a hot solution of corrosive sublimate, wringing out, and covering with oiled silk. A hot-water bag applied over it will maintain the heat. The water-bath is seldom used. Dry heat may be applied by means of heated cloths, by Leiter's tubes, through which hot water flows, or by a hot-water bag.

Irritants are used for their local effect to increase the supply of blood to a part, while counterirritants affect some distant part by bringing blood to the surface and away from the area of inflammation. Irritants are serviceable in chronic inflammations, while counterirritants relieve pain and congestion in early inflammations, and later promote absorption of exudates. Friction acts as a counterirritant, and may be employed with liniments. Blisters are serviceable in pleural effusion, inflamed joints, pericarditis, pneumonic consolidation, acute and chronic rheumatism, congestive coma, and meningitis. A small piece of lint dipped in chloroform, applied to the surface, and covered with oiled silk and a watch-glass will quickly blister. Lard and ammonia, in equal parts, will blister in 5 minutes. Cantharidal collodion or plasters are mostly used. The hair should be shaved before applying a blister. The plaster is removed in 2 hours in children and the aged, and in 6 hours in strong adults. If no vesicle exists, a poultice may be applied for a few hours. A vesicle should be opened by a needle and the contents evacuated. To heal the blister, it may be greased with cosmolin or zinc ointment; but if it is to be kept open, after cutting away the stratum corneum, cosmolin 1 ounce, with 4 to 6 drops of nitric acid added, may be spread on the part.

Constitutional treatment of inflammation includes the use of: (1) Venesection, (2) arterial sedatives, (3) cathartics, (4) diaphoretics, (5) diuretics, (6) anodynes, (7) antipyretics, (8) emetics, (9) mercury and iodids, (10) stimulants and (11) tonics, (12) diet.

Venesection is rarely employed at the present time; but it may occasionally be indicated to relieve distention of the right heart, or to lessen the amount of toxin in the circulating blood, especially when followed by the intravenous injection of salt solution. Blood-letting is contraindicated during epidemics, in typhoid conditions, gangrenous, ulcerative, or suppurative processes,

erysipelas, in corpulent persons, in extremes of age, in drunkards, and in debilitated or nervous individuals.

The effects of general blood-letting are to relieve arterial tension, diminish the volume, accelerate the current of the blood, relieve the tissues of effused material, and reduce the temperature by withdrawing a large amount of pyrogenous or fever-producing material from the general circulation. It likewise promotes the action of other remedies. When these desirable effects are produced, the condition may be maintained by the use of arterial sedatives, such as tincture of veratrum viride, aconite, gelsemium, or tartar emetic.

The *diaphoretics* in general use are acetate of ammonium, citrate of potassium, Dover's powder, fluidextract of jaborandi, pilocarpin hydrochlorid, lemon-juice, with bicarbonate of potassium.

The *diuretics* in use are infusion of digitalis, salts of potassium, citrated caffein, colchicum, cocain, coffee, etc.

Cathartics are used to evacuate the bowels, deplete the mucous membrane, excite the action of the liver, salivary glands, and mucous follicles, and to stimulate the absorbents, thereby inducing them to remove inflammatory deposits. Calomel and the salines are the best.

Enemata of warm water, or soap and water, to which turpentine or vinegar may be added are frequently employed. Glycerin suppositories may be used to unload the bowels, to take the place of cathartics.

Emetics are indicated when the skin is hot and dry, the tongue heavily coated, and when there exists a sense of great weight at the epigastrium. All emetics should be followed by copious drafts of warm water. The emetics generally used are alum in doses of a dram, sulphate of zinc in 20 grain doses, sulphate of copper in like quantity, mustard and salt, ipecacuanha in 20 grain doses, tartar emetic in 2 grain doses. Emetics should not be prescribed in inflammation of the brain, eye, or of the viscera below the diaphragm.

Mercury is indicated when the pulse is soft, skin relaxed and moist, and when there is a general tendency to restoration of the secretions, and not before. It reduces the plasticity of the blood and causes absorption of the embryonic tissue. It is of great benefit in membranous croup, hepatization of the lungs, iritis, syphilitic inflammation, and similar diseases. It is usual to combine a small quantity of opium with the mercury, to prevent it being carried off by the bowels. Mercury is contraindicated in persons of strumous habit, the old, ill fed, badly nourished, and the anemic.

Opium is applicable to the treatment of inflammation in all stages of the disease. The exhibition of opiates should be preceded by blood-letting when admissible; in other cases by a cathartic. The remedy should be administered in full doses, as small doses act as stimulants, while larger doses act as sedatives.

Hypnotics.—When the patient is restless, but not suffering acute pain, hypnotics are indicated, such as phenacetin, 5 grains; sulphonal, 15 grains; bromid of potassium, 30 grains; chloral, 10 grains, taken at bedtime. Paraldehyd, in doses of 1 dram, freely diluted, or hydrobromid of hyoscin in doses of 1/120 of a grain, may be used; if the patient suffers great pain, 1/6 of a grain of any of the salts of morphin may be added. Sometimes a glass of milk-punch, ale, or whisky will answer.

Tonics.—The principal are quinin, iron, and nux vomica, or its equivalent, strychnin.

Antipyretics.—These are principally quinin, given in 20 grain doses, administered about an hour before the evening exacerbation; salicin in doses of about 15 grains during the intervals; acetanilid or antipyrin administered by the stomach or hypodermically.

Antiphlogistic Regimen.—In the early stages of inflammation the patient has no desire for food, nor should he be induced to eat, as it may produce a feeling of great distress, as well as nausea. At this period iced lemonade is very grateful. After the administration of a cathartic, a fluid diet may be resorted to. Suitable articles are beef-tea, milk, soups with the fat skimmed off, meat-extracts, koumiss, raw oysters, sweetbreads, soft-boiled eggs, egg-nog, etc. A patient on a liquid diet should have at least 2 pints of milk, with 1 pint of beef-tea, during 24 hours. Stimulation by brandy, whisky, sherry, Madeira wine, etc., must be resorted to when necessary.

INFLUENZA (La Grippe).—A specific, contagious, epidemic affection characterized by catarrhal inflammation of the mucous membrane of the respiratory tract, accompanied by a mucopurulent discharge, fever, and prostration. There is a strong tendency to the development of bronchopneumonia. At times symptoms referable to the gastrointestinal system predominate; at other times the symptoms are mainly referred to the nervous system. The aged, weak, and young often succumb. The disease is popularly called by its French name, la grippe. The period of incubation is a few hours to 3 or 4 days.

Etiology.—The exciting cause is the bacillus of influenza, first described by Pfeiffer in 1892. This microorganism is rod-shaped, narrower in the middle than at the two extremities, nonmotile, and in size is one of the smallest of bacilli yet discovered. It may be seen singly or in pairs; often in chains of 3 or 4. The central portion of the bacterium does not take the stain as deeply as the two bulbous ends. It stains well with Loeffler's methylene-blue solution or with the Ziehl-Neelsen fluid.

The bacillus may be found in the nasal and bronchial secretion. It has been found in the blood.

Predisposing Causes.—Adult or old age, debility, nervous temperament. One attack predisposes to subsequent attacks.

Pathology.—There is congestion of the nasal mucous membrane and respiratory passages, with the exudation of an excessive amount of whitish, tenacious mucus, in which is found the specific microorganisms in abundance, together with various micrococci. In some cases the stomach and intestines may be congested. There is often enlargement of the spleen and mesenteric glands.

Symptoms and Clinical Course.—The onset is marked by chilliness, flashes of heat and cold, sneezing, nasal discharge, intense frontal or occipital headache of a paroxysmal character, cold perspiration, cough, expectoration of a whitish and tenacious mucus, chest pains, fever 101° to 103°, and profound exhaustion. The symptoms are often associated with severe muscular pains. In some cases the nervous manifestations, such as mental depression, mental confusion, and delirium, are quite marked. Gastrointestinal symptoms, such as nausea and vomiting, tympanites and diarrhea, are often present.

The fever, as a rule, remains elevated for 3 or 4 days, and often ends by rapid lysis. The pulse is increased in proportion to the temperature, and may be full or small, sometimes irregular. In many cases the cough continues for an indefinite duration, and catarrhal pneumonia is a very common sequel. The skin is dry and hot; often sudamina and herpes develop. Urticaria is common.

Complications and Sequels.—Inflammatory conditions of the respiratory tract, especially pneumonia and bronchopneumonia are the most frequent. Hyperpyrexia, cerebrospinal meningitis, nephritis, pericarditis, and cardiac neuroses are also encountered as complications. As sequels may be mentioned phthisis, mania, confusional insanity, melancholia, neurasthenia, insomnia, neuritis, neuralgia, persistent headache, and lymphatic enlargements.

Diagnosis.—The diagnosis ordinarily is readily made, although doubtless during an epidemic many cases are called influenza that are really cases of simple bronchitis, angina, or nasal catarrh. The diagnostic features, in addition to the catarrhal factor, are the short fever, extreme prostration, and muscular rheumatic pains. In typhoid there are a typical temperature, epistaxis, diarrhea, and longer course.

Prognosis.—In the young the prognosis is good. In the very old it is guardedly favorable. Complications are prone to occur.

Treatment.—Absolute rest in bed and a liquid nutritious diet are indicated. If the tongue is coated or the bowels constipated, calomel in fractional doses (1/6 grain) may be given until 1 grain or 1 1/2 grains have been taken. For the excruciating pains and hyperpyrexia 5 grains of phenacetin may be given every 3 or 4 hours.

Or:

℞.	Codein sulphate,	gr. vj
	Phenacetin,	ʒ j
	Salol,	ʒ j.

Divide into 12 powders. One powder every 3 or 4 hours.

Quinin (4 grains) should also be given every 3 or 4 hours with the above prescription. In some cases sodium salicylate, 7 grains every 4 hours, or preferably aspirin, exerts a beneficial effect. Solution of potassium citrate (1 tablespoonful every 2 or 3 hours) is beneficial.

An excellent prescription is the following:

℞.	Quinin sulphate,	gr. xxxvj
	Extract of aconite,	gr. ijss
	Phenacetin,	ʒ j
	Dover's powder,	gr. xij.

Divide into 24 capsules and take two every three hours.

Whisky (4 drams) may be given as a stimulant every 3 or 4 hours. For the excessive nasal discharge and congested nasal mucous membrane a local application may be made:

℞.	Menthol,	gr. jss
	Liquid vaselin,	ʒ j.

Apply to the nostrils on absorbent cotton once or twice daily.

For insomnia, trional (15 grains) or sulphonal (10 grains) may be given at night.

During the convalescence the patient should take a general tonic, such as the elixir of the phosphates of iron, quinin, and strychnin, after meals.

INFUSION OF SALINE SOLUTIONS.—Senn has insisted that the operation of transfusion of blood is an absolute failure. Death from hemorrhage is not prevented by it, and the blood elements do not subsequently retain their vitality, the blood pigment being passed in the urine. After severe hemorrhage the injection of nutritive elements is not necessary. What is needed is the restoration of the intravascular and intracardiac pressures. Moreover, the dangers of embolism and of infection are superadded, the material to be used for the transfusion is often difficult to obtain, and there is no single element of value beyond that obtained by the intravenous infusion of a salt solution, so that the operation of transfusion of blood is to-day almost abandoned. Infusion of saline solutions has in great part replaced the old operation of transfusion.

In the sense used here infusion relates to the introduction under the skin (**hypodermoclysis**) or into the veins (**venous infusion**) of a solution which in chemic composition, specific gravity, and temperature nearly approaches the inorganic portion of the blood serum. It is sometimes called "normal salt solution." "Physiologic salt solution" or "physiologic saline solution" is, approximately, a decinormal solution (one-tenth the strength of "normal solution") of sodium chlorid. It is called "physiologic" from its use in investigations upon the blood in the physiologic laboratory. Solutions of sodium chlorid containing 0.65 to 0.75 percent of the salt preserve the blood-corpuscles from shriveling when withdrawn from the veins, and do not bring about their disintegration. The total percentage of saline constituents and the proportions of the several salts contained in normal blood are variously stated by different observers. Of sodium chlorid there is about 0.5 percent, and of other sodium salts (sulphate, carbonate, and phosphate) about 0.1 percent additional; potassium, calcium, and magnesium salts bring up the total to a figure given by one observer at 0.645 percent, and by others as high as 0.9 percent.

The therapeutic saline solution cannot, therefore, be made to comply with an ideal, or even average, standard of blood-serum composition; and to insist upon a definite percentage and constitution is, in the present state of knowledge, useless pedantry. For most purposes a solution of sodium chlorid will answer, and the convenient proportion of a dram to the pint, or its approximate equivalent of 8 grams to the liter, is easily remembered and sufficiently accurate.

In cases of threatened or actual diabetic coma, or in any other condition in which it is deemed necessary to alkalinize the blood, sodium carbonate may be substituted for a portion of the sodium chlorid; and Cohen has found one-third of the total saline strength a convenient and safe proportion of this agent when used by the subcutaneous method.

Locke and Hare have suggested a general formula for "artificial serum," which contains in the liter:

℞.	Calcium chlorid,	0.25 gm.
	Potassium chlorid,	0.1 gm.
	Sodium chlorid,	9.0 gm.

An artificial serum of the following formula may be used instead:

℞.	Sodium chlorid,		gr. l
	Potassium chlorid,		gr. iij
	Sodium sulphate,	each,	gr. xxv
	Sodium carbonate,		
	Sodium phosphate,		gr. ij
	Boiling water,		Oj.

It is extremely important, whatever formula may be employed, that the solution and all the apparatus used be properly sterilized. In an emergency, in any household, a teaspoonful of sodium chlorid may be dissolved in a pint of water, and the solution sterilized by boiling. If the water contains foreign particles that cannot be strained out, and there is no proper filter at hand, the water must be allowed to stand, after boiling, until sedimentation occurs, when the supernatant fluid should be poured off, again sterilized, and used. When time permits, distilled water, filtered water, or other pure, clear water should be used for the solution. One may sometimes find pure spring-water, which contains very little mineral matter, useful and handy.

The therapeutic saline solution should be introduced at a temperature of about 38° C., or 100° F.; and if the process is slow, care should be taken to maintain the heat meanwhile. It may be introduced directly into a vein, a process often erroneously termed "transfusion," but properly called "venous infusion" or it may be introduced into the circulation indirectly, through the absorbents, beneath the skin—"subcutaneous infusion" or "hypodermoclysis"; or it may be introduced into the peritoneal sac—"peritoneal infusion"; or it may be introduced into the intestine—"enteroclysis." Subcutaneous infusion is the usual and most convenient method. Venous infusion is resorted to when time is a prime object; or peritoneal infusion, as especially advocated by Sir B. W. Richardson in the collapse of cholera, may be employed when subcutaneous infusion is too slow and the venous method dangerous or inexpedient.

Enteroclysis may be used when time is not at all pressing and if one desires to avoid puncturing the skin. It is uncertain, but often efficacious. Venous infusion Cohen is now little inclined to resort to, except under distinct stress of urgency, as the hypodermoclysis is reasonably prompt; and, indeed, for one who is neither a surgeon nor a physiologic investigator unfamiliarity with the manipulations of venous infusion—comparatively simple as they are—may act as a deterrent, or induce greater delay while skilled assistance is being sought, than the difference between the methods as to the rapidity of absorption.

Surgeons have used intravenous infusion of saline solution with great success in cases of shock and collapse, in hemorrhages following wounds and operations, and in other conditions in which the action of the heart had to be maintained. It acts mechanically by filling the vessels and raising blood-pressure. Chemically or dynamically it seems to stimulate diuresis, and especially to favor elimination of toxins of various kinds. It likewise permits free bleeding to be done to relieve congestion and stasis and remove waste and poison from the vessels, as it supplies the necessary quantity of fluid to continue circulation, just as it does in loss of blood from other causes.

It is indicated to supply fluid following blood losses or other drains; as a stimulant in shock and collapse, particularly when accompanied by loss of blood; and as an internal detergent in toxemias (comas), whether from septic poisoning, as in puerperal fever, from acute infectious diseases, such as pneumonia, typhoid fever, the exanthemata, tuberculosis, etc., from acute or chronic disease of the liver, kidney, or other excretory agents—among which puerperal nephritis must be specially mentioned—or from intoxication by drugs, as alcohol, opium, and the like. The rise of temperature which, in Cohen's experience, has invariably followed both intravenous and subcutaneous infusion is to be regarded favorably, as a sign of reaction. The quantity of fluid introduced at one time varies from half a pint to a quart.

Hypodermoclysis may be given in the thigh, the buttocks, the back, the chest, or, in women, in the submammary region. If one place is insufficient, several may be used successively. During the flow of the fluid the tissues should be massaged toward the heart to promote absorption. The apparatus Cohen employs is very simple: A needle taken from an aspirator set, attached to 4 1/2 feet of black rubber tubing, connected with a hard-rubber funnel. Everything, including the physician's hands, being clean and sterile, the funnel, tube, and needle filled with solution, and the skin properly prepared, the needle is thrust into the subcutaneous tissues to a depth of about 2 inches, the funnel is elevated to a height of 3 or 4 feet, the solution, as it enters the tissues, is forced onward by manipulation, and the funnel is kept filled by an assistant. · A rubber bag or other receptacle,

such as the glass jars used by the surgeons for irrigation solutions, may be substituted for the funnel, and the introduction of a section of glass tubing about 2 feet from the needle permits one to watch the passage of the fluid, and to interrupt it at once by pressure with the fingers should any foreign particles be detected in the current.

Arterial Infusion.—This method of infusion of blood or of normal salt solution has been performed to avoid the danger of venous embolism: a little air in an artery will do no harm. The radial artery is most convenient. It should be surrounded by 3 ligatures, and the one nearest the heart being tied at once, the distal ligature is but slightly tightened to cut off anastomotic blood supply. The artery is transversely cut, the syringe inserted pointing toward the periphery, and fastened by the third ligature. The second ligature is now loosened and the solution injected. After transfusion, that portion of the artery which held the cannula should be excised, the peripheral ligature being fastened tightly. The method is troublesome and not without danger, and is no better than the harmless hypodermoclysis. See TRANSFUSION, INTRAVENOUS INJECTION.

INFUSIONS.—Liquid preparations, made by treating vegetable substances with either hot or cold water. They are not boiled, though boiling water is often employed.

TITLE.	COMPOSITION.	AVERAGE DOSE.
Infusum digitalis (*Infusion of digitalis.*)	Digitalis, 1.5 percent. Alcohol, 10.0 percent. Cinnamon water, 15 percent.	2 drams.
Infusum pruni virginianæ (*Infusion of wild cherry.*)	Wild cherry, 4 percent. Glycerin, 5 percent.	2 ounces.
Infusum sennæ compositum (*Compound infusion of senna;* also called Black draught.)	Senna, 6 percent. Manna, 12 percent. Magnesium sulphate, 12 percent. Fennel, 2 percent.	4 ounces.

The pharmacopeia also contains a general formula for infusions according to which the preparation would represent 5 percent of any drug desired. The strength of infusions of energetic or powerful substances should, however, be specially prescribed by the physician.

INGROWING NAIL.—See NAILS (Diseases).

INHALANTS.—An inhalant is a remedy which is diffused in the air and is drawn in the nose, mouth, and throat by the act of breathing. It is thus opposed to the spray, in which the remedy is thrown in. It may be accepted tentatively that no form of the vapor of water can be relied upon to carry medicinal agents in the respiratory passage further than the larger divisions of the bronchial tubes. It is far different with volatile substances. The vapor of ether and chloroform and of the numerous volatile oils presumably reaches the alveoli of the lungs and is absorbed by the pulmonic vessels. Many of the volatile oils yield stimulating inhalants which are conveniently combined with steam. These are indicated in chronic inflammation, accompanied by hypersecretion. In the judgment of many practitioners stimulating inhalations are of doubtful worth, since the agents cannot be used in strength sufficient to relieve the symptoms without exciting spasm of the glottis or other irritative effect. This is less true than formerly, owing to the increase of the number of agents from which selections can be made; while for the sedative and antispasmodic inhalants, whether used in the medium of steam or otherwise, no doubt remains of their value in many conditions of disease. Nevertheless, inhalations must be used with discrimination to insure safety and success.

Steam is the favorite inhalant. It is a convenient means of diffusing moist heat. Like other forms of water, it tends to dilute mucus and thus diminish its irritative power. It removes the sense of dryness so common in acute affections of the throat. In tonsillitis it favors the formation of pus, and is thus indicated when it is desired to hasten suppuration. Its use is contraindicated in pharyngitis when there exist relaxed states of the glands and membranes, with hypersecretion. It will be observed that the uses and abuses of steam are much the same as those of moist heat in other forms than steam. It can be variously medicated by the use of apparatus known under the name of steam-sprayers.

Steam should be inhaled: *i. e.*, should not be forced in the nose and throat. It is often borne when sprays excite irritation. In many individuals with irritable mucous membranes, when an attempt is made to spray the throat the tongue instinctively ascends at its basal half and occludes the passage of air. Properly to use the spray in such cases the mouth should be wide open and the tongue depressed. If difficulty is experienced, the nostrils must be closed. If the trachea and bronchi are to be reached, the inspirations must be deep.

INJECTIONS.—See ENEMA, HYPODERMIC INJECTION, VAGINAL DOUCHE, GONORRHEA, CYSTITIS, etc.

INOCULATION.—The introduction into the circulation of the virus of infectious diseases or of certain medicinal agents. See DIPHTHERIA ANTITOXIN, SERUM THERAPY, VACCINATION.

INOSCOPY.—Jossuet's method of predigesting the coagulum of suspected exudates prior to search for tubercle bacilli. Though of considerable value, it is not so accurate as cytodiagnosis and animal inoculation. See CYTOLOGY.

Technic.—The fluid is collected in a sterile flask and allowed to clot. The coagulum is then removed and washed and treated with 30 c.c. of a solution to digest the fibrin (pepsin 2 grains, sodium fluorid 3 grains, glycerin and strong hydrochloric acid of each 10 c.c., distilled water to 1000 c.c.). At incubator temperature digestion will be complete in about 24 hours. Then the fluid is centrifuged 10 minutes. Two smears are made of the sediment, albumin fixative being added to them. After being fixed in the flame each smear is stained with carbol-fuchsin.

INSANE, COMMITMENT, AND CARE OF.—One of the most responsible duties of the physician in active practice is the commitment and care of the insane. To deprive a citizen of his liberty is a serious matter; the law looks with suspicion upon any attempt in this direction and practically all the states have passed stringent regulations not only as to the manner of commitment to both public and private institutions, but have also established regulations as to the care of the insane, their transportation from one place to another, and the care of their property, including rights and duties of guardians, etc. In the New England and Middle Atlantic States the regulations are fairly uniform.

Institutions are divided into three classes:

(1) General and private hospitals, where restraint is permitted only for short periods in cases of febrile delirium, and in cases of mental diseases only until the patient can be committed and transferred to one of the following institutions.

(2) State or municipal asylums or psychopathic hospitals under the care of state or municipal authorities. Municipal and county institutions are subject to the state laws of lunacy.

(3) Private institutions for the care of the insane, which are licensed by the state usually through a lunacy commission or commissioner, and subject to the same rules of commitment and care of the insane as are state institutions.

When the physician is consulted as to the commitment of a patient of unsound mind, he should give advice to the parties interested as to the different institutions, who will then make personal arrangement with the institution to which the patient is to be committed. This should always be done by the family or other interested parties, so as to relieve the physician of any suspicion of interest in the commitment of the patient. Having made financial and other arrangements for the reception and care of the patient, a blank form of commitment from the selected institution (each institution has its own special form, all of which are uniform as to the state lunacy requirements) is handed to the physician who proceeds to make an examination in order to determine whether the patient is of sufficiently unsound mind to require restriction of his liberty. In most of the states the law requires an examination by two physicians who shall have been in active practice at least three years (in Pennsylvania five years). The examinations must be made separately, *i. e.*, not in joint consultation. The physicians must not be officially connected with the institution to which the patient is to be committed or be related by blood or marriage to the patient. The certificate of commitment filled out in detail is sworn to before a magistrate (in Pennsylvania) or a probate judge, who after the examination signs the commitment papers and sends the patient to the designated institution. In Massachusetts, the patient must be present in court, and if for any reason this is deemed unadvisable, this must be so stated by the committing magistrate. In some of the Southern and Western states, a physician is appointed by the court to make an examination. In Alabama, the judge must call one respectable physician and other trustworthy witnesses to fully investigate the case, and either with or without the verdict of the jury decide the case as to sanity and indigence. In Arkansas, a time shall be appointed by the judge for a hearing, and at such time such competent witnesses as are produced shall be heard; in addition to which, the alleged insane person must have been examined by one or more physicians, who present in writing the results of their examination including the answers to certain questions prescribed by the statute. In California, at least two graduates in medicine must appear at a hearing before a judge of court of record, listen to the testimony of at least two witnesses and must then make a personal examination of the alleged insane person. Whatever method of commitment is prescribed by the particular state in which the patient is committed, the committing physician is held to a definite responsibility, both as to his diagnosis and to following in detail of the laws regulating lunacy and the commitment of the insane. The physician may be liable for a civil action for an improper commitment, and may also be liable to criminal prosecution for improperly "committing to an insane hospital or asylum a person who is not insane." For these reasons physicians should make a careful and painstaking examination not only as to family history and previous history of the patient, but also as to his present physical and mental condition. He should not depend upon the hearsay of others who may be more than interested in the commitment of the patient, but should convince himself from the statement of the patient as to the presence of hallucinations, delusions, etc. If the examination is thorough, and the physician has a reasonable degree of knowledge, and skill, and experience, and has used ordinary care and diligence, he cannot be held responsible for an honest error of judgment. If there is any doubt as to the mental condition, repeated examinations should be insisted upon and the patient should not be confined in an asylum unless the physician is more than reasonably certain of mental disease.

Detention wards for observation of the insane may be found in most of the large municipal hospitals. These wards are not as a rule covered by the lunacy laws. If the patient is detained there for a longer period than five days, it is in distinct conflict with the statute. Inasmuch, however, as it is to the advantage of the patient to remain in such a ward in preference to the immediate commitment to an asylum, the question of the legality of such detention has not been raised. It should be remembered in this connection, that while the state gives the right to a family or others to arrest or restrain an insane person to such an extent and for such length of time as may be necessary to prevent injury or damage to themselves or to the lunatic, yet a person harmlessly insane cannot be arrested without a warrant even though the purpose is to detain him until proper commitment can be had.

Whether the lunatic be in or out of the asylum, and quite independent of the question of commit-

ment, a commission *de lunatico inquirendo* may be appointed by the court to determine the mental condition. Such a writ may be applied for on behalf of a lunatic already confined by those in favor of reestablishing his control over his own estate or by relatives of a man in possession of his estate, but whom they consider unable to administer it. In case of an affirmative decision on the part of the court, the patient may be directly committed to an institution or detained there from a previous commitment. A *habeas corpus* proceeding may have the same result in either direction. The commission may be composed, as in Pennsylvania, of a practitioner of law, a practitioner of medicine, and a layman, to hear evidence, or the court may appoint a commissioner, usually an attorney, who appoints a jury, usually of six, to hear evidence, and reports to the court its findings which may or may not be approved. In some of the states, those addicted to the chronic abuse of alcohol, opium, cocain, etc., may be committed as such to institutions for the care of the insane, or to special institutions for a period varying from a few months to a year, by a judge of the probate court.

Any one desiring to treat persons of unsound mind in his own house must comply with regulations established by the laws of particular States. When a person living in his own home is under treatment for insanity, a medical attendant is justified by common law in adopting measures of restraint necessary for personal safety or proper treatment. To change the patient to an asylum or other place needs certain legal requirements and forms. Each of the United States possesses its own lunacy laws. Certain fundamental principles of law underlie all requirements. A person mentally deranged so as to be dangerous to himself or others if remaining at liberty, may be confined by any one, but only for such time as is necessary to institute proceedings requisite to determine the insanity. Such person restraining another, however, is liable in damages to the person so arrested if the lunacy is not proved. It is always a judge's province, in an issue framed to determine the insanity of an individual, to decide whether sufficient evidence of insanity appears to warrant a submission of that issue to the jury. The law presumes all persons to be sane until otherwise proved, and the burden of proof is upon the person alleging insanity. When once insanity is proved, however, the presumption is that insanity continues, and the burden of proof shifts to the opposite side: *i. e.*, the party alleging insanity.

The opinions of witnesses as to a person's sanity or insanity are to be regarded only in connection with the facts upon which such opinions are based. Persons competent as experts on the subject of insanity may give opinions based on facts observed by themselves or upon hypothetic questions based on the evidence appearing in a case. See EXPERT TESTIMONY.

INSANITY.—A derangement or abnormal condition of the mental faculties, with or without loss of volition and of consciousness. Insanity may be due to defective development, to acquired disease, or to natural decay. It is characterized, according to its form, by a variety of symptoms, the most common of which are change of character and habits, moroseness, confusion, elation, melancholy, mania, delusions, and hallucinations. The psychotic tendency is the chief predisposing cause, and on this some one of the many exciting causes will act and result in the final breakdown. The vast majority of cases of insanity occur between the ages of 25 and 45. Melancholia, mania, delusional insanity, and dementia are the four principal types of the affection. According to **Krafft-Ebing**, insanity may be divided into two great groups, according as the disorder is the result of a disturbance of the developed brain or of an arrest of brain development. He places insanity ordinarily so called under the first head; his subdivisions are as follows:

A. Mental affections of the developed brain.
  I. Psychoneuroses.
    1. Primary curable conditions.
      (*a*) Melancholia.
        a. Melancholia passiva.
        β. Melancholia attonita.
      (*b*) Mania.
        a. Maniacal exaltation.
        β. Maniacal frenzy.
      (*c*) Stupor.
    2. Secondary incurable states.
      (*a*) Secondary monomania.
      (*b*) Terminal dementia.
        a. Dementia agitata.
        β. Dementia apathetica.
  II. Psychic degenerative states.
    (*a*) Constitutional affective insanity (*folie raisonnante.*)
    (*b*) Moral insanity.
    (*c*) Primary monomania.
      a. With delusions.
        aa. Of a persecutory tinge.
        aβ. Of an ambitious tinge.
      β. With imperative conceptions.
    (*d*) Insanities transformed from the constitutional neuroses.
      a. Epileptic.
      β. Hysteric.
      γ. Hypochondriac.
    (*e*) Periodic insanity.
  III. Brain-diseases with predominating mental symptoms.
    (*a*) Paralytic dementia.
    (*b*) Cerebral syphilis.
    (*c*) Chronic alcoholism.
    (*d*) Senile dementia.
    (*e*) Acute delirium.
B. Mental results of arrested brain-development: Idiocy and cretinism.

Kraepelin's Classification of Mental Diseases.

I. Infection psychosis:
  a. Fever delirium.
  b. Infection delirium.
  c. Infection weakness. (Neurasthenia.)
II. Exhaustion psychosis:
  a. Collapse delirium. (Acute delirium.)
  b. Acute confusion. (Amentia.)
  c. Chronic nervous exhaustion.
III. Toxic psychosis:
  1. Acute intoxication.
  2. Chronic intoxication.
    a. Alcoholism.
    b. Morphinism.
    c. Cocainism.
IV. Thyrogenic psychosis:
  a. Myxedematous insanity.
  b. Cretinism.

V. Dementia præcox:
  a. Hebephrenic form
  b. Katatonic form.
  c. Paranoid form.
VI. Dementia paralytica: (Paresis, General paralysis.)
VII. Organic dementia:
VIII. Involution psychosis:
  a. Melancholia.
  b. Presenile insanity.
  c. Senile dementia.
IX. Manic depressive psychosis:
  a. Maniacal states.
  b. Depressed states.
  c. Mixed states.
X. Paranoia.
XI. Neuro-Psychosis:
  a. Epileptic insanity.
  b. Hysteric insanity.
  c. Traumatic insanity.
XII. Degenerative psychosis:
  a. Constitutional perversion.
  b. Compulsive insanity.
  c. Impulsive insanity.
  d. Sexual perversion.
XIII. Arrested psychical development:
  a. Imbecility.
  b. Idiocy.

Idiocy and **Imbecility** are sometimes regarded as distinct phases of mental unsoundness, idiocy being the more profound defect and a fundamental congenital condition, but the distinction is not marked. As yet, the causes of idiocy and imbecility have not been definitely established. Intemperance and syphilis in the parents are generally regarded as predisposing causes. Marriages in close consanguinity are held by many to be causes. The experience of the Jewish people, however, among whom marriages between uncle and niece are not unknown, does not seem to bear out this as a law of heredity. It has been claimed that defects, mental or physical, are more apt to be transmitted to offspring when parents are in close consanguinity, and this view has led to the forbidding of such marriages in many places. Pennsylvania, for example, has a law forbidding the marriage of first cousins. Incidents and accidents of pregnancy and parturition are causes of idiocy.

Idiocy is distinguished from other forms of mental disorder by being congenital; and this condition is manifested by imperfect development of both body and mind. The idiot, from an original defective structure of the brain, is able to acquire only a limited degree of intellectuality. His instincts, habits, and appetites are largely animal. Often there is no sign of recognition, nor indication of memory, in which respect he is below many animals. There are some cases of idiocy, however, in which the want of cerebral development is not so great, and some intelligence is manifested, with a partial development of some few of the faculties. Such idiots are docile and tractable; they are capable of being taught many things by careful and judicious training, even to talk and read; and thus being materially improved.

Physical Peculiarities of Idiots.—These are manifested in smallness of the head, in the majority; thickness of the lips, which are often fissured, particularly the lower one; enlargement of the tongue, salivary glands, and tonsils; vaulting of the hard palate; irregularity of the teeth, with tendency to early decay; deficiency of the lobules of the ears; defects of vision, such as myopia and congenital cataract; weakness and clubbed appearance of the fingers and thumbs, and want of power over the sphincters. In some idiots the head is preternaturally large, especially in congenital hydrocephalus.

An *autopsy* will generally disclose a deficiency of gray matter (from a defective size of the brain) and a want of proper development of the convolutions; sometimes an absence of the entire cerebellum, of the pineal gland, of part of the fornix, of the olivary bodies, thalamus, and corpus striatum; and an absence, or rudimentary state, of the corpus callosum, and soft commissures. Deaf-dumbness is common. Some are born deaf, dumb, and blind.

While the higher faculties are wanting, there often exists a marked development of the lower ones, such as the love of money, sexual feelings, gluttony, and filthy habits, together with a slow and tottering gait.

The different symptoms of insanity are considered under their separate alphabetic headings. See DELIRIUM, DELUSIONS, MANIA, MELANCHOLIA, etc.

INSECTICIDES.—See DISINFECTION.

INSECT STINGS AND BITES.—See BITES AND STINGS.

INSENSIBILITY.—See COMA.

INSOLATION.—See HEAT-STROKE.

INSOMNIA.—Want of or inability to sleep.

Etiology.—Among the causes of insomnia, those of a predisposing character are the female sex, old age, nervous temperament, and intellectual pursuits. Of exciting causes are functional or organic diseases of the brain, worry, anxiety, grief and bodily pain, noise, if not monotonous, fever, coffee, tea, etc. Insomnia is most frequent among the insane, and is the most distressing accompaniment of melancholia. Other prominent causes are habit, indigestion, genitourinary disorders, autotoxemia, gout, lithemia, syphilis, habitual constipation, anemia, vasomotor changes, neurasthenia, eye-strain, and hallucinations of sight and hearing.

Treatment.—In treatment of chronic insomnia a normal and sufficient general nutrition is to be secured as the basis for normal cerebral nutrition, but this does not imply overfeeding. A useful criterion is the body-weight in reference to the height and usual or normal condition of the individual, and diet is to be regulated on this basis. The distribution of the blood is to be equalized, with the balance, however, tending to anemia of the brain rather than the reverse, though by no means to the extreme. The derivation of blood may be accomplished by hot baths to the feet or to the lower half, or even the whole body, emphasized, if necessary, by a little mustard. The well-known expedient of a small amount of easily digestible food just on going to bed or on waking up in the course of the night probably acts, to a considerable extent, at least, in the same way. Hot toddy adds to a slight direct narcotic effect, the early vasomotor dilating action of alcohol. Another illustration of the same influence is to be found in the intense drowsiness that comes over one who has

been for a long time in the cold and who sits down in front of a cheerful fire, when the blood, previously driven to the interior of the body, flows outward again as the arterioles dilate.

Cold feet are often an accompaniment or partial cause of insomnia, and it is well to promote the circulation in them by a hot bath for 5 minutes, followed by a short cold douche and friction, rather than simply to attempt to warm them by hot bottles and the like.

There is strongly recommended in cases of sleeplessness the wearing of the moist abdominal bandage, or what the Germans call "Neptune's girdle." This was one of the favorite remedies of Priessnitz.

Warm baths, as is well known, produce a calming effect and tend to bring on sleep, and Alldorfer has attempted to apply such a method to patients when a sedative effect is desired, and yet when a bath is inapplicable. His method consists in wrapping the lumbar region and belly with linen cloths soaked in warm water, and then covering them with oiled silk or rubber cloth, so as to prevent evaporation, while the whole is kept in place and loss of heat prevented by a flannel cloth. This procedure is of ready performance, and the author says that by this simple means he has obtained most astonishing results in the treatment of insomnia. By dilating the large vessels of the intestinal tract by the warmth applied, a condition of anemia of the brain is produced favoring sleep. These large intestinal vessels have been very properly termed the waste-gates of the circulatory system.

According to Edes, a plan sometimes resorted to in desperation by victims of insomnia, that of producing great bodily fatigue—as, for instance, by a walk far beyond the usual habit or ability—is an extremely bad one, and usually fails entirely of its object. As with the circulation, a certain medium degree of fatigue is required for the best kind of sleep, and if increasing the burden is to be of value, it must be shifted so as moderately to fatigue new portions of the brain, and not deepen the old ruts from which it is already too difficult to dislodge the current of the thoughts. Mere labor which fatigues the muscles without engaging the attention in something outside the fixed and disturbing current of associations does not fulfil this indication. Moderate gymnastic exercises carried out in bed have been commended.

Reading one's self to sleep with a suitable book is a common and commendable device. The book, however, is not a matter of indifference. It should not be at all in the direction of one's anxious daily occupations, nor sufficiently exciting to set up a train of thought intense enough to be itself a cause of wakefulness; and, on the other hand, it must have enough interest to sufficiently divert the mind. Probably nothing could be more valuable and efficient, were it generally available, than music, which would, however, require a delicacy of adaptation to the individual case that would greatly interfere with its practical applicability. The prescription most frequently made for chronic insomnia, and in most cases undoubtedly the best, is that of complete rest or a vacation, recommendations more easily given than taken. Absolute vacancy of mind is talked about but never artificially attained, and relief from mental activity means relief from the habitual train of thought, most probably of a depressing or anxious character. It is especially difficult to obtain the proper conditions at home or among familiar surroundings. A vacation in the country is by far the best method of getting the necessary diversion, but here also there is a choice. The disturbances which drive away sleep come from within, and the occupation of the vacation must be such as will displace morbid activities by healthy ones, not intense, but sufficient to predominate. If the patient has nothing else to think about, he will be sure to think about his troubles. Life in the woods, with adventure enough to command the attention of the invalid in an entirely different direction, is desirable.

Some of the mild hypnotics may be given in very small doses as placebos. A graduated series of powders, with sugar of milk to maintain the bulk, and enough quinin to maintain the taste, beginning with a full dose of sulphonal and ending with none of it, is a convenient way of ridding the patient of the drug habit.

Hypnotics may be roughly divided into two classes: Those which diminish the nervous irritability which keeps the patient awake, and those which distinctly, though perhaps not profoundly, narcotize the nervous centers. The most typical of the first class are the bromids, among which Edes prefers the potassium salt, as the most powerful, believing that the fear of any depressing effect of the basic element upon the heart is purely imaginary; at least in such doses as should be or are likely to be used in the treatment of insomnia. The bromids are better given in 2 or 3 doses during the latter part of the day, and in many chronic cases through the day, than in a single large one, although the latter plan has worked well also. In cases in which a good deal of nervous excitability and restlessness during the day—"nervousness" *par excellence*—is added to the insomnia, a bromism lasting a few days or a week or two is occasionally admissible. The bromid of potassium, under circumstances demanding mental activity, even in considerable doses, is not a distinct hypnotic, although, when given properly, it will allow a patient to sleep if it does not make him do so. The same is true of its action when given with narcotics that are liable by themselves to produce an excitant effect. Opium or cannabis indica may be converted by it from an excitant to a sedative.

Opium, with its alkaloid, morphin, the first of narcotics, notwithstanding its undoubted power and the fact that sleep usually follows a sufficient dose after a varying interval, is not a desirable hypnotic in the strict sense of the word. According to Edes, in small doses it is untrustworthy, in many persons having the reverse of the desired effect, while in large doses its disadvantages far outweigh its benefits. When, however, the want of sleep is dependent upon pain, the case is entirely different. It would be peculiarly dangerous in a case of neurasthenia. Cannabis indica is not a hypnotic alone, but often does well in combination with bromid.

Choral has been to a great extent abandoned for safer if less powerful drugs. Of the immense number of other hypnotics of recent introduction, mostly of coal-tar or alcoholic origin, each of which had in turn been brought forward as agreeable, certain, and free from danger or disagreeable after-effects, Edes only mentions three.

Sulphonal, used with care, is little likely to do harm, except that which attaches to any habit of the kind or dependence upon artificial aids to sleep.

The tardiness and permanency of the action of sulphonal, undoubtedly a consequence of its difficult solubility and slow absorption, cannot be looked upon as a disadvantage when properly allowed for. A second good night without a renewal of the dose is by no means an exceptional occurrence, even when the dose has not been excessive. It seldom fails in the dose of 15 grains if given well dissolved and early enough in the evening. In dose of 5 grains or less it is somewhat of a placebo. The full dose should not be repeated on the same night, and it should not be given continuously—that is, upon successive nights—for any length of time. If its use is to be prolonged beyond an emergency period of 4 or 5 days, the interval should be more than 48 hours.

Trional is more soluble and rapid in its action, but seems to enjoy most of the advantages of sulphonal except the important one of having its effect last over 2 nights.

The peculiarities of each may be best utilized by reserving the sulphonal for a patient who has not slept for several nights, and who, it is fairly clear, is not going to get a good night unassisted, so that the medicine may be given early—namely, at 6 or 7 P. M.—in order that its effect may be developed at the regular time for going to sleep. Trional, on the other hand, may be kept for a case in which sleep is likely to be well begun, but when it is likely to be broken off very early in the night and not renewed without a hypnotic. It is preferable for a provisional prescription, since the dose may be given at any time in the night necessary and the effect will not be too far distant. Paraldehyd is a rapidly acting and safe narcotic, probably coming much closer in its mode of action to alcohol than the coal-tar preparations (Edes).

Hyoscin, 1/100 of a grain of the hydrobromid, hypodermically, is useful in insomnia from intense mental excitement. Duboisin, 1/100 to 1/30 of a grain hypodermically, is more calmative than hyoscin. Ignatia is better than morphin for nervous erethism. Gelsemium is indicated in mania, overexcitement, and the insomnia of drunkards. Sumbul, 30 minims of the fluidextract, is efficient in insomnia of chronic alcoholism when given with a little spirit of chloroform.

℞. Paraldehyd, ℥ j
Alcohol, ℥ jss
Tincture of vanilla, ℥ ss
Water, ℥ j
Simple syrup, enough for ℥ iv.

Take a teaspoonful or two every hour until sleep is obtained

℞. Choral hydrate, ℥ ij
Potassium bromid, ℥ iij
Tincture of opium, ℥ j
Syrup of orange, ℥ iij
Water, enough for ℥ ij.

A teaspoonful at a dose. May be repeated if necessary.

INSTRUMENTS, CARE AND PREPARATION.—See Abdominal Section.

INSULAR SCLEROSIS (Disseminated, Cerebrospinal, or Multiple Sclerosis).—A disease characterized by scattered islets of sclerosis in the brain and cord. It is called *sclerose en plaques disseminées* by the French, and *multiple sclerosis* by the Germans. It is distinctly a disease of early adult life, and is of about equal frequency in the two sexes. The causes are obscure. The disease has been observed to follow infectious diseases, exposure to wet and cold, and traumatism. In some cases a neuropathic predisposition has been present. The symptoms vary according to the situation of the islets; the most common are motor derangement, a jerky tremor, paresis or paralysis, and ocular symptoms, as diplopia and amblyopia, with nystagmus, and occasionally atrophy of the discs. The tremor is ordinarily absent during repose, but appears on attempted movement, and is hence designated intention tremor. The speech is a characteristic one, very slow, each syllable being pronounced with difficulty; hence it is said to be of a *scanning* nature. Vertigo is also a very frequent symptom, and in the advanced stage the mind undergoes deterioration, and dementia may make its appearance. The knee-jerks are exaggerated, and ankle-clonus is present. The lesions of the disease are small grayish or yellow gelatinous patches scattered throughout the brain and in both the white and gray matter of the cord. See Brain, Spinal Cord.

INSURANCE EXAMINATION.—See Life Assurance Examination.

INTERCOSTAL NEURALGIA.—This is the form of neuralgia most frequent in anemia and hysteria of women. It must be differentiated from the pain of caries and of aneurysm felt in the intercostal region. Inflammation of the pleura is often mistaken for it. In intercostal neuralgia the pain is constant, and is exaggerated by movement. A local intercostal neuralgia, confined to one spot, usually along the course of the nerve or at the exit from the spinal canal, is known as **pleurodynia.** Herpes zoster or zona occurs with the most exaggerated form of intercostal neuralgia. The eruption is usually preceded by the pain. It consists of a series of pearly vesicles, which take 2 or 3 days to develop and gradually disappear. The most distressing feature is the presence of pain after the eruption has subsided.

Treatment.—As a rule, the neuralgia recurs unless the general health is improved, and hence tonics and hygienic measures are to be employed. Often a change of air or of surroundings will effect a relief. Iron is a specific in cases with chlorosis or anemia. All forms of arsenic are beneficial. Quinin has been overrated, but is valuable if there

are malarial complications. Strychnin, cod-liver oil, and phosphorus are advantageous. For the relief of the pain, antipyrin, antifebrin, and phenacetin are sometimes of value. Morphin is to be used with great caution. Gelsemium is highly recommended. Of local applications, chloroform liniment, camphor and chloral, menthol, the oleates of morphin, atropin and belladonna with lanolin, may be tried. Freezing with the ether spray is sometimes successful. The positive pole of the electric current may be placed near the seat of the pain until the current causes slight tingling or burning. The surgical treatment of intractable neuralgia embraces nerve-stretching and excision. The thermocautery and acupuncture are used in very chronic forms. See NEURALGIA.

INTERMITTENT CLAUDICATION.—See ARTERIOSCLEROSIS.

INTERMITTENT FEVER.—See MALARIAL FEVERS.

INTERNAL SECRETIONS.—See ORGANOTHERAPY.

INTERTRIGO.—An erythematous eruption or lesion of the skin produced by friction of adjacent parts. See ERYTHEMA.

INTESTINAL ANTHRAX.—See ANTHRAX.

INTESTINAL OBSTRUCTION.—Obstruction of the passage of fecal matter along the intestinal canal.

Varieties.—(1) Acute intestinal obstruction; (2) chronic intestinal obstruction.

Acute Intestinal Obstruction

Location.—It usually involves the small bowel.

Etiology and Pathology.—(1) Strangulation; (2) intussusception (invagination); (3) twists (volvulus), and knots; (4) foreign bodies.

Strangulation is the most frequent cause of acute intestinal obstruction, and is most often due to adhesions or bands of peritoneal tissue. Most cases occur after the twentieth year. The seat is generally located in the small bowel.

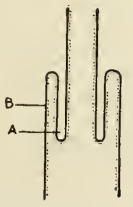


DIAGRAM OF INTUSSUSCEPTION.—(*After Rose and Carless.*) A. Intussusception. B. Intussuscipiens.

DOUBLE INTUSSUSCEPTION.

Intussusception is due to one portion of the bowel slipping into the lumen of another portion, and may even protrude at the rectum. It is generally a disease of childhood.

Twists and knots (volvulus) commonly occur only after the age of 30, in those cases in which the bowel has a long mesenteric attachment. The usual site is in the region of the cecum.

Foreign bodies may be gall-stones, coils of lumbricoid worms, or the result of large doses of bismuth.

Chronic Intestinal Obstruction

Location.—It involves the large intestine.

Etiology and Pathology.—(1) Fecal accumulation; (2) stricture of the bowel; (3) inflammatory changes in the bowel; (4) tumors or abscesses; (5) chronic peritonitis.

Fecal accumulation is a very frequent result from the imperfect gastric and intestinal digestion of such foods as cheese, boiled milk, cabbage, and beans.

Strictures are usually the result of a malignant growth.

Inflammatory changes may occur as the result of traumatism.

Tumors or abscesses may so compress the lumen of the bowel as to cause chronic intestinal obstruction.

Symptoms of Acute Intestinal Obstruction.—There is intense localized pain, an anxious countenance, feeble pulse, normal or subnormal temperature, and often syncope. Vomiting comes on early, first being of the contents of the stomach; later the vomitus becomes greenish or stercoraceous. Complete constipation follows, the abdomen becomes exceedingly tender to the touch, is greatly distended with gas, yielding a tympanitic note on percussion. The normal peristaltic movement is altered and there is a loud gurgling, or borborygmus.

Symptoms of Chronic Intestinal Obstruction.—In this variety constipation gradually ensues, and pain, which at first is only slight, within the course of a few days becomes more severe, and later presents the symptoms observed in the acute variety.

Diagnosis is not always possible. When first called to see a case with the signs of intestinal obstruction—that is, pain, vomiting, constipation, and possibly distention of the abdomen—the physician should exclude the possibility of external strangulated hernia, not merely contenting himself with an examination of the femoral and inguinal rings, but also making a search in the less common situations of hernia, such as the obturator foramen and sciatic notch. Further diagnosis depends upon the subjective and objective symptoms.

Treatment.—When no diagnosis can be clearly made, the treatment may at first be expectant, but no long delay is admissible if surgery is to have a fair chance of saving the patient. Thus, in acute cases nothing should be given by the mouth save small pieces of ice to suck, the stomach should be emptied by irrigation with warm water with the siphon stomach-tube, and the patient placed under the influence of morphin, injected subcutaneously. An enema may be given, but purgatives must, of course, be avoided. The relief, however, obtained by these means is often deceptive, and if the obstruction continues, it is worse than useless to waste further time in giving drugs. It is better at once to open and explore the abdomen before irreparable harm has been done. If when first seen

Strangulation.	Intussusception.	Twists (Volvulus).	Chronic Intestinal Obstruction.	Appendicitis.	Peritonitis.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*
1. Generally occurs after age of 20.	1. Most frequent during childhood.	1. Most frequent after age of 30.	1. Middle life.....	1. Most cases occur before age of 25.	1. Usually in middle life.
2. Pain localized, causing rapid collapse.	2. Constant tenesmus.	2. Pain diffuse.....	2. Pain diffuse, but comes on gradually.	2. Pain often develops rapidly.	2. Pain develops suddenly.
3. Pain intense, paroxysmal in character.	3. Pain develops suddenly and is continuous.	3. Pain paroxysmal, but recurs at longer intervals than in strangulation.	3. Pain continuous.	3. Pain continuous.	3. Pain continuous.
4. Constipation complete.	4. Frequent diarrhea and passage of bloody mucus.	4. Constipation complete.	4. Constipation complete.	4. Stools infrequent.	4. Stools infrequent.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*
1. Temperature often subnormal.	1. Temperature normal or subnormal.	1. Temperature slightly elevated.	1. Temperature moderate; frequently high.	1. Temperature moderate; frequently high—104° F.	1. Same as in appendicitis.
2. Pulse very weak.	2. Same as in strangulation.	2. Same as in strangulation.	2. Pulse of good volume.	2. Pulse of good volume.	2. Pulse usually of high tension.
3. Stercoraceous vomiting comes on early.	3. Same as in strangulation.	3. Same as in strangulation.	3. Stercoraceous vomiting comes on after first few days.	3. Same as in intestinal obstruction.	3. Vomitus greenish; rarely stercoraceous.
4. Location in small intestine.	4. Location in small intestine; bowel frequently protrudes at rectum.	4. Location in small intestine; abdomen often protrudes, in certain areas giving dulness on percussion.	4. Location in large intestine; dulness on percussion.	4. Location in right iliac region; dulness on percussion.	4. Diffuse inflammation; tympanitic resonance.

the patient is already collapsed and his condition is such that he could not bear the shock attending exploration, a small incision may be made through the abdominal wall and the first piece of distended intestine that presents secured to the edges of the wound and opened. In **chronic cases** the diet should be restricted, only small quantities of the most digestible food being given at a time; and as soon as a diagnosis can be made, measures should, of course, be taken for relieving, if practicable, the obstruction.

In **impacted feces,** when medical means and enemata have failed, the rectum may require clearing with a scoop or other suitable instrument.

In **obstruction from impacted gall-stones** or other foreign bodies, after the usual remedies have been unsuccessful, the abdomen may be opened and the gall-stone or foreign body removed through an incision in the intestine, or else made to pass, by gentle manipulation, through the ileocecal valve. The incision should be made in the longitudinal axis of the gut, and not opposite the impacted body, where the coats may be damaged, but a few inches further down. The gall-stone or other foreign body may then be removed, breaking it first, if necessary, and the wound afterward united by Lembert's suture; or should the walls of the gut be softened by ulceration, a portion of the intestine may be resected, and the continuity of the tube restored by one of the methods of enterorrhaphy. An impacted gall-stone may sometimes be broken up with a needle without opening the intestine.

In **internal strangulation** abdominal section is the only procedure of any avail, and ought, like herniotomy, to be undertaken early, and not merely as a last resource.

In **volvulus** of the sigmoid flexure insufflation with air or hydrogen, or a large enema, will at times succeed in untwisting the intestine. If these means fail, no time should be lost in opening the abdomen. If there is great distention, Treves advises that the inflated coil be punctured through the abdominal parietes.

In **intussusception,** when *acute*, copious injections of warm water to empty the lower bowel, followed by insufflation of air or hydrogen, the patient in the inverted position, and thoroughly relaxed under chloroform, will often succeed in the early stages, and should be given a fair trial. In the meantime opium may be given in doses suitable to the age of the patient, food withheld, and the stomach emptied by an emetic or irrigated with warm water. These means failing, celiotomy must be performed. If the signs of strangulation are well marked, too much time should not be lost in trying injections and insufflation, lest the bowel become so damaged or the intussusceptum so adherent to the intussuscipiens as to render the prospect of success hopeless. In infants intussusception, unless relieved by injections, inflations, etc., or by early operative means, may be said to be almost invariably fatal.

It is infinitely better to open the abdomen of every patient who is not relieved within twelve hours after the beginning of the attack than it is to continue with measures which have already proved ineffectual.

In *chronic* cases, although there is less need for early operative interference than in acute, as the bowel may remain incarcerated for some time before becoming strangulated, it should not be delayed too long, lest the intussuscepted portion become adherent to the sheath. Should it appear probable that this has already happened, two courses are open: either to open the abdomen or to keep the patient under the influence of opium in the hope that the intussusceptum may slough off and be passed by the anus. The latter measure is not commended. In exceptional cases of intussusception of the sigmoid flexure the mass may be drawn out of the anus, the gut above and below united by sutures, the intussusceptum cut away, and the united gut reduced.

For **stricture of the large intestine** left inguinal colotomy should be performed when the obstruction is in the rectum or lower part of the sigmoid flexure, and typhlotomy when in the transverse or descending colon. Should the strictured portion be readily reached in performing the operation, it may, if the disease is localized, be cut out, and the bowel secured to the wound, or, better, the two portions of bowel united.

In **stricture of the small intestine** enterotomy may be performed as a palliative; or, under suitable conditions, enterectomy, with union of the intestines by one of the recognized methods.

In **contractions**, when the intestines are matted together by chronic peritonitis or cancer, when medical means have failed, enterotomy may prove of temporary benefit by relieving the distention.

The treatment of **appendicitis and peritonitis** are discussed under their separate headings.

For **surgical procedures**, see Abdominal Section, Intestines (Surgery).

INTESTINES, DISEASES.—See Intestinal Obstruction, Enteritis, Enterocolitis, Colic, Appendicitis, etc.

INTESTINES, PHYSICAL EXAMINATION.—In the majority of instances in which the objective methods of examination are applied the patient should be lying on his back with thighs flexed on the abdomen. Palpation may be done while the patient is in various attitudes, on back, on one side, or on abdomen.

Inspection detects the region affected, and reveals the cutaneous appearance, venous engorgement, various eruptions, local enlargements, pulsation, and peristaltic movement.

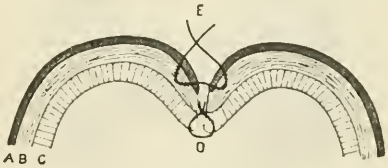
Palpation elicits pain, presence of gas in bowels, size, shape, and hardness of tumors.

Percussion yields a tympanitic note in the healthy condition, detects painful areas, outlines the area of tumors, and indicates the character of contents of tumor, whether solid or filled with gas. If ascites is present, dulness should be noted in the most dependent parts, while patient is lying on the side, and it will gravitate to the opposite side when the patient is turned, and dulness will be replaced by a tympanitic note.

INTESTINES, SURGERY.—**Wounds of the intestine** should be drawn gently through the aperture and the wound of its coats united by Lembert's sutures. Should the intestine be torn completely across, its continuity should be restored by some form of circular enterorrhaphy, as that of Senn, Maunsell, or Paul, or by Senn's bone-plates, Murphy's button, or Laplace's forceps. If its coats are much lacerated, the lacerated portions should be first excised. These methods have so reduced the time required for restoring the continuity of divided intestine that only in exceptional cases should the patient's general condition render it necessary to draw the injured gut into the wound, stitch it to the parietes, and make an artificial anus. In gunshot wounds of the intestines Senn's inflation method is useful in determining if there are one or more wounds. The rectum is first inflated, and the lowest wound detected by the escape of the gas. This wound is then sutured, the inflation repeated, and the gas extends up to the next wound, and so on.

Section of Intestine United by Lembert's Seromuscular Suture.—(*Spencer and Gask.*)

It is the practice in all cases of intestinal wounds to sew up the wound, however small. This is now usually done by interrupted sutures, the two peritoneal surfaces being placed in contact. The sutures are best applied by Lembert's method, as shown in the accompanying diagram, in which it is seen that the suture passes through the peritoneal and muscular coats only, avoiding the mucous membrane, since if this is included, there is danger of peritonitis from leakage along the thread. The sutures, which may consist of fine China silk, should be introduced about 2 lines from the edge of the wound and brought out at the margin of the serous coat, and then passed in the same manner on the opposite side. If, however, the edges are lacerated, the sutures should be introduced further from the wound, and brought out a good line from the margin, so as not to include the bruised tissues. Sufficient sutures should be passed to insure the parts being everywhere in apposition, and should not be tied too tightly, lest gangrene, the commonest cause of nonunion, ensue.



Czerny-Lembert Suture.—(*Spencer and Gask.*)

A. peritoneal; B. muscular; and C. mucous coats. D. mucous stitch. E. Lembert stitch.

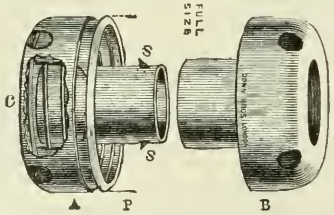
The peritoneal surfaces thus placed in contact unite by adhesive inflammation. The sutures either remain encysted or ulcerate through the mucous membrane and drop into the interior of the bowel. It is not safe to suture the wound (1) when the wound runs longitudinally along the mesenteric aspect, inasmuch as gangrene of the part cut off from its vascular supply will inevitably

ensue; (2) when suturing would reduce the lumen of the gut to less than half its normal size; (3) when there is much bruising of the gut; (4) when there are several wounds close together. In such cases the injured portions of the intestine should be excised and the two ends united by some form of circular enterorrhaphy, or an intestinal anastomosis may be formed.

Circular enterorrhaphy is the union of the ends of the completely divided intestine with the peritoneal surfaces in contact by a row of sutures around the circumference of the bowel. The Lembert method of a single row and the Czerny-Lembert method of a double row have in recent years usually been employed. The objection to these methods is the great number of sutures required, and hence the length of time consumed in the operation—a serious drawback in abdominal cases—and the danger of extravasation at the mesenteric attachment. Many, therefore, employ Maunsell's or Connell's method of suture. **Connell's method** consists of a "a single continuous in-and-out Glover's suture through all the coats, by which the edges of the gut are turned inward, so that all sutures are buried within the peritoneal fold. Over this a row of seromuscular Lembert's sutures are inserted. It has been objected that by this method a marked edge is formed, which narrows the lumen of the bowel, but this results from taking up too much of the edge of the gut in the sutures. If, however, the circular enterorrhapy threatens to narrow the lumen unduly, a short longitudinal incision should be made into each end of the bowel on the aspect opposite to the mesentery, so as to enlarge the ring to an oval. To strengthen the line of union a strip of omentum may be stitched over the line of suture."

Intestinal anastomosis, or the restoration of the continuity of the intestine after complete division or excision of a portion, may be done by Murphy's button, Laplace's forceps, or Moynihan's forceps.

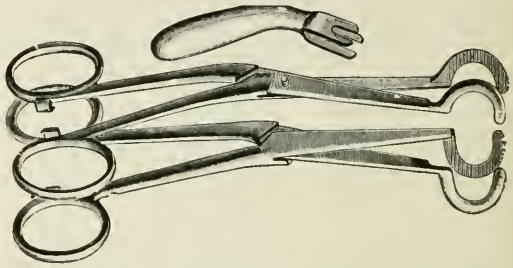
Murphy's Anastomosis Button.—By this contrivance an end-to-end approximation or a lateral anastomosis may be quickly accomplished without sutures. The button consists of two



MURPHY'S BUTTON.

A. Male half. B. Female half. P. Spring flange. *s, s.* Springs projecting through openings in hollow stem. Part of the cap of the male half has been cut away at *c* to show circular spring which acts on flange. The round holes in the caps are for drainage.

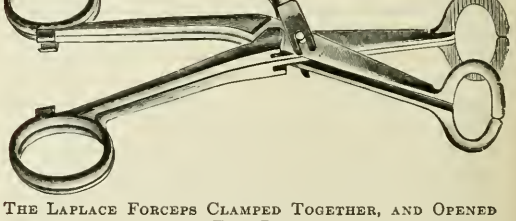
halves. The male half, A, has a spring flange, P, for keeping up pressure on the approximated intestine. The two springs, *s,s*, projecting through openings in the hollow stem, act as the male thread of a screw when the shank is telescoped within the stem of the female half, B. The intestine having been clamped, pass the running thread, by the overhand stitch, round the cut end of the intestine, beginning and ending opposite the mesenteric attachment. One return stitch should be taken at the mesenteric attachment to close the



THE LAPLACE FORCEPS BENT INTO SEMICIRCLES, AND CLAMPED TO HOLD IT TOGETHER.

triangular interval which exists at the reflection of the mesentery from the gut. Insert one half of the button in the end thus prepared, tighten the running thread so that the intestine is puckered up round the stem of the button, tie the ends of the thread, and cut them short. Secure the other half of the button in a like manner in the other end of the intestine. Press the two halves together and the peritoneal surfaces are held in close and accurate contact.

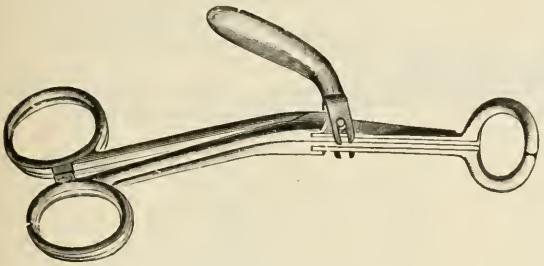
Laplace Forceps.—Of the mechanic means of effecting intestinal anastomosis the forceps designed by Ernest Laplace is the most promising. It consists of two parts, and is really a hemostatic forceps, curved into a semicircle on each side, only held together by means of a clasp; it opens as two rings. It is opened within the intestine, and serves the same purpose as Senn's rings or any other ring that has been devised, bringing serous membrane to serous membrane. Accurate suturing is the operation of the present. Therefore, if



THE LAPLACE FORCEPS CLAMPED TOGETHER, AND OPENED AS TWO RINGS.

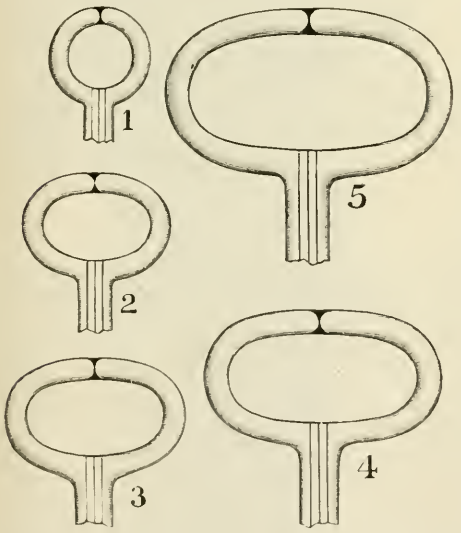
this forceps is within the gut, and sutures are applied, as they would be with the help of Senn's rings, it follows that sutures are introduced all around, except where the forceps penetrates the parts that are sutured. The suturing being done, the forceps is released by loosening the clasp and then withdrawing it from the small opening:

first one half, then the other, when the operation is finished by a stitch or two. This forceps will serve for the operation of end-to-end anastomosis, and also of lateral anastomosis.



The Forceps Closed.

End-to-End Anastomosis.—Having resected the required amount of intestine, the two ends are first united by a fixation stitch at the four cardinal points. This assures the right relation of the mesentery in the two ends of the gut. The forceps is introduced between two of these stitches. The blades are opened apart so that one penetrates one end and the other the other end. The serous surfaces are inverted or pushed in. This may be facilitated by drawing a thread around the united ends between the two blades. The forceps is clamped. When the forceps is clamped, serous membrane is in apposition to serous membrane. The sutures are then applied all around the clamped surfaces, to the point where the forceps



Various Sizes of Rings made for the Forceps Blades.

penetrates the gut. The clamp is removed; one half of the forceps is removed. The other half is then removed. The operation is completed by adding one or two stitches to close the opening through which the forceps was removed. The caliber of the gut is preserved.

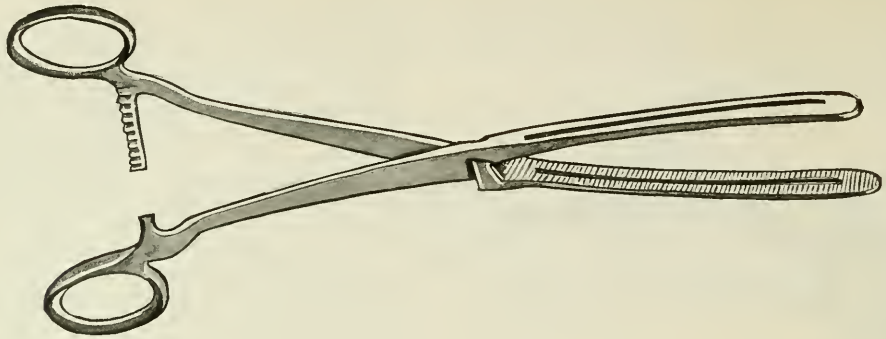
Invagination.—Should it be desired to make an enterostomy, with invagination of the ends of the gut, the forceps here illustrated facilitates the invagination, and obliterates the ends of the gut. It is a long, slender, straight, hemostatic forceps. The end of the gut is clamped and pressed down within the caliber of the gut; the serous membrane on each side thus rises, and is rapidly sutured under the control of the instrument. When the suturing is done, the instrument is loosened and withdrawn; one more suture is applied at the point where the instrument penetrated. This makes a very good stump, and is very expeditious.

Circular or lateral anastomosis is satisfactorily performed by means of Moynihan's forceps and sutures. In the lateral method the loops of gut to be anastomosed are brought outside of the abdomen, the contents squeezed out and the clamps applied. The two loops of gut are then united for about 4 inches by a row of continuous Lembert sutures passed through all the coats except the mucous membrane. This suture is knotted when the approximation has been made and the needle is temporarily laid aside. The bowel is then

Invagination Forceps.

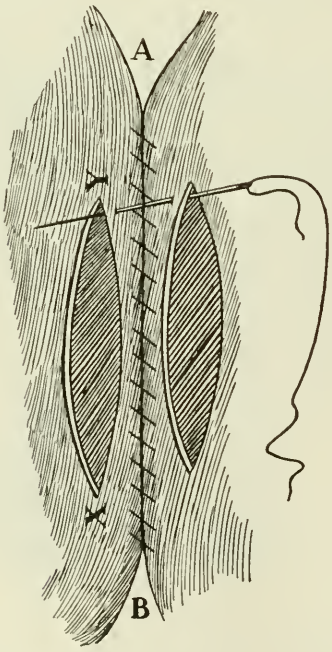
opened for a distance of about three inches on each side of the line of sutures. The mucous membrane is cut away with scissors. The adjoining edges are now united by a continuous perforating catgut suture, involving all the coats of the intestine and shutting off the intestinal cavity from the line of Lembert sutures. Connell's suture is frequently used in this step of the operation. It is an in-and-out Glover's suture by which the edges of the gut are turned inward so that all knots are placed within the lumen of the bowel. As this suture progresses the opposite angle of the wound is reached, but without interruption it continues to draw together the more widely separated borders; when it has reached the point of beginning the terminal thread is knotted with the first, which was left long, and thus the perforating suture is finished. A return is now made to the primary sero-serous suture which is carried again completely around the bowel and buries the perforating suture. Some operators remove the clamps when the perforating suture has been completed; others leave them on until the serous suture has been completed. The line of suture is enforced with interrupted Lembert sutures at any points where it is necessary.

Enterotomy, or Nélaton's operation, consists in opening the abdomen by a short incision in the middle line or in the right or left groin, seizing the first piece of distended intestine that presents, and securing it to the wound by sutures and then opening it. This operation is employed in cases when the obstruction is believed to be in the small intestine, though the diagnosis of the situation is



Moynihan's Forceps.

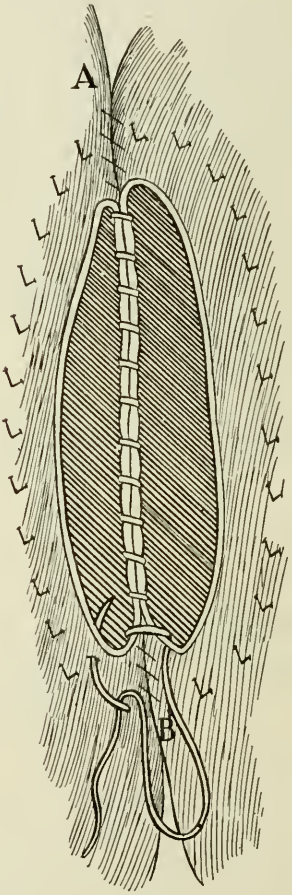
uncertain, and when the patient's condition is such that the severe shock and the prolonged manipulation that necessarily attend celiotomy (the operation otherwise indicated) would probably be fatal. It may also be employed in cases of obstruction due to contractions consequent upon the matting together of the small intestines from chronic inflammation, cancer, etc. It should be thoroughly understood, however, that the operation is only intended to relieve the distention of the intestines and prevent their rupture. It does



(*Binnie.*)

not attack the seat of obstruction, but by relieving the acute symptoms it may give time for a diagnosis in doubtful cases, and the patient's condition after it may so far improve as to allow of a more radical course of treatment on a future occasion.

Enterectomy consists in opening the abdomen and excising a portion of the intestine. It may be required for irreducible intussusception, carcinomatous stricture, gangrene from strangulation by bands, the closure of fecal fistulæ, wounds of the intestine, etc. Open the abdomen as in celiot-

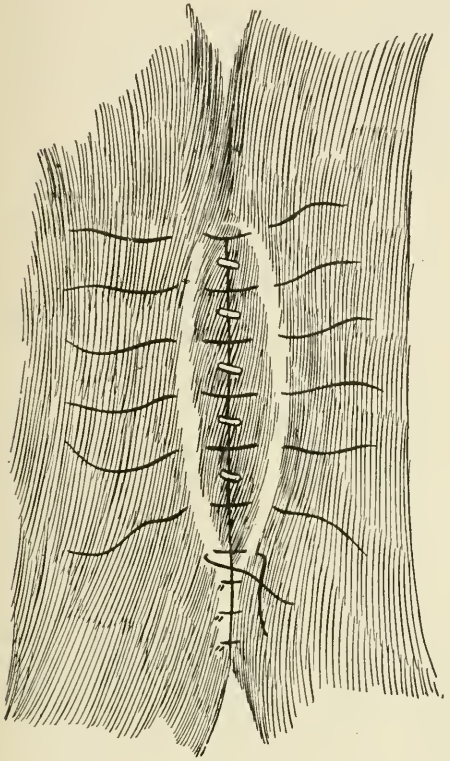


(*Binnie.*)

omy; draw the portion of intestine to be removed well out of the wound, and pack it round with moist antiseptic gauze; clamp the intestine with a rubber tube passed through a small incision in the

INTESTINES, SURGERY

mesentery above and below, to prevent the escape of feces; cut out the diseased or damaged part; tie all bleeding vessels; and then unite the intestine by one of the methods already described. Or if the intestine is much distended and the patient in a state of extreme collapse, secure both the proximal and distal portions of the intestine to the wound in the abdominal parietes by sutures. After the contents of the overdistended bowel have been evacuated and the gut has regained its tone, the



(*Binnie*)

two portions may be united and returned to the abdomen. For the removal of the cecum the incision should be made in the right iliac fossa. According to whether small intestine, colon, or cecum is excised, the operation is spoken of as enterectomy, colectomy, or typhlectomy.

Inguinal colotomy is the operation of opening the sigmoid flexure of the colon in the left groin (*Littre's operation*). It has been much employed of late in place of lumbar colotomy, especially for carcinoma of the rectum before distention of the colon consequent on the stricture has occurred. Its chief advantages over the lumbar operation are: (1) That there is less difficulty in finding the gut; (2) that there is less danger of peritonitis, in that, as the peritoneum has to be opened, all proper precautions can be taken; (3) that the wound is more superficial, and, consequently, there is less risk of infiltration of the tissues and septic poisoning; and (4) that the groin is a more convenient situation for an anus than the loin. An oblique incision about 2 inches long is made 1 inch from the anterior superior iliac spine, at right angles to a line drawn from the umbilicus to the iliac spine, 1 inch of the incision being below and 1 inch above the line. Divide the skin, superficial and deep fascia, muscles, fascia transversalis, and the peritoneum on a director. If the gut does not present in the wound, carefully search for it with the fingers. It may be known by the longitudinal bands of muscular fibers, by the epiploic appendices, and by its mesentery running to the left, whereas that of the small intestine runs to the right. Having found the colon, introduce a flat sponge into the wound to prevent the entrance of blood, and stitch the parietal peritoneum to the skin with four sutures. Remove the sponge and draw down the colon until the mesocolon is taut, so as to avoid prolapse of the bowel subsequent to the operation. Draw the bowel well into the wound, pass a piece of glass rod beneath it through the mesocolon, so as to produce a good spur, and thus prevent the feces going down the distal end of the intestine, and secure the gut to the parietal peritoneum by sutures passed through only the peritoneal and muscular coats. Apply an antiseptic dressing, with a piece of protective next the bowel to prevent its adhering to the gauze, and at the end of 3 to 5 days, when adhesions have had time to form, cautiously open the gut by cutting through it on to the glass rod. Some surgeons, for the purpose of forming a spur, draw the gut forward by a ligature passed through the mesentery; others, with the same aim in view, divide the colon and secure both open ends to the wound; while others, again, close the lower end by means of Lembert's sutures, and drop it back into the peritoneal cavity. No food should be given by the mouth for the first 12 or 24 hours, and then liquid diet until the gut is opened. If the bowel is greatly distended at the time of operation and threatens to burst, it may be opened at once; or should vomiting and distention come on after the operation, it may be opened before the usual 4 or 5 days have elapsed. Some surgeons give opium as a routine practice; others withhold it unless there is pain or restlessness. If the bowel does not act spontaneously after the gut has been opened, a gentle saline purge or an enema may later become necessary. The bowel below the wound may also require washing out by an enema.

Lumbar colotomy is the opening of the colon in the left lumbar region (*Callisen's operation*), or in the right (*Amussat's operation*). The former should be chosen when the disease is in the rectum or lower part of the sigmoid flexure; the latter when there is any doubt whether it may not be in the transverse colon. That on the left side, the common operation, need only be described. Place the patient on his right side, slightly inclining toward his face, with pillows under his abdomen or beneath his loin, in order to make his left side prominent. The outer border of the quadratus lumborum, the guide to the colon, should then be marked; it is situated 1/2 of an inch posterior to a line drawn vertically upward from a point midway between the anterior superior and posterior superior spines of the ilium. Then make an incision about 4 inches long between

the last rib and crest of the ilium from the erector spinæ obliquely outward and downward. Divide the skin, fascia, and various layers of muscles—viz., the latissimus dorsi, external oblique, internal oblique, and transversalis—and the transversalis fascia on a director, and the quadratus lumborum will now be exposed at the inner part of the wound, and may be known by its fibers running upward and inward. When the colon is distended, it will bulge in the wound; when contracted, however, it may be sought in the wound by carefully scratching through the fatty tissue covering it, with 2 pairs of dissecting forceps. If there is much difficulty in finding it, pass by rectum a small catheter, if practicable, through the stricture, and inflate the colon. The colon may be distinguished from the peritoneum, which sometimes presents in the wound, by its situation immediately external to the quadratus lumborum and below the kidney; by the presence of the longitudinal bands of muscular fibers; by the thickness of its coats on nipping it up by the fingers; and, at times, by in this way feeling scybalous masses of feces in its interior. The peritoneum, on the other hand, may generally be known by the absence of the above characters, and, if it is nipped up, by the intestine being felt to slip away from between the fingers. Having found the colon, secure it to the skin. This is usually done by passing a silk suture by means of a curved needle on a handle, first through the skin, then through the bowel, and then through the skin on the opposite side of the wound, and repeating the procedure at the other end of the wound. The bowel is then opened in a longitudinal direction, the loops of suture by which it is transfixed hooked out by the finger and divided, and the bowel secured to the integument by the four sutures thus formed. A better and more convenient way of passing the sutures—which should then be of wire—is by Smith's cleft-palate needle. If this is used, a series of sutures are passed, first through the skin, and then through the wall of the bowel, and tied before the bowel is opened. Should the peritoneal cavity be opened by mistake, it must be carefully closed by suture before the incision is made into the colon.

Some surgeons perform lumbar colotomy in two stages, like gastrotomy; but if the operation is carefully done in the way described, this is hardly necessary. The bowel beyond the wound may subsequently require clearing with an enema. Indeed, it has been proposed to close completely this part of the bowel by operation, so as to prevent feces passing down it.

Cholecystenterostomy, or the establishment of an opening between the gall-bladder and the intestine, may occasionally be required for immovable obstruction of the common bile-duct, as from cancer about the head of the pancreas, duodenum, etc., involving the duct. Having opened the abdomen as in other operations on the gall-bladder, draw the gall-bladder and duodenum into the wound, and, having made an incision into each, unite them by suture, or, better, by Murphy's button or Laplace's forceps. When the latter method is employed, a running thread is first passed through all the coats of the duodenum, and then another thread in like manner through all the coats of the gall-bladder. An incision is next made into the duodenum within the running thread, two-thirds of the length of the diameter of the button to be used, the button slipped in, and the thread tied tightly round the central cylinder. A similar incision is made in the gall-bladder, its contents evacuated, the other half of the button inserted and secured by the running thread in a similar way. The two halves of the button, held by the fingers, are now pressed together, thus fixing the serous surfaces in contact. The spring in the button produces pressure atrophy of the tissues embraced by it, leaving an opening as large as the button, which, thus freed, is passed by the anus (Walsham).

INTOXICATION.—A word popularly used to denote the effect of the excessive use or of an overdose of an alcoholic liquor; in a wider sense, any poisoning; the state resulting from an overpowering dose of any poison. See ALCOHOLISM, AUTOINTOXICATION, SEPTICEMIA, UREMIA.

INTRASPINAL ANESTHESIA.—This is produced by the injection of a local anesthetic into the subarachnoid space. Cocain and eucain are seldom used at the present time. Stovain has a strong affinity for the motor nerves, and may, in high anesthesia, cause paralysis of the respiratory muscles. Tropacocain and novocain possess less of this affinity, hence are safer; the usual dose is from 1/2 to 1 grain. The solution is prepared by dissolving the drug selected (previously sterilized) in cerebrospinal fluid, which is drawn into the syringe containing the anesthetic, after the introduction of the needle into the subarachnoid space. In order to make the solution of a higher specific gravity than the spinal fluid and so remain in the lower part of the spinal theca, Barker uses distilled water 1 c.c., glucose 0.05 gram, and stovain 0.1 gram. The syringe should be boiled in plain water, as the soda solution employed for other instruments may diminish the efficacy of the anesthetic. The patient lies on the side, or assumes the sitting posture; in either case the back should be bent forward in order to increase the space between the vertebral arches. The operator places one finger upon the spine of the fourth lumbar vertebra, which is on a line between the two iliac crests, and enters the needle fitted with a stylet, just below and to the right of this point, in a slightly upward and inward direction, until the dura has been punctured, which in the adult is usually at a depth of 2 1/2 inches. The stylet is withdrawn and 1 dram of the cerebrospinal fluid allowed to escape. The anesthetic solution is then slowly injected; the needle withdrawn, and the puncture sealed with collodion. The patient is then placed in proper condition for operation, but never should the head and shoulders be on a lower level than the lumbar vertebræ, as the fluid may gravitate toward the medulla and cause respiratory paralysis. Anesthesia results in about 5 minutes and lasts from 1 to 3 hours or longer. No attempt should be made to induce anesthesia above the diaphragm. Headache, nausea, and vomiting are frequent sequelæ, and evidence of

transient and permanent cord injuries has been noted. The *chief dangers* are infection, injury to the cord, and poisoning from the anesthetic employed. The *mortality* has been estimated at 1 in 200. From what has been said it may be gathered that the method is destined to pass into desuetude (Stewart).

INTRATRACHEAL INSUFFLATION OF ETHER (Meltzer-Auer).—This promises to supplant the various forms of apparatus designed to prevent collapse of the lungs during intrathoracic operations, since it not only obviates the danger of pneumothorax but automatically ventilates the lungs. It is of great value also in operations about the mouth and pharynx, in that it keeps the anesthetizer out of the way, eliminates the possibility of obstruction of the air passages, and prevents the inhalation of blood, mucus, vomitus, and other deleterious substances. It should prove of service in operations for intestinal obstruction in which fluid is constantly regurgitated from the stomach, in operations for goiter and similar conditions in which the trachea is displaced or distorted, and in operations in which the patient must lie face downwards. According to Peck the relief of all strain upon the respiratory apparatus and consequently the relief of much strain upon the heart and central nervous system is one of the most valuable features of the method. "Overetherization is impossible." In cases of apnea from opium poisoning, etc., air, or air mixed with oxygen, can be blown into the trachea, thus maintaining aeration of the blood until spontaneous respiration returns. The patient is first etherized in the usual way; then, with the aid of a Jackson laryngoscope, a silk elastic catheter is inserted into the trachea to a point just short of its bifurcation, and the catheter connected with the insufflation apparatus. The catheter should be about half the length of the glottis in diameter. *i. e.*, about 24 F. for the average adult, and correspondingly smaller for children. It should have two marks on it, one 13 cm. and one 26 cm. from the tip. When the latter mark is opposite the teeth the first mark is opposite the glottis, and the tip 5 cm. above the bifurcation of the trachea. One must be sure the tube is not in the esophagus. The tube may be held in place with a special clip, or fastened to the cheek with adhesive plaster. The apparatus devised by Elsberg or a simpler home-made contrivance may be employed. The air is driven by foot bellows (or an electric blower, in which case an oil filter is needed) through a wash bottle containing hot water, thus filtering, warming, and moistening the air, which is then delivered to a bifurcated tube, one branch of which passes directly to the tube connected with the catheter and the other to the ether reservoir, the ether reservoir having another tube on its opposite side joining the tube connected with the catheter. By manipulating clamps on stop-cocks on these branches the patient may receive pure air, pure ether vapor, or a mixture of air and ether. In the Elsberg apparatus the percentage of ether and air is regulated by a hand wheel which is connected with an indicator, so that the anesthetizer knows the exact quantity of ether the patient is receiving. The tube leading to the catheter is connected with a manometer, which records the pressure of the air current passing through it. The average pressure during anesthesia should be 20 mm., but, if indicated, it can be increased to 40 or even 50 mm. Every minute or two, however, the pressure should be reduced to zero for an instant to allow the lungs to deflate. The percentage of ether needed varies with the patient, half ether and half air probably being the average. "If the patient is cyanosed, it means either that the tube is not far enough in the trachea or that too large a tube has been introduced" (Elsberg). At the end of the operation quick recovery from the anesthetic can be secured by insufflating pure air, thus blowing the ether from the lungs. Hoarseness and pulmonary complications are not produced by insufflation anesthesia, post-anesthetic vomiting is less common than after other methods, and shock from operation seems to be less marked (Peck and Elsberg) (Stewart).

INTRAVENOUS INFUSIONS.—See Infusion of Saline Solutions.

INTRAVENOUS INJECTION.—The intravenous injection of mercuric chlorid in the treatment of syphilis was originally suggested by Professor Guido Baccelli, of Rome, who had previously been quite successful in the treatment of the pernicious as well as the other forms of malarial fever by the intravenous injection of the salts of quinin. The good results obtained in this manner impressed Baccelli with the advantage of direct medication to the corpuscular elements of the blood in certain phases and types of disease. At first it was thought that the drug would cause coagulation of the blood, but experiments on the lower animals proved the contrary. Baccelli injected a dog intravenously with a solution of mercuric chlorid 1 : 1000 until 5 cm. of the salt were injected in a single dose, without subsequent toxic symptoms and only slight salivation. He then directed his experiments to the treatment of some obstinate cases of organic syphilis, which had resisted all other treatment, by the intravenous injection of mercuric chlorid 1 : 1000, commencing with doses of 0.001 gram (equivalent to 1 gram of the solution) and progressively increasing the dose to 0.005 gram. His investigations met with the most brilliant results, and since then thorough investigation into the merits and value of the method has been made by Baccelli, Jemma, Colombini, Nieddu, Campana, and many others throughout Italy.

In the preparation of the fluid for injection the following formula is used:

℞.	Mercuric chlorid,	1 gm.
	Sodium chlorid,	3 gm.
	Water,	1000 gm.

A small quantity of alcohol may be added to facilitate solution. The mixture should be well stirred, and filtered until perfectly clear. It is advisable, but not necessary, to sterilize it, that it may be aseptic and to facilitate solution.

A ligature is applied above the elbow, and any one of the superficial veins in the neighborhood,

which soon become prominent, may be selected as the point for injection. The point selected and the surrounding area are then thoroughly scrubbed and disinfected with a 1 : 1000 solution of mercuric chlorid or a 5 percent solution of carbolic acid. The needle, previously sterilized, is plunged directly toward the center of the vein, at the point selected, and a few drops of blood allowed to ooze out, assuring entrance into the vessel; the barrel is carefully applied, avoiding any entrance of air.

Loosen the ligature and make the injection, at first using only 1 gram of the solution, and progressively increasing to 4 grams at a dose. Occasionally, on the withdrawal of the needle there is some extravasation of blood into the neighboring subcutaneous tissue; but this is absorbed very quickly, and is only of occasional occurrence. Repeated injections may be made in the same vein. In a case reported by Jemma 75 injections were made in the median cephalic vein. This vein and the median basilic are the best to use.

There are two precautions that should be remembered: First, always use a fresh solution, which the physician should prepare himself, to be assured that the salt has not decomposed, which is often the case after the solution has been standing some time. No after-dressing is needed, and it is not necessary to cover the wound of puncture with collodion. Second, do not use a concentrated solution. That of 1 : 1000 is to be preferred, but in late injections a 1 : 500 solution may be used.

The advantages claimed by the advocates of intravenous injection are:

1. There is absolute certainty of absorption, which cannot be obtained by hypodermic or other methods.

2. There is little or no pain. Intramuscular and hypodermic injections are very painful. The subconjunctival injections in the treatment of syphilitic iritis are impracticable on account of the pain. This method is as successful, and painless. In using the hypodermic treatment it is not possible to use any local anesthetic successfully.

3. There is no disturbance of the digestive tract during treatment. In fact, a slight salivation and diarrhea, temporary only, are the only local disturbances reported.

4. There is more rapid absorption and therapeutic effect than by any other method.

5. Less of the mercurial salt is required.

6. Absolute exactitude of dosage can be obtained, which is a rational necessity. Owing to variations in absorption, this is the only method that offers this advantage.

7. It seems to be completely safe; not one accident has been recorded.

8. It is perfectly reliable. All cases reported have shown some improvement, and never any retrogression.

9. Abscesses are absent. These cannot always be avoided in the hypodermic method.

10. There are no dermal irritations or eruptions, such as follow friction or inunctions.

11. The hysteric or nervous symptoms sometimes associated with the hypodermic method are never observed with the intravenous injections.

12. It is successful often when all other methods fail.

13. There is no history of recurrence after a cure.

14. Mercuric chlorid has a preservative action on the red blood-corpuscles, and hence must be valuable intravenously in such a disease as syphilis, in which there is a strong tendency toward destruction of the red blood-corpuscles and subsequent anemias.

The objections offered to the intravenous method may be summarized as follows:

1. In the early stages of syphilis the lesions are in the skin and connective tissue, and, therefore, intravenous injections do not offer the most immediate and satisfactory method of medication.

2. Syphilitic gummata have no vascular supply, and the intravenous injections do not directly reach them. Despite this fact, it is more than probable that the gummata are influenced by mercurial medication as rapidly by the intravenous injections as by any other method.

3. There is a belief that mercuric chlorid, intravenously, has only a temporary action, being quickly eliminated, necessarily making the treatment longer in such a case than with hypodermic injections of solutions of insoluble salts (Colombini).

While it is true that insoluble salts are eliminated more slowly than the soluble, and hence have a more permanent effect, yet observation of the relative merits of soluble and insoluble mercuric salts has shown that mercuric chlorid has a decided preference and gives the most satisfactory results generally. This is most likely due to the rapid absorption and action of the drug, in contradistinction to the slow and uncertain absorption of the insoluble salts. Uncertain elimination and absorption are always unsatisfactory factors to deal with in therapeutics, and complicate any attempt at definite and scientific treatment.

The disadvantages of intravenous injections are as follows.

1. The needle may not reach the vein; but this can be remedied by applying the needle first and awaiting the appearance of a few drops of blood.

2. Some of the blood may extravasate into the subcutaneous tissue adjacent to the point of injection; but this has been of very rare occurrence, and the blood is soon absorbed.

3. There is likely to be a slight stomatitis at first.

4. There is the appearance of albumin in the urine after the injections, which, however, is also often a result of hypodermic administration.

5. There is, in all intravenous injections, a subsequent polyuria and increase of urea, but neither has any special disadvantage.

6. During the injection, through a reflex action on the circulatory center, fainting may supervene, but is of no vital import.

7. Jemma has seen slight salivation immediately after injection of small doses. This is likely to happen in any administration of mercury.

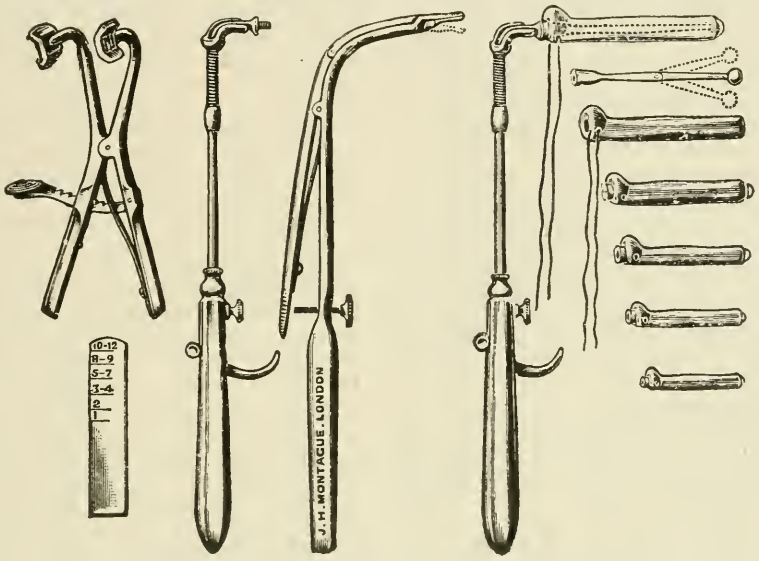
Since Baccelli's first investigations, various

other preparations of mercury have been advised, and simple saline solutions have been advocated. See INFUSION.

INTUBATION.—The passage of a tube into or past the larynx, to allow the entrance of air into the lungs in croup, diphtheria, etc., or to dilate a stricture, etc.

The great **indication for intubation** by O'Dwyer's tubes is laryngeal diphtheria. Before the discovery of antitoxin, in the majority of cases of laryngeal diphtheria the symptoms became urgent enough to demand intubation for their relief. Under the influence of this remedy 60 percent recover without mechanic aid. It will be apparent, then, that in a given case our decision as to the necessity for intubation will be modified by the fact whether antitoxin has been previously administered. We may defer operation in a case already under the influence of this remedy, whereas in another case, presenting identical symptoms, we may feel warranted in intubating at once, because 12 to 24 hours must elapse before amelioration of symptoms can be expected. If at the end of 24 hours a study of the symptoms leads us to the conclusion that the patient is not better, then intubation should be performed. In all cases presenting any one of the following symptoms prominently—namely, deep epigastric recession with each inspiration, labored and prolonged expiration, extreme restlessness, spasmodic attacks coming on at intervals, or persistent cynosis—intubation is indicated. In enthusiastic confidence in antitoxin too much is often expected from the remedy, and in cases seen late it may be wise to intubate and administer this remedy rather than give the remedy and wait for its effect. Antitoxin and intubation are in no way antagonistic.

Technic.—The O'Dwyer tubes and apparatus are almost universally used. The shortest tubes are 1 1/2 inches in length; the longest 3 inches. At the upper end is a diamond-shaped head, flattened in front and provided with a small eye to carry a thread. Below is a neck which expands into a fusiform enlargement. Each tube is provided with a jointed guide, which can be screwed on to an introducer. This consists of a stem set on a handle and carrying a sliding tube, so arranged that when the cannula is in position it can be pushed off the guide and left as the latter is withdrawn. Finally, there is an extractor for the purpose of getting the cannula out again. The cannulas and guides are made in 5 sizes, the smallest being suitable for a child under 2 years of age.*



To the left is the mouth gag and the scale for determining the proper sized tube according to the age of the patient. Next is the introducer, next the extractor. On the right are the tubes, which are expanded above to rest on the ventricular bands; with a prominence posteriorly which rests between the arytenoid cartilages. The middle of the tube is enlarged, the enlargement resting just below the vocal cords, to prevent displacement of the tube upward when it is in position. Between the tubes on the right is the obturator, which fits into the tube and is screwed into the holder, and which is hinged in the middle so that it may be withdrawn after the tube is in position.

"The patient should be held firmly upright on the left thigh of an assistant, whose legs are tightly closed on the patient's legs. The left arm of the assistant is thrown around the back of the patient, holding the left hand and arm of the latter, while with the right hand the assistant holds the patient's right hand. The right side of the patient is firmly held against the breast of the assistant, the left side of the patient being free. The second assistant stands back of the patient, holding the head

* The paragraphs in quotation marks are from the article on Intubation by W. K. Simpson, "Medical News."

firmly in a suspended position, and steadying the mouth-gag with the left hand. There should be no twisting of the neck of the patient, who should be held perfectly straight. This cannot be too strongly emphasized, as it especially pertains to the successful introduction of the tube. The proper-sized tube having been chosen according to the scale, it should be threaded, always using braided silk of a size which will pass easily through the opening in the tube, and of a length which will permit of being looped over the patient's ear when the tube is in position, and so tied that the knot is always at a point furthest away from the tube. The operator, standing or sitting in front and a little to the right of the patient, at a height which gives easy access to the mouth, the patient's mouth being well open and the gag on the left side, passes his left forefinger well down into the larynx over the epiglottis until he feels the two small tips of the arytenoid cartilages, which indicate the posterior portion of the larynx. Then the introducing instrument is quickly passed down over the palmar tip of the left forefinger until the end of the tube engages in the larynx, gentle pressure being continued until the tube is well down in the larynx, when the left forefinger is transferred to the head of the tube, and the obturator removed by liberating the sliding catch on the handle of the introducer. The left forefinger should remain gently pressing the head of the tube until the obturator is well out of the mouth. Care should be taken that the obturator is not removed in any way from the tube until the latter is well down in the larynx, thus avoiding any danger of stripping off or wounding the mucous membrane.

"**The means of knowing that the tube is properly placed** in the larynx are, first, the relief in breathing; and, second, the characteristic cough which immediately occurs, and is of a moist metallic character, produced by mucus and air passing through a metallic tube. This cough should always be expected, and if not present, should be provoked by the administration of a teaspoonful of diluted whisky or brandy. The character of the cough is peculiar, and is far better appreciated by being heard than from any description. Oftentimes, in moribund cases, the cough may be delayed or be but feeble when it is heard. The cough is valuable in clearing the trachea of secretions, and as an indication of the firmness with which the tube is retained in the larynx. Another way of determining whether or not the tube is in the larynx is by passing the left index-finger down into the esophagus and feeling the tube through the anterior wall of the former. This means is of great service if for any reason the breathing is not fully relieved and if it is desired to be positive as to the position of the tube.

"Accidents.—If, after the introduction of the tube, the breathing is not relieved or becomes suddenly worse, the question of having pushed down with the tube some detached membrane is to be considered. This is one of the accidents that may happen, but, as a matter of fact, is very rare. If it were of frequent occurrence, it would be of most serious objection to the operation. The reason of its infrequency is that the stenosis is not entirely due to a complete membranous cast of the larynx and trachea, through which the tube has to pass, but to lessening of the lumen of the larynx by infiltration of the submucous tissue. This may be easily observed in a cross-section of a larynx from a case of diphtheritic croup. The accident mentioned is more likely to occur in late cases of croup in which the membrane has begun to exfoliate, and at any time when traumatism has been occasioned by the introduction of the tube. It is accompanied by excessive coughing and a flapping sound caused by the loosened membrane. If, for this or any other reason, the breathing is not relieved, the tube should be withdrawn by the string and the child encouraged to dislodge the loosened membrane by coughing, after which a second attempt at introduction should be made. It sometimes happens that pieces of detached membrane accompany the withdrawal of the tube. If it is reasonably certain that loose membrane is blocking the tube and is not readily expelled, a short cylindric tube (foreign-body tube) may be inserted. These tubes for a given age are much larger in caliber than the ordinary ones, and allow large masses of membrane to be expelled. Owing to their larger size they should not be left in the larynx more than a few hours, on account of the pressure which they cause.

"Another accident which may possibly occur is the introduction of the end of the tube into one of the ventricles of the larynx. This is obviated by using the present type of tubes, somewhat bulging on the end, which thus permits them to override the ventricles, and by keeping in the median line during introduction. Introduction of the tube into the esophagus will sometimes occur. This may be appreciated by failure to relieve the difficult breathing, and by attempts on the part of the patient to expel the tube or by efforts to swallow. If the string is observed to be disappearing within the mouth, it is evident that the tube is in the esophagus, and it should be immediately withdrawn. This accident is an avoidable one, and need not occur if the proper rules are followed. The tube may be occasionally swallowed when coughed up by the patient.

"**The string** should be permitted to remain in place, being passed over the left ear, until quiet breathing is restored—from 15 minutes to half an hour—and should then be removed by cutting one side of the loop close to the mouth, taking hold of the long end, and withdrawing while the left forefinger is making gentle pressure down on the head of the tube. Never, under any circumstances, remove the string without making pressure on the head of the tube, as the string becomes twisted in the mouth and will be caught in the eyelet of the tube and the latter itself withdrawn unless the counterpressure is made. Another very important precaution in regard to the string is that the person holding the child should never release the child's hands until the string is removed by the surgeon. Almost the first thing a child will do if the hands are released is to instinctively pull at the string, resulting, of course, in withdrawal of the tube.

"It is the practice of some, in preparing the child, to tightly incase the arms and chest in a draw-sheet wrapped around the body. While this keeps the hands out of the way, it is open to the objection of two firmly constricting the chest, and in case of artificial respiration being necessary, much valuable time may be lost. Also, some operators prefer to introduce the tube while the patient is in the dorsal position."

Removal of the Tube.—In preantitoxin days the average period during which the tube was allowed to remain in the larynx was from 6 to 7 full days. Under the present mode of combined treatment the time may be somewhat shorter, varying, in different experiences, from 3 to 5 days; in private practice, preferably 5 days.

"The principal indications for removing the tube previous to its final removal are severe discomfort or pain from pressure, especially if the pain is radiating in character, thus indicating the occurrence of ulceration, severe attacks of coughing, and sudden stenosis due to the lodgment of membrane in the lumen of the tube. This last-named condition is, perhaps, more likely to arise earlier under the antitoxin treatment on account of the earlier exfoliation of the membrane. In some instances, however, if the membrane is sufficiently loosened to block up the tube, the latter will be coughed up with the membrane. This is especially the case with the present rubber tubes, especially if the tube does not fit too tightly. If, under these circumstances, the tube is expelled, its reintroduction may not be necessary, or, at any rate, the necessity for reintroduction will, as a rule, be sufficiently delayed to permit reintroduction by the physician in charge.

"In extracting the tube the same precautions as to the position and management of the patient as during introduction should be followed. The instrument for this purpose is called the extractor. Before being used it is absolutely imperative that the thumb-screw on the under side of the instrument should be so set that the proximal jaw can open just sufficiently to exert the proper amount of pressure within the opening in the tube. If the jaws are open too widely, there is great liability of lacerating the surrounding mucous membrane in ineffectual attempts at removal. It is good practice to test the degree of opening of the extractor on a tube of the same size as the one in the larynx. In extracting, the left forefinger should be passed down on the head of the tube until the opening is felt, and then the extractor, closed, is passed down until the point strikes the head of the tube and enters the opening in front of the tip of the finger. When in the opening in the tube, the jaws of the instrument are opened by thumb-pressure on its handle, and the tube withdrawn, pressure being continuous until the extractor and tube are removed from the mouth. Never have the thumb on the lever until you feel sure that the end of the instrument is in the tube. The operation for extracting is, perhaps, more difficult than that of introduction, as it requires a finer degree of touch to determine the opening in the head of the tube, and the difficulty is increased in proportion to the smallness of the tube. Modifications, from time to time, have been made in the head of the tube and in the extractor, to facilitate removal, but the original procedure just described is the one almost universally employed. Extraction by pushing out the tube from below without any instrument may successfully be performed, if for any reason great difficulty is experienced in the application of the usual method; or in case of emergency when the tube must be removed by the nurse in the absence of the surgeon. This is done by slightly inverting the patient, and, with mouth open, placing the thumb in the episternal notch and pushing the tube up in the mouth and grasping it with the fingers of the other hand or with a pair of ordinary forceps. This can be done by any one of ordinary intelligence in charge of the case, and is, under these circumstances, a most admirable method of extraction.

"**After removal of the tube** the patient should not be left until there is sufficient evidence that the tube will not have to be replaced. A small dose of an opiate may then be given to allay cough and irritation. Slight cough and hoarseness generally continue a few days to two weeks—especially the hoarseness—which, however, pass away without incident.

"**Feeding** after intubation is best accomplished by having the child in an inclined position, the head being down. This is commonly called the 'Casselberry' method. It is best performed by raising the foot of the bed, removing the pillow, and bringing the child to the edge of the bed on the side, and using for the purpose of feeding an ordinary duck-shaped feeding-cup. This procedure prevents, in a great measure, fluids from entering the tube and the accompanying paroxysms of coughing. However, it is remarkable how some children, with a tube in the larynx, will readily learn to swallow in the ordinary upright position. It is also very excellent practice to keep the patient in the feeding position during the entire period in which the tube remains in the larynx, in order to lessen the chances of secretions passing down through the tube, and thus, possibly, causing the development of pneumonia. The frequent removal of the tube for purposes of feeding has been advocated by some, but such a practice should be condemned. The food should be fluid or semisolid, solid particles of food being avoided so as not to run the danger of large pieces being drawn into the tube. In case great difficulty is experienced in the use of the mode of feeding mentioned above, recourse may be had to alimentation through the esophageal catheter, passed either through the nose or through the mouth, or, as a last resort, rectal alimentation may be employed.

"It is most important to watch the respirations during the entire period of intubation, as bearing on the progress of the disease. If they continue about normal, it is indicative of favorable progress; if they show a tendency to increased rapidity it is indicative of extension of the membrane. Fortunately, however, the latter does not occur so frequently as it did in preantitoxin days."

INTUSSUSCEPTION.—See INTESTINAL OBSTRUCTION.

INUNCTION.—The epidermic method of administration of drugs, consisting in the promotion of the passage of a medicament between the cells of the epidermis by more or less energetic friction. If a systemic effect is desired, a region where the cutaneous surfaces are thin, as the insides of the thighs or the axillæ, is chosen, and the rubbing may be carried on gently for a variable time and be aided by heat: as, for instance, before a fire or after the parts have been previously warmed. The inunction method is an old and effectual plan of conveying mercury into the system by the skin. A dram or less of mercurial ointment mixed with an equal part of lard or vaselin should be rubbed into the skin on the inside of the thighs, legs, and arms before bedtime, using different limbs on successive nights. The friction should be continued for half an hour and be gentle. The surface should not be washed, and the same flannel underclothing should be worn night and day. If irritation of the skin ensues, the surface must be washed clean and rubbing discontinued. Inunction is a most convenient way of treating hereditary syphilis. The ointment should be spread on a flannel roller and the body of the child swathed therein.

Inunction is an excellent method of introducing fatty substances into children and persons who cannot take oils by the stomach. The inunction of castor oil will produce purgative effects. Cod-liver oil and other fats, oleates, etc., are rubbed into the skin of the armpits, the popliteal space, and other parts of the body, for local and systemic effects.

INVOLUTION.—The return of the uterus to its normal size and condition after labor. This process is mainly fatty degeneration and atrophy of the hypertrophied uterus and adnexa. It continues over a period of 6 weeks, during which time the uterus is reduced in weight from 2 pounds to 2 ounces, and in length from 12 inches to 2 1/2 inches.

Involution may be excessive (*superinvolution*) or defective (*subinvolution*).

Superinvolution.—An exaggeration or abnormal prolongation of the process of involution. This is a rare condition, said to be due to great loss of blood during labor, prolonged lactation, and puerperal peritonitis. Amenorrhea and nervous disturbances are the chief symptoms.

The diagnosis is made by physical examination, which shows a very small uterus. Senile atrophy can be excluded by the age of the patient; infantile uterus by the fact that she has borne children.

The treatment consists in attention to the general health of the patient, the administration of tonics, and the use of pelvic massage.

Subinvolution.—A retardation or arrest of the process of involution. This is of rather frequent occurrence.

It is caused by: (1) any condition which increases the pelvic blood supply, such as fibroid tumors, pelvic inflammatory conditions, early resumption of sexual intercourse, and premature rising from bed; (2) any condition interfering with contraction of the uterus, such as retained secundines, uterine displacements and adhesions.

The diagnosis is made by a bimanual examination, which shows the uterus much larger than normal. The fundus uteri should be at the level of the symphysis pubis about the tenth or twelfth day after labor. Irregular bleeding, which may persist for some days or weeks, is a common symptom.

The treatment of subinvolution varies with the cause. Thorough curettage should usually precede other treatment. Rest in bed, copious vaginal douches of hot water, abstinence from sexual intercourse, and correction of constipation, are all beneficial. Displacements must be corrected. Tonics are indicated, the most useful being a capsule of ergotin (1 grain), strychnin (1/20 of a grain), and quinin (2 grains).

IODALBIN.—A brown powder of pleasant odor containing about 21.5 percent of iodin in combination with blood albumin. After passing apparently unchanged through the stomach it is slowly dissolved in the small intestine and has the same action as the soluble iodids with the advantage of slower elimination. Dose, 5 to 10 grains.

IODIN.—I = 126.53; quantivalence 1; specific gravity, 4.948 at 17° C. (62.6° F.). A nonmetallic element with metallic luster, volatilizing at a low temperature, and giving off a crimson-purple vapor. It occurs in cod-liver oil, in most marine plants, and in shell-fish. It is soluble in alcohol, in solution of potassium of iodid, and in solution of sodium chlorid. In its elementary state it is an irritant to the skin, and is much used as a tincture to produce counterirritation.

Therapeutics.—Iodin is irritant to the mucous membranes and to the skin. Applied to the latter it stains a deep yellowish-brown color and combines with the albumin of the tissue, causing considerable pain and subsequent exfoliation of the epidermis. Vesication may be quickly produced if the quantity used is large. Inhaled, its vapor irritates the respiratory mucous membrane, producing sneezing, cough, dyspnea, also pain in the chest and the frontal sinuses. In the gastro-intestinal canal it is equally irritant.

Iodin is alterant, rubefacient, vesicant, caustic, antiseptic, and parasiticide. When iodin is applied to the skin or mucous membrane, it is irritant or caustic. It stains the skin yellow, creates sensation of warmth if in small quantity, or burning if in larger quantities, and excites a superficial inflammation, followed by desquamation. In some subjects the application of the tincture of iodin results in vesication. Pure iodin kept in contact with the tissues produces a brown, dry eschar. The vapor of iodin is often irritating to the mucous membranes of the air-passages, causing increased flow of mucus, and even spasm of the glottis. As a simple counterirritant iodin is frequently employed when it is desired to maintain a mild, persistent influence.

The tincture is the preparation that is generally used. It is best applied by painting over the part with a camel's-hair brush or a swab. Differences

obtain between individuals as to the degree of susceptibility to iodin. For those of a sanguine temperament, in whom the skin is fair and the hair light, the stronger preparations must be used with caution. If an application causes pain, the iodin should be washed off with alcohol, whisky, cologne, or, what is best, a solution of iodid of potassium, and the pain subdued by the application of a starch poultice. A crop of itching papules will often follow the use of iodin under ordinary conditions.

Iodin is used in diseases associated with disorder of the processes of nutrition. In enlargement of lymph-glands in fibroid phthisis, in hypertrophy of the thyroid gland and of the tonsils, in cervical and ovarian cysts, it is of value. It ought not to be employed in cases in which rapid changes are going on in a gland, such as pus-formation, since it furthers the process. The fumes may be inhaled to stimulate the bronchial mucous membrane, but not in phthisis. In chronic bone-disease, applied externally as an ointment it is of service. Its external uses are many and important, and it is particularly useful in children, and in from 1 to 3 coats painted on at one time, and no more. A good black coating should be painted on at one time, and not repeated until the skin has desquamated. If reapplied soon after a good coat has already been put on, it will cause burning pain which nothing will relieve except removal.

As a counterirritant the tincture is used on sprains and bruises. It may be used in pleurisy, harassing irritative cough and chronic bronchitis, phthisis (when a spot in the chest becomes sore), lupus, chronic rheumatism, synovitis, in pleurodynia and intercostal neuralgia, tineæ tonsurans and circinata, and in erysipelas. For inhalation, 20 to 30 drops of the tincture may be dropped into a jug or vessel holding about 2 pints of boiling water, and the iodized steam inhaled, the head being covered to prevent the escape of the vapor. When used night and morning for 5 minutes each time, it will relieve the itching of the nose and of the inner canthus of one or both eyes, with the sneezing and running at the nose of a watery fluid and severe frontal headaches. In acute coryza relief may be had from sniffing from the bottle containing iodin, the heat of the hand disengaging the vapor. It is much used in local application in the practices of rhinology, laryngology, and even ophthalmology.

Antidotes, Antagonists, and Incompatibles.—Starch is the antidote to free iodin, but the stomach must be evacuated, as the resulting iodid is active. Albumin, starch, lime-water, tannin, and soap may be used in poisoning by the iodids, and free emesis should be induced. In chronic iodid poisoning a free salivary flow, brought on by chewing pyrethrum root, will hasten elimination of the drug. Restoratives and vasomotor tonics, as quinin, digitalis, etc., are therapeutically antagonistic.

Incompatibles with iodin and the iodids are the mineral acids, metallic salts, alkaloids and their salts, ammonia, etc. If potassium iodid is combined in solution with potassium chlorate, a poisonous compound will result. As potassium iodid decomposes nearly all the metallic salts, and is incompatible with so many substances, it is best prescribed alone, or in some simple vehicle, a favorite one being the compound syrup of sarsaparilla. It may be prescribed with tincture of cinchona, an ounce of which dissolves 30 grains, or in combination with liquor potassi arsenitis, which prevents the iodic eruption to some extent. In the "mixed treatment" of syphilis it is combined with the biniodid of mercury. It is better borne when combined with nux vomica or potassium acetate, or alternately with ammonium carbonate, 2 parts of the latter to 1 or 1 1/2 of the iodid (Gull).

Test-paper for Iodin in Saliva and Urine.—A sheet of filtering-paper is dipped in a 5 percent solution of cooked starch. When dry, it is marked off into 5 cm. squares, and in each square 2 or 3 drops of a 5 percent solution of ammonium sulphate are dropped and dried, sheltered from intense light. The ammonium sulphate loses its power in 2 or 3 weeks; it is best applied fresh. To test the intestinal absorption let the subject swallow a glutoid capsule containing a little iodoform. Then mark the hour on the first square, and number the rest. The subject then deposits some saliva on the corresponding square every hour, and an exact record of the intestinal absorption is obtained, as the paper turns blue in contact with any traces of iodin.

Iodids.—**Potassium iodid** is the most frequently used, and mostly administered in either the simple solution, the compound infusion, or syrup of sarsaparilla. It is almost specific in tertiary syphilis and its results, such as neuralgia, paralyses from gummata, ulcerations, syphiloma of the internal viscera, lupus, chronic rheumatism, and sciatica. Doses varying from 5 to 150 grains to systemic saturation are employed. In mercurial poisoning, to remove the products left behind by pneumonia, pleurisy, and pericarditis, in the early stage of hepatic cirrhosis, in acute catarrh and hay-fever, and in aneurysm, potassium iodid is employed. In tonsillitis and sore throat a weak solution (2) to 5 grains to the ounce) is a good gargle.

Sodium iodid may be used instead of the potassium salt, but requires larger doses. **Strontium iodid** is less liable to produce eruptions, and has been used with benefit in scrofulous, rheumatoid, and cardiac disorders.

Ammonium iodid is an excellent remedy in acute catarrh, hay-fever, duodenal catarrh and accompanying jaundice, and in capillary and chronic bronchitis, given in grain doses and frequently repeated. It is more irritating than the other iodids, and is more energetic in action, but less stable. See Ammonium.

Hydriodic acid is used as a substitute for the iodids and for iodin. It is used almost entirely in the form of the syrup, which contains 1 percent of absolute hydriodic acid. The syrup should be kept in a dark place and not exposed to air. Its advantages are its activity, agreeable taste, and the fact that it rarely disorders the stomach.

Iodoform, aristol, europhen, and **iodol** are described under their respective titles.

Preparations.—**Tinctura Iodi,** strength 7 percent Dose, 1 to 3 minims; but it is generally used as a local application, or for injection into cavities. **Liquor Iodi Compositus** (*Lugol's solution*), has of iodin 5, potassium iodid 10, in distilled water to 100. Dose, 1 to 10 minims, well diluted. **Unguentum Iodi,** has of iodin 4, potassium iodid 4, glycerin 12, benzoinated lard 80. **Churchill's Tincture of Iodin** (unofficial), contains iodin 75 grains, potassium iodid 1 1/2 drams, alcohol 1 ounce, and is used locally, chiefly in gynecology **Ammonii Iodidum,** a deliquescent, granular, white salt soluble in 1 of water and in 9 of alcohol at 59° F. Dose, 2 to 10 grains. **Potassii Iodidum,** a colorless, deliquescent, crystalline salt, of saline and bitter taste; soluble in 0.8 of water and in 18 of alcohol. One ounce of this salt dissolved in 1 ounce of water makes nearly 1 1/2 ounces of fluid, so that 7 1/2 minims of the solution would be required to obtain 5 grains, a fact to be remembered in prescribing. Dose, 5 to 20 grains. **Unguentum Potassii Iodidi,** has of the iodid 10, potassium carbonate 0.6, hot water 10, benzoinated lard 80. **Sodii Iodidum,** minute deliquescent crystals; soluble in 0.6 of water and in 1.8 of alcohol. Dose, 5 to 20 grains. **Strontii Iodidum,** colorless, hexagonal plates, of bitter, saline taste; very soluble in water and in alcohol. Dose, 5 to 20 grains. **Acidum Hydriodicum Dilutum,** contains not less than 10 percent by weight of hydriodic acid, HI. Dose, 5 to 15 minims. **Syrupus Acidi Hydriodici,** contains about 1 percent of the absolute acid. Dose, 1/2 to 2 drams, well diluted.

IODIPIN.—There are two preparations of sesame oil, one, for hypodermic use containing 25 percent of iodin, the other 10 percent. Iodipin is carried to every tissue of the body, however administered, its iodin being converted into soluble iodids, and its fat being oxidized and acting as a nutrient (Winternitz). It may be given internally for a long time without disturbing the digestion or producing iodism. It is an efficient substitute for the iodids, and is said to be even more efficient than the latter, by reason of its slower rate of elimination.

IODISM.—The term applied to the condition produced by the prolonged use of iodin and its compounds. The symptoms are irritation of mucous membranes, violent coryza, sore throat, acute conjunctivitis, profuse mucous discharges, headache, and irritation of the kidneys and skin. The earliest signs are the metallic taste in the mouth, particularly before breakfast, slight tenderness of the gums and teeth, an increase in salivary secretion, morning nausea, and lack of appetite. Acne does not come on very early. If the iodids are not withdrawn, these symptoms are aggravated and the coryza becomes intense. The pustular and other bleb-like changes in the skin go on to active suppuration, and sometimes the eruption is furuncular, or even purpuric.

Strontium iodid is less likely to produce iodism than any of the other salts of iodin. When well diluted, excretion is promoted, and the development of unpleasant results is less likely. The ptyalism of the iodids generally occurs in persons who have previously taken mercurials, which have been deposited in the tissues and are set free by the iodid and come again into the circulation.

Elimination and withdrawal of the drug in full dose is the indication for the treatment of iodism. Chewing pyrethrum root will establish free salivary flow and hasten elimination, while quinin, digitalis, and other restoratives and vasomotor tonics are beneficial.

Tincture of belladonna in doses of 5 minims with each dose of iodid of potassium has the almost infallible effect of obviating the disagreeable catarrhal symptoms. These symptoms in some subjects very much resemble those of hay-asthma —persistent sneezing, profuse watery discharge from the nostrils, frontal pain, etc. This control of belladonna over the iodin symptoms is attributed to its effect upon the salivary secretions. It may be supposed that other substances having a similar control over the salivary secretions would exert a like control over iodin, but belladonna will be found most serviceable because of the convenience with which it can be administered.

IODOFORM.—Triiodomethane, CHI_3. Iodid of formyl. A compound containing about 96 percent of iodin. It is an antiseptic and a feeble anesthetic, and is highly useful for local application to wounds, abrasions, and indolent sores. Internally it is a tonic. It seems to exert a special influence upon tuberculous processes. Its odor may be disguised by means of thymol (2 drops to the ounce) or oil of rose (1 drop to the dram). Dose, internally, 1 to 6 grains.

Therapeutics.—Iodoform is chiefly employed in local diseases as an antiseptic, anesthetic, and alterative agent. It may be dusted in fine powder over a wound or sore, or used in ethereal solution to saturate gauze or absorbent cotton. It is particularly useful as an application to sloughing and phagedenic ulcers, gunshot wounds, chancroids, fistulæ, sinuses, and painful affections of the rectum or uterus. Internally it may be used as a general tonic and alterative in syphilis and other cachexias, also for neuralgia, and is frequently prescribed with iron. Triturated with tannin it forms a useful application to the cervix uteri in erosions and ulcerations thereof, or an iodotannin may be prepared by saturating the tincture of iodin with tannic acid, and applied on a cotton tent to the uterine mucous membrane in many chronic affections of that organ. Tuberculosis is successfully treated by iodoform, which certainly does check the activity of the bacillus of that disease. Diabetes has been apparently cured by iodoform, and syphilis has been combated successfully thereby in lieu of potassium iodid.

Agents Which Have Been Recommended to Neutralize the Odor of Iodoform.—Among the statements made in this connection may be included the following: Ehrmann recommends an admixture of tar with iodoform, and it is said the result gives a spicy odor, resembling neither ingredient. This, it is claimed, may be further disguised by the addition to the powder of liquid styrax. Oppler adds 1 part of copper sulphate to 2 of iodoform. Gillette with 100 parts of iodoform com-

bines 1 of sulphate of quinin and 3 of powdered wood charcoal. Cantrell uses with every 15 grains of iodoform 3/4 grain of menthol and 1 drop of essence of lavender. Jaksch recommends a 2 percent admixture of creolin with iodoform. Among other agents may be mentioned ground coffee, balsam of Peru, oil of bitter almond, oil of cade, thymol, coumarin, attar of rose, oil of bergamot, and oil of coriander; of the agent last named 8 drops may be added to a dram of the drug. A serious objection to the use of many of the deodorants could be found in the addition of a septic material to one assumedly sterile.

Poisoning.—Numerous instances are on record of the toxic effect being produced by the local application of the drug. It appears to be more quickly absorbed than are other forms of iodin preparations. If a disposition to toxic effect from a moderate quantity is obtained, iodoform should be abandoned. Iodoform is, with some individuals, irritative to the skin, and may excite dermatitis.

According to Treves, the conditions favorable for poisoning are clean, granulating wounds or burns, abscess cavities, fistulæ, and sinuses; cases in which the powder is applied under pressure or covered with impermeable dressings, as well as in instances in which the drug comes in contact with mucous surfaces, as may occur after dressing the wound in colotomy. The symptoms of poisoning may appear shortly after the application of the powder, or be deferred for days or weeks.

Two forms of poisoning occur, the acute and the chronic. In the *acute* form the symptoms are violent, and generally develop suddenly. Vertigo, headache, sleeplessness, and delirium follow. The temperature rises, the pulse ranges from 150 to 180 in the minute, vomiting and even mania ensue. The patient wastes, and may die in a state of exhaustion attended by coma. In the *chronic* form malaise, loss of strength, depression of spirits, slight fever, a rapid pulse, and headache are prominent symptoms. The patient becomes apathetic, melancholy, weak, and apprehensive. This train of symptoms may extend over a period of from a week to months before dissolution.

IODOFORMOGEN.—An odorless compound of albumin and iodoform. It is a light yellow powder insoluble in water. It is three times lighter than iodoform, and therefore more economic to use. It is almost odorless.

IODOL.—Tetraiodopyrrol. A pale yellow inodorous, tasteless powder, insoluble in water, soluble in 3 parts of alcohol, 15 parts of ether, 50 parts of chloroform, and 15 parts of oil. It contains 89 percent of iodin. On account of its freedom from odor and its nontoxicity it has been recommended as a substitute for iodoform. It dissolves readily in the gastric juice. Dose, 1 to 10 grains.

IODONE.—A periodid of phthalic anhydrid and talcum; a surgical dressing and dusting powder containing 2 percent of available iodin.

IODOTHYRIN.—The active principle of the thyroid gland. It has apparently the same properties as the gland, but is said to be of a more definite strength and devoid of objectionable material. Dose, 1 to 5 grains in tablet form.

IONIC MEDICATION and **IONIZATION.**—See CATAPHORESIS.

IOTHION.—A yellowish liquid containing 77 percent of iodin. It acts like iodin and the iodids but it is claimed to be rapidly absorbed by the intact skin and it is said to be a satisfactory substitute for iodin and iodids. A 25 to 50 percent ointment with a mixture of equal parts of wool fat (lanolin) and petrolatum as a base is applied in the same manner as mercurial inunctions.

IPECAC (Ipecacuanha).—The dried root of *Cephaëlis Ipecacuanha* or *C. acuminata*, growing in Brazil and Columbia. It contains *cephaëlin*, a crystalline alkaloid; *emetin*, an amorphous alkaloid and a methyl compound of cephaëlin; also a third alkaloid in very small quantity, a glucosid named *ipecacuanhic acid*, starch, gum, and a trace of a volatile oil. Dose of the powdered root, as an expectorant, 1/2 to 2 grains; as an emetic, 10 to 20 grains.

Therapeutics.—Ipecac is much used as an emetic, being safe, efficient, and nondepressant, though slow of action. It is the best agent of the kind to relieve the stomach in acute indigestion and bilious sick headache, and an ipecac vomit is frequently very serviceable at the commencement of eruptive, continued, and periodic fevers. The syrup is a favorite domestic emetic to cut short an attack of spasmodic laryngitis, and it may be used beneficially in membranous croup and capillary bronchitis. In small doses ipecac is an excellent stimulant of the gastric and hepatic functions, and an expectorant of great value. In atonic dyspepsia, catarrhal jaundice, intestinal colic, bronchial asthma, hay fever, bronchial catarrh, acute laryngitis and pharyngitis, also in nervous and other coughs, it has rendered good service. In still smaller doses, ♏ j of the wine frequently repeated, it is an efficient antiemetic in vomiting of nervous origin, and especially in the vomiting of pregnancy, also in that of gastric atony as seen in chronic alcoholism; its action in this affection being due perhaps to its possessing a sedative influence upon the pneumogastric in small doses. It is an excellent remedy in hemoptysis if given in small and frequently repeated doses until nausea occurs. As an antihemorrhagic it has been efficiently used in epistaxis, menorrhagia and post-partum hemorrhage, in the latter affection given with ergot. In doses of a grain several times a day it has given satisfaction in cases of idiopathic neuralgia, hyperhidrosis, intermittent fever, erysipelas, acute and suppurative hepatitis and opium narcosis, also in many of the affections which frequently complicate the puerperal state.

Dysentery is a disease in which large doses of ipecac (20 grains every 4 hours) are used with great success, especially in the epidemic form and in the summer dysentery of teething children. Tolerance must be established to produce its curative action. In small doses (1 minim of the wine), frequently repeated, it will relieve many kinds of vomiting, especially those of nervous origin.

Emetin hydrochloride has been used with much success in amebic dysentery. It may be administered by mouth in doses of 2 grains, or hypo-

dermatically in doses of 1/2 to 3/4 grain. It has also been used in cases of pyorrhœa alveolaris.

A common emetic:

An emetic for children:

℞. Powdered ipecac, gr. xx
Boiling water, ℥ v
Pour on and strain and add:
Honey of squills, ℥ ss.

Give a teaspoonful every 10 minutes until it acts.

In bronchitis:

℞. Wine of ipecac, ♏ xx
Solution of ammonium acetate, Water, each, ℥ ss.

To be taken 3 times daily.

For children threatened with croup or bronchitis:

℞. Wine of ipecac, ℥ iij
Syrup of tolu, ℥ v
Mucilage of acacia, ℥ j.

Give a teaspoonful every hour or second hour.

Preparations.—**Fluidextractum I.**—Dose, as an expectorant 1/2 to 2 minims; as an emetic 10 to 20 minims. **Syrupus I.**—strength 7 percent. Dose, as an expectorant 10 to 20 minims; as an emetic 2 to 6 drams. **Vinum I.**—strength 10 percent. Dose, 10 to 20 minims. **Pulvis I. et Opii** (*Dover's Powder*)—has of ipecac 10, powdered opium 10, sugar of milk 80, triturated together to a fine powder. Dose, 3 to 15 grains. **Tinctura I. et Opii,** has of tincture of deodorized opium 100 evaporated to 80, fluidextract of ipecac 10, diluted alcohol to 100, and is a fluid representative of Dover's powder. Dose, 3 to 15 minims. **Pilulæ Laxative Compositæ**—have in each pill gr. 1/16 of ipecac (see under PILLS). Dose, 1 to 4.

IRIDECTOMY.—Excision of a portion of the iris. It is performed in glaucoma, in cataract extraction, for the removal of foreign bodies and growths, in complete synechiæ, and for optic purposes. Having first secured a lid-speculum in position, a fold of conjunctiva, near the cornea and opposite the place where the incision is to be made is seized by fixation forceps. A keratome is entered through the cornea at the scleral border, the point being kept nearly perpendicular to the sclera until it has reached the anterior chamber, when the handle is depressed so as to bring the blade parallel to the iris. The blade is then pushed forward until it has made a wound sufficiently large for operation; still depressing the handle, the blade is withdrawn slowly, and iris forceps are thrust through the wound closed, and opened in the anterior chamber to seize the iris. The iris is then drawn out of the wound, and as much of it as desired is excised by fine iridectomy scissors held firmly against the eyeball and parallel to the wound. The stump of the iris is then carefully returned to the anterior chamber, no portion of it being allowed to become incarcerated in the corneal incision. The delicate McClure iris-scissors are the best for cutting the iris, but they are rather expensive, and not always obtainable. The eye should be thoroughly cocainized, and the operation should be done under antiseptic precautions; after the operation the eye should be thoroughly irrigated, a light bandage applied, and the eye kept closed until the corneal incision has become united. The incision may be made with the Graefe knife instead of the lance-shaped keratome.

Iridotomy is performed when the pupil for any reason is occluded by a thickened and opaque capsule or with exudations from the iris. One mode of operation is with a needle-knife having a double cutting-edge, with its shank so constructed as completely to fill the coneal wound, thus preventing any escape of aqueous. This knife is thrust through the cornea midway between its center and circumference and the occluding membrane is divided at right angles with the line of greatest tension. When the iris is to be incised so as to make an artificial pupil, a lance-knife is used instead of a needle-knife, and introduced in the same way as before, and withdrawn half way, allowing some of the aqueous to escape, thus carrying the iris forward. The knife is thrust through the iris and then withdrawn. De Wecker's scissors for iridotomy are entered closed, and opened in the anterior chamber, one blade passed through the cut in the iris, and the blades brought together through the iris, thus elongating the incision.

Iridocystectomy is preferable to iridotomy. An incision is made with a Beer's knife through cornea, iris, and the thickened or adherent lens-capsule. Next a Tyrrell hook or one branch of a pair of iris-forceps is passed into the opening in the iris. The edge of the iris (and capsule) is drawn out of the corneal wound and cut off close to the cornea.

Iridodesis consists of drawing the pupil into a new shape and position, and is accomplished by making a small incision in the cornea and drawing a part of the iris, including some of the pupillary border, into it, and fixing it with a ligature. This operation is now almost obsolete.

IRITIS.—**Hyperemia of the iris** is due to congestion of the iridic vessels preceding iritis or accompanying some inflammation of the adjacent tissues. It is recognized by the contraction and discoloration of the pupil, and the sluggish reaction to atropin. If the hyperemia becomes so intense as to produce an exudate, there is a genuine inflammation, called iritis.

Plastic Iritis.—An inflammation of the iris in which a scant, fibrinous exudate is deposited on the anterior or posterior surface of the iris, the pigment-layer at the edge of the pupil thereby becoming adherent in places to the capsule of the lens. This binding down of the iris to the lens is the cause of the immobile pupil.

Symptoms.—The patient complains of intense pain radiating over the forehead and face, and which is not proportionate to the severity of the disease. The pain is worse at night. There is lacrimation, photophobia, and dimness of vision. In some cases the subjective symptoms may be

very slight. The objective symptoms are pericorneal injection, haziness of the pupil, loss of luster in the iris, and contracted, distorted, or unsymmetric pupil. Hyperemia of the optic nerve is said to accompany iritis.

Course and Sequels.—An uncomplicated iritis running its course in from 2 to 4 weeks is an exception. Permanent adhesions, or synechiæ, of the iris, by organized exudate between it and the surface of the capsule of the lens, are often left behind, and render relapses of iritis likely. The whole pupil may become blocked with organized exudate, and thus produce loss of vision in the eye affected. It there are many severe recurrences of attacks of iritis, circular adhesions may form between the lens and iris, and destroy communication between the anterior and posterior chambers. In such a case the iris bulges forward from the tension of the aqueous that collects in the posterior chamber, causing the condition known as "ballooned iris," or "umbrella iris." Unless an artificial pupil is formed at once by iridectomy, reestablishing the communication between the chambers, the whole eye will be destroyed.

Causes.—What is called *idiopathic iritis* is generally the result of some general systemic dyscrasia, although one eye only is often affected. Syphilis is the most common cause. Other causes are tuberculosis, rheumatism, gout, gonorrhea, diabetes, nephritis, and the severe infectious fevers. Often the only explanation of the origin is exposure to cold, or "catching cold" in the eye. Secondary iritis follows inflammation of the adjacent tissues; even a conjunctivitis may lead to iritis. Traumatism, with or without infection, or a foreign body in the iris are causes of the inflammation.

Treatment.—The most important element in the treatment is to prevent or overcome adhesions of the iris. If possible, a history of an injury or clinical manifestations of some systemic condition known to cause iritis should be elicited. It is especially important to institute immediately general treatment in syphilis, rheumatism, and gout. The iodids, salicylates, salol, and mercurials are useful along with the usual general treatment. Tuberculin injections should be employed in tuberculosis. See Tuberculosis, Ocular. The diet should be chiefly of milk and broth during the acute stage. The pupil should be immediately dilated by atropin, and if it yields to the drug and is perfectly circular, a rapid improvement may be expected. Caution must be used in the administration of atropin to persons past 45, or in cases showing increased tension of the eyeball, or in which there is idiosyncrasy to the drug. If the pupil resists dilatation, the atropin solution should be heated; or a drop of 5 percent solution of cocain every 3 or 4 minutes 4 or 5 times, and then another application of atropin, should be tried. If the iris is still bound down, 6 or 8 leeches, or a mechanic leech, should be applied to the temple, and mercurial inunctions begun, using a hot bath and profuse diaphoresis before each inunction. Atropin must be kept up throughout the treatment. If it causes much conjunctivitis, scopolamin may be substituted. The pain is best relieved by local depletion with leeches, or artificial scarification over the temple, or hot, moist compresses to the eye for 15 minutes every 2 hours. Antipyrin, morphin or other analgesic may be administered. Profuse diaphoresis, with a Dover's powder, hot drink, foot-bath, and blankets, is of great value, and may be repeated several times. If all other means fail, puncture of the cornea will relieve the tension. Iridectomy is not indicated in the inflammatory stage except when there is a circular synechia obliterating communication between the anterior and posterior chambers. If there are enough adhesions left to warrant belief that there will be future relapses, iridectomy should be performed after the inflammation has subsided. This is a prophylactic measure of great importance. Smoked glasses should be worn all through the disease. Alcoholic beverages should be interdicted.

Serous Iritis.—A chronic inflammation in which an inflammatory product, poor in cells, settles in the anterior chamber, causing a haziness of the aqueous, and deposits on the posterior surface of the cornea, on account of which the disease is sometimes called **descemetitis.**

Symptoms and Diagnosis.—The chief objective signs are the deposits in the aqueous and on the back of the cornea, the haziness of the aqueous, the increase in the depth of the anterior chamber, and the signs of acute iritis in a milder degree. Pain and other subjective symptoms are inconsiderable, and the pupil may be dilated. There is often a rise of tension, due to the chemic and physical changes in the aqueous, causing simulation of glaucoma.

The important **sequels** are striated opacities on the back of the cornea, which never quite clear up, posterior synechia, and, if the ciliary body is affected, vitreous opacities, and possibly opacities in the lens.

Causes.—Serous iritis occurs in debilitated and anemic young persons, and has been ascribed to syphilis and other general dyscrasias. It is commonly bilateral, which fact points to a systemic cause. It may occur after cataract operations.

Treatment.—The patient's general health should be attended to, and good food and hygienic measures instituted. To keep the pupil dilated and break up adhesions, atropin twice a day is necessary. To hasten absorption of the inflammatory products, heat, diaphoresis, and the iodids are useful. The depressed physical condition of the patient generally forbids any rigorous mercurial treatment. The deposits may be mechanically removed by releasing the aqueous by repeated paracenteses. If there is much rise of intraocular tension, atropin must be suspended and eserin substituted. Repeated paracenteses will here prove of great value. Iridectomy may be indicated in the worst cases.

Suppurative Iritis.—A condition in which the inflammatory product is purulent, and saturates the tissues of the iris and overflows into the anterior chamber, forming a **hypopyon,** which is more fluid than the hypopyon following inflammation of the cornea.

Symptoms.—In this condition the iris is highly hyperemic, and is swollen and discolored yellow by the pus in its matrix. The chief symptoms are: The marked changes in the iris; the swollen pupillary border of the iris, which often occludes the pupil; the fluid hypopyon, which changes position, in distinction to the stationary fibrinous clot of pus in corneal disease; the history of infection, chiefly through a wound. In this day of aseptic precautions, suppurative iritis after operation is very rare. Diabetes is said to be a systemic cause. If the disease is due to infection through a wound or following an operation, there is great danger of general involvement of the eye, and such cases should be regarded as very dangerous. What have seemed idiopathic cases have often yielded readily to treatment and left no sequels.

Treatment is that of simple iritis, and should be energetically pursued—rapid mercurial inunctions, atropin, and paracenteses, after the height of the inflammation has been passed. Serum or vaccine therapy should be given a trial. For idiopathic or diabetic cases, the salicylates have been used to great advantage.

Iritis nodosa is an inflammation in which small nodes or tubercles are seen on the iris. Nodules are sometimes noticed on the iris in both simple and suppurative iritis, but the name is usually applied to conditions in which small gummata or tubercles are found on the iris.

Gumma of the iris is a local expression of tertiary syphilis, and generally yields to antisyphilitic treatment. There is usually seen near the pupillary edge of the iris a yellowish mass, about the size of a split pea, surrounded by a brownish-red base. A history of syphilis is generally obtainable.

Tubercles of the iris usually occur in groups, are some distance from the edge of the iris, and are grayish or pale yellow in color. The adjacent lymph-glands are swollen, and there is a history of tuberculosis. Tubercular iritis usually attacks young persons, while gummata are mostly seen in advanced life. Gummata may disappear under the iodids and mercurials, or may leave the iris atrophic or immobile. In tubercular iritis the prognosis is bad. In severe cases the eye must be enucleated. Excision of the tubercles is useless. Tuberculin therapy seems most encouraging and is gaining more and more favor. See Tuberculosis, Ocular.

IRON (Ferrum).—Fe = 56. Quantivalence, II, IV. A metal having a luster varying from silver-white to gray. In pharmacy, a fine, nonelastic, soft wire is used. Reduced iron consists of metallic iron in fine powder. It is a fine, gray-black, lusterless powder, odorless, tasteless, and insoluble in water and alcohol, but soluble in dilute sulphuric acid. Dose, 1/2 to 2 grains, after meals.

Therapeutics.—Iron is a normal constituent of the blood (1 part to 230 of red blood-corpuscles), and, given medicinally, it promotes appetite and digestion and increases the number of red corpuscles. In the stomach the salts are converted into the chlorid, and in the duodenum into an albuminate. In large doses, or in small ones long continued, iron produces indigestion, nausea, and vomiting. The iodid, chlorid, nitrate, and sulphate are astringent, and act injuriously on the teeth. The tincture of the chlorid is considered as diuretic. Externally, many of the soluble salts make excellent styptic and astringent preparations.

The chief indication for iron is anemia. Plethora is a contraindication. Iron should generally be given after meals.

It is well known that it is by no means a matter of indifference what form of preparation of iron is used in different cases of anemia, and nothing is more common than to find a particular preparation succeed after many others have failed. Burney Yeo has considered this question as follows:

In the first place, the state of the digestive functions should be examined carefully. If with a coated tongue there are a loss of appetite, flatulent distention, and other signs of dyspepsia or chronic gastric catarrh, the digestive functions should be improved before any form of iron is prescribed, and some such formula as the following should be ordered:

℞. Solution of bismuth citrate, ʒ iv
Sodium bicarbonate, ʒ ij
Aromatic spirit of ammonia, ʒ iij
Tincture of nux vomica, ʒ ij
Infusion of calumba, to make ʒ viij.
Two tablespoonfuls an hour before food twice a day.

If there is constipation, the following pill should be given daily, immediately before or after dinner, or supper, when dinner is taken at midday:

℞. Extract of aloes, gr. jss
Powdered ipecac, gr. ss
Quinin sulphate, gr. j
Soap, gr. ss
Make 1 pill.

After a week or 10 days of this treatment one of the milder preparations of iron may be given, and then 5 grains of iron ammoniocitrate added to each dose of the foregoing mixture, and 1 grain of ferrous sulphate to each of the pills. Subsequently the mixture may be replaced by a modification of Blaud's pills, in which the whole of the ferrous sulphate is not decomposed by potassic carbonate, but an excess of sulphate is left in the pill.

℞. Exsiccated ferrous sulphate, gr. lxxij
Potassium carbonate, gr. xij
Powdered nux vomica, gr. xxiv
Soap, gr. vj.
Divide in 24 pills. To be coated with a suitable covering. From 1 to 3 after each meal.

Some prefer to give the insoluble preparations of iron immediately or about an hour after food, in order that they may be dissolved by the gastric juice, and so absorbed with the food; and in some

cases in which there is an intolerance of iron preparations this is a good plan. The *ferrum reductum* [the solubility of reduced iron in gastric juice has been estimated by Quevenne: when 50 centigrams (7 1/2 grains) of reduced iron were treated with 100 grams (3 ounces) of gastric juice, 51 milligrams were dissolved, or about one-tenth], in 2- or 3-grain doses, may be given in pill or powder, or the *ferri carbonas saccharatus* in 5- to 10-grain doses in the same manner, 3 times daily after food.

In atonic leukorrhea, in the dose of 2 to 5 grains, ammonioferric alum is given. The arsenate of iron is used in 1/16 to 1/12 grain doses in skin-diseases. The carbonate of iron is given largely in the treatment of amenorrhea. The tincture of the chlorid of iron may be administered in 10-drop doses every hour as a specific in erysipelas. It is useful in chronic Bright's disease, and as a local application it is valuable in diphtheria and in tonsillitis. It should be administered through a glass tube to protect the teeth. In chronic affections of the respiratory organs the phosphates of iron, quinin, and strychnin are beneficial. The syrup of the iodid of iron is much used in scrofulous states and in struma. Monsel's salt finds application in hemoptysis (in a fine spray), in uterine hemorrhage (when diluted) or the hemorrhage from polypus, in nose-bleed, in intestinal hemorrhage, in hematemesis, and in tonsillitis and pharyngitis (in equal parts with glycerin).

In melancholia:

℞. Quinin valerate,
Iron valerate,
Zinc valerate, } each, gr. xx.

Divide into 20 pills; 1 pill 3 times daily.

In cardiac dropsy:

℞. Potassium bicarbonate, gr. x
Iron and ammonium citrate, gr. v
Tincture of digitalis, ♏ x
Infusion of buchu, ʒ j.

To be taken 3 times daily.

In diphtheria:

℞. Tincture of iron chlorid, ʒ ij to iij
Potassium chlorate, ʒ j
Dilute hydrochloric acid, gtt. x
Simple syrup, ʒ iv.

A teaspoonful every 2 hours.

See Anemia.

Untoward Effects.—Prolonged administration of iron causes frontal headache and gastric distress in those unaccustomed to its use. The constipation resulting may be relieved by mild purges and laxatives. These untoward symptoms show themselves especially in gouty or rheumatic persons. Nocturnal incontinence of urine may follow the administration of iron in children. A constant desire to urinate, with excessive mucus formation in the bladder, sometimes ensues. Iron is antidotal to arsenic when precipitated from any liquid preparation by the addition of an alkali, such as ammonium or magnesium carbonate. The latter in itself is antidotal, and it should be preferred to precipitate the iron. When ammonia is used, the precipitate should be well washed to remove the irritating excess. The antidote should always be given in large quantities, and as much as a pint should be precipitated. Too much of the magnesia cannot be given, and it should be freely used to bring about the precipitate. See Arsenic.

Incompatible with *metallic iron:* Hydrogen dioxid, oxidizers, potassium chlorate, potassium permanganate; salts of antimony, copper, bismuth, lead; mercury, and silver. With *ferrous salts:* Alkalies, carbonates, chromates, chlorates in acid solution, ferricyanids, gold salts, hydrogen dioxid, mercuric salts, phosphates, permanganates, sulphids, tannic acid, silver salts. With *ferric salts:* Acacia, albumin, alkalies, apomorphin, aloin, benzoates, carbonates, creosote, balsam of Peru, benzoin in alcoholic solution, diuretin, gallic acid, gelatin, guaiac, guaiacol, hydriodic acid, hypophosphites, hyposulphites, iodids, morphin; oils of bay, cloves, cinnamon, pimento, thyme, and wintergreen; pyrogallol, resorcin, salol, salicylates, sulphids, sulphites, tannic acid, vegetable infusions and decoctions. With the *tincture of ferric chloride:* Acacia, albumin, alkalies, carbonates, gelatin, lime-water, magnesium carbonate, piperazin, vegetable decoctions, infusions, and tinctures. With *ferrous sulphate*: Alkalies, carbonates; chlorids of ammonium, barium, and calcium; gold and silver salts, lead acetate, lime-water, piperazin, potassium iodid, potassium nitrate, Rochelle salt, sodium borate, tannic acid, vegetable astringent infusions.

Preparations.—**F. Carbonas Saccharatus** has at least 15 percent of ferrous carbonate. A greenish-gray powder, of sweetish taste at first, changing to ferruginous. Partially soluble in water, but soluble in dilute hydrochloric acid with evolution of CO_2. Action—slightly stimulant to the digestive tract. Dose, 2 to 10 grains. **Massa F. Carbonatis** (*Vallet's mass*), ferrous sulphate 100, sodium carbonate 46, honey 38, sugar 25, syrup and distilled water, each, to make 100 parts. Has 42 percent of ferrous carbonate. An astringent, nonirritant, ferruginous tonic. Dose, 1 to 5 grains after food. **Pilulæ F. Carbonatis** (*ferruginous pills, chalybeate pills, Blaud's pills*), made by mixing ferrous sulphate, about 2 1/2 grains for each pill, with potassium carbonate, sugar, tragacanth, althæa, glycerin and water. Dose, 1 to 3. **Mistura F. Composita** (*Griffith's mixture*), has of ferrous sulphate 6, myrrh 18, sugar 18, potassium carbonate 8, spirit of lavender 60, rose-water to 1000. Is really a solution of the carbonate formed by reaction between the two principal constituents. An excellent chalybeate. Dose, 2 to 6 drams. **F. Chloridum** (*perchlorid of iron*), orange-yellow, deliquescent pieces, of styptic taste and acid reaction, freely soluble in water, alcohol or ether. Action—strongly astringent, hemostatic. Dose, 1/2 to 1 1/2 grains. **Liquor F. Chloridi,** an aqueous solution of the preceding, containing 29 percent of the anhydrous salt, with some free HCl. Action is strongly astringent and styptic. Dose, 1 to 3 minims, well diluted. *Creuse's tasteless solution,* is

an agreeable preparation; it has liquor ferri chloridi 1 ounce, acidum citricum 544 grains, sodii carb. 1000 grains or q. s., aqua destil. 1 ounce, alcohol, q. s. Dissolve the citric acid in the water, heat to the boiling point, gradually adding the sodium carbonate until the acid is neutralized; mix with the iron solution and add alcohol up to a total of 4 ounces. Dose, 20 to 30 minims, diluted. **Tinctura F. Chloridi,** a hydro-alcoholic solution of ferric chlorid containing about 13.3 percent of the anhydrous salt, corresponding to about 4.6 percent of metallic iron. Has of the preceding solution 35 in alcohol to make 100. A bright, brownish liquid, of ethereal odor, styptic taste and acid reaction. Is used in mistura ferri et ammonii acetatis. One of the best preparations of iron. Action—ferruginous tonic. Dose, 5 to 15 minims in water, syrup or glycerin. **F. Citras,** garnet-red, transparent scales, slowly soluble in water, not in alcohol. Action—mildly stimulant. Dose, 2 to 6 grains. **F. Hypophosphis,** a white or grayish-white powder, odorless, tasteless, slightly soluble in water, freely so in HCl or in a solution of sodium citrate. Action, ferruginous tonic. Dose, 1 to 5 grains. **Pilulæ F. Iodidi,** made with reduced iron, iodin, licorice, sugar, acacia, and water, covered with a coating of balsam of tolu in ether. "Blancard's pills" differ from these only in being covered with a coating of reduced iron to protect the interior from oxidation, but it also protects them from the solvent action of the gastric juice. Dose, 1 or 2 pills, thrice daily. **Syrupus F. Iodidi,** a syrupy liquid containing 5 percent of ferrous iodid. Action—ferruginous tonic. Dose, 5 to 30 minims. **F. Hydroxidum** (*hydrated ferric oxid*), a brown-red magma, wholly soluble in HCl without effervescence. Should be freshly prepared by mixing together solution of ferric sulphate 100, ammonia water 138, and water to 300 grams. It is the chemical antidote for arsenic. Dose, 1 dram in water, frequently repeated. **F. Hydroxidum cum Magnesii Oxido** (*ferric hydrate with magnesia*), is a more convenient and more efficient antidote for arsenic than the preceding, as the excess of the alkaline precipitant is non-irritant, and is itself an arsenic antidote. The two following solutions should be kept ready: (1) Solution of ferric sulphate 40 c.c. in water 125 c.c. (2) Magnesium oxid 10 grams rubbed up with water 750 c.c. in a bottle of 1000 c.c. capacity. When wanted, shake the latter to a homogeneous magma, add it to the former gradually, and shake them together to a uniform, smooth mixture. Should be given in large doses (4 ounces) and frequently repeated. **F. Phosphas Solubilis,** bright-green, transparent scales, of acidulous, saline taste, soluble in water, not in alcohol. Used as an adjuvant to laxative pills to prevent the after reactionary constipation. Dose, 1 to 6 grains. **F. Pyrophosphas Solubilis,** green, transparent scales, of acidulous taste, soluble in water, but not in alcohol. Is almost tasteless and unirritating, and nonconstipating. Dose, 2 to 5 grains. **F. Sulphas,** large, pale, bluish-green prisms, efflorescent, of saline, styptic taste, and acid reaction, soluble in water, insoluble in alcohol. Is chiefly used to make the dried sulphate and other preparations. Dose, 1 to 5 grains. **F. Sulphas Exsiccatus,** a grayish-white powder, nearly soluble in water, consisting of the preceding salt, heated gradually until it ceases to lose weight. The most astringent and irritating ferrous salt, but an excellent one in small doses. Dose, 1/2 to 3 grains in pills. **F. Sulphas Granulatus,** the same salt as the sulphate, precipitated by alcohol from solution in dilute sulphuric acid. Dose, 1/2 to 5 grains. **Liquor F. Subsulphatis** (*Monsel's solution*), an aqueous solution of chiefly basic ferric sulphate; a dark, reddish-brown, almost syrupy liquid, of very astringent but not caustic taste, and acid reaction, mixing with water and alcohol in all proportions without decomposition. Is but slightly irritating and powerfully astringent, chiefly used locally as an astringent and hemostatic, but may be given internally in doses of 1 to 5 minims well diluted. The salt obtained by its evaporation, *Ferri Oxypersulphas* (*Monsel's salt*), is used in astringent ointments. **Liquor F. Tersulphatis** is an aqueous solution of normal ferric sulphate, containing 36 percent of the salt. Has the properties described for the preceding. Used to make other preparations of iron. **Liquor F. et Ammonii Acetatis** (*Basham's mixture*), prepared with tincture of ferric chlorid 4, diluted acetic acid 6, solution of ammonium acetate 50, aromatic elixir 12, glycerin 12, water to 100. An excellent and very pleasant preparation, having some diuretic and diaphoretic powers. Dose, 2 to 6 drams well diluted. **F. et Ammonii Citras,** transparent, garnet-red scales, deliquescent, readily soluble in water, insoluble in alcohol. Dose, 2 to 6 grains. **Vinum F.,** has of iron and ammonium citrate 4 percent. Dose, 1 to 4 drams. **F. et Ammonii Sulphas** (*Ammonio-ferric alum*), pale, violet crystals, efflorescent, of styptic taste and slightly acid reaction, soluble in 3 of water, insoluble in alcohol. Is the least astringent of the sulphates of iron, but more so than any of the salts formed by vegetable acids. Dose, 3 to 15 grains. **F. et Ammonii Tartras,** transparent, reddish-brown scales, slightly deliquescent, of sweetish and slightly ferruginous taste, very soluble in water, insoluble in alcohol. Contains an equivalent of about 25 percent of ferric oxid, and has but slightly irritant qualities. Dose, 2 to 6 grains. **F. et Potassii Tartras,** transparent, garnet-red scales, slightly deliquescent, of sweetish and slightly ferruginous taste, very soluble in water, insoluble in alcohol. Is the least disagreeable in taste of all the iron preparations, and but slightly astringent and not constipating. Dose, 2 to 6 grains. **F. et Quininæ Citras,** thin, transparent, yellowish-brown scales, slowly deliquescent, of bitter taste, slowly soluble in water, slightly soluble in alcohol. Contains 11 1/2 percent of dry quinin. Action, astringent and stimulant to the digestive tract. Dose, 3 to 5 grains. **F. et Quininæ Citras Solubilis,** thin, transparent scales, of greenish, golden-yellow color, rapidly soluble in cold water, partly soluble in alcohol. Dose, 3 to 5 grains. **Vinum F. Amarum,** has of the preceding 5 parts, tincture of sweet orange 6, syrup 30, white wine to 100. Dose, 1 to 4 drams. **F. et Strychninæ Citras,** transparent

garnet-red scales, deliquescent, readily soluble in water, slightly so in alcohol. Contains 1 percent of strychnin. Action, astringent and stimulating. Dose, 1 to 3 grains. **The Glycerite, Elixir, and Syrup of the Phosphates of Iron, Quinin and Strychnin** are described under PHOSPHORUS. **Syrupus Hypophosphitum Compositus,** has of ferric hypophosphite 2 1/4 percent, and is described under PHOSPHORUS. **Pilulæ Aloes et F.** are described under PILLS.

IRRIGATION.—The application of water, especially a stream, to an inflamed or abnormal tissue for purposes of moistening, antisepsis, cooling, or flushing the part.

It may be practised with various temperatures of water, pure or medicated. Plain cold water is frequently employed, but it is rarely safe to irrigate with ice-cold water. See COLD, ICE. . Irrigation is of especial value in cleansing cavities, such as the nose, the pleura in empyema, the bladder, urethra, vagina, and rectum. In treating foul wounds irrigation carries off secretions and, when antiseptic, prevents putrefaction and promotes healing. Wetting of cloths and of the bed may be prevented by the use of rubber blankets, pads, and bed-pans, with proper position.

Water may be allowed to flow from a tap or to drop on a joint or part; a liquid may be left to trickle from a suspended can or bucket, or through an elevated tube, on the siphonage principle. As a rule, it must be continued for many hours, often several days, before beneficial results are realized, while the details of usage give a great field for ingenuity.

In the cleansing of wounds and ulcers, irrigations with solutions of mercuric chlorid or boric acid are constantly employed. Plain sterilized water is used to irrigate the abdominal cavity after section or normal salt solution may be employed. The nasal douche is a form of nasal irrigation. See CYSTITIS, GONORRHEA, HEAT, WATER, etc.

ISCHEMIA.—See ANEMIA.

ISCHIORECTAL ABSCESS.—See RECTUM (Inflammation).

ISCHURIA.—Retention or suppression of urine. See URINE.

ISINGLASS (Ichthyocolla).—The swimming-bladder of the sturgeon, *Acipenser huso.* It occurs in horny, semitransparent sheets, that form a jelly with hot water. It is the purest form of gelatin, and is used as a food, for clarifying liquids, and as a test for tannic acid. **I., Emplastrum,** court-plaster; it consists of isinglass 10, glycerin 1, alcohol 40, water and tincture of benzoin q. s., spread upon fine white silk bolting-cloth and dried. See GELATIN.

ITCH.—See SCABIES.

ITCHING.—See PRURITUS.

IVY-POISONING (Dermatitis Venenata).—This form of inflammation is due to the contact of deleterious animal and vegetable substances. Among these may be mentioned the acids and alkalies, croton oil, mustard, cantharides, anilin dyes, etc. The dermatologist is more particularly interested in the dermatitis produced by poisonous plants, chiefly the *Rhus toxicodendron, poison ivy* or *oak,* and the *Rhus venenata, poison sumach* or *dogwood.*

Symptoms.—From a few hours to several days after exposure the hands, face, and genitals (in a typical case) become the seat of innumerable vesicles and blebs, accompanied by swelling and great burning or itching. The eruption is carried to various parts of the body by autoinoculation. The eruption lasts from 1 to 4 weeks, disappearing spontaneously. Some individuals are extremely susceptible to ivy poison: so much so that proximity without contact suffices to bring on an attack. Other individuals enjoy comparative immunity.

The treatment consists of the application of mildly astringent and sedative lotions and ointments. At the very outset lotions are to be preferred. A solution of the hyposulphite of sodium, 1 dram to the ounce, often relieves the itching and acts most happily. A saturated solution of boric acid is almost as efficient, and is to be preferred when the face is involved. Many laud the use of the fluidextract of grindelia robusta, 1 dram to 4 ounces of water. This is a time-honored application, and is certainly most grateful to the skin. When the vesicles and blebs have ruptured and the skin is covered with crusts, sedative ointments are to be used. A salve, for instance, containing carbolic acid 10 grains, boric acid 30 grains, to 1 ounce of ointment base, may be advantageously employed.

When large areas of the body are affected, medicated baths may be used with good results. The alkaline bath—containing a handful of the ordinary washing soda (sodium carbonate) to 20 gallons of water—is most soothing to the inflamed skin.

J

JABORANDI.—See PILOCARPUS.

JACOB'S ULCER.—See EPITHELIOMA.

JACTITATION.—A restless and anxious tossing to and fro, from one posture to another; a symptom of conscious or unconscious distress observed in all severe mental affections. It is associated with certain severe febrile diseases, with severe pericarditis, or as a sequence of uterine or other hemorrhages. A restlessness amounting to jactitation may occur in those suffering from severe or long-continued pain. It must not be confounded with chorea, in which the absence of pain and of marked febrile disturbance, together with the history of the patient, will establish a ready diagnosis.

JALAP.—The dried tuberous root of *Exogonium purga*, a Mexican plant. It should contain not less than 8 percent of total resin, which is composed of two glucosids, *jalapin*, soft, soluble in ether, and *convolvulin*, which is hard, insoluble in ether and the more active of the two. Dose, 5 to 20 grains.

Jalap is an active cathartic, producing copious and watery stools, with considerable tormina and tenesmus, also sometimes nausea. It is more drastic than senna and less irritant than gamboge, but in overdoses may produce dangerous hypercatharsis.

Convolvulin in sufficient dose is an active irritant poison, producing gastroenteritis and narcotism. Its action as a purgative seems to be wholly local, as from its intravenous injection no catharsis results, yet it exerts little if any irritant action on the conjunctiva, nasal mucous membrane or skin. It is not eliminated in the urine or the feces, and is therefore probably destroyed in the system by oxidation.

In olden times jalap and calomel were used together, in doses of 10 grains each, as a routine purgative prescription. Less ponderous doses are now considered equally efficient, and 1 grain of each agent, with the same quantity of extract of hyoscyamus as a corrective, may be used with advantage at the onset of fevers and inflammations. As the compound powder, it is much employed to produce free watery evacuations in ascites and anasarca. Being nearly tasteless, it is a useful cathartic for children, and may be administered in syrup of rhubarb (2 to 5 grains in 1/2 ounce). As a vermifuge it is efficient as an adjunct to more powerful agents, and is employed with calomel and santonin for the expulsion of lumbrici. Jalap is contraindicated in all inflammatory conditions of the intestinal mucous membrane.

Preparations.—Resina J., *Resin of jalap*, prepared from a tincture by precipitation by water. Is insoluble in water, soluble in alcohol. Dose, 1 to 5 grains. It is an ingredient of pil. cathartic. comp. and pil. cathartic. vegetabiles.

Pulvis J. Compositus, *Pulvis purgans*, has of jalap 35, potassium bitartrate 65, thoroughly mixed. Dose, 10 to 45 grains.

JAMESTOWN WEED.—See STRAMONIUM.

JAUNDICE (Icterus).—Deposition of bile pigment in the tissues of the body.

Varieties.—(1) Hepatogenous or obstructive jaundice; (2) hematogenous or nonobstructive jaundice.

Hepatogenous Jaundice

Etiology.—(1) Obstruction by gall-stones or parasites; (2) catarrhal condition of bile-duct or duodenum; (3) stricture of gall-duct; (4) pressure from tumors in the neighboring organs (cancer of liver, pancreas, etc.); (5) altered blood-pressure in the vessels of liver, causing greater pressure in the smaller ducts than in blood-vessels.

Symptoms and Clinical Course.—Deposition of the biliary pigments in the skin or conjunctivæ, causing a distinct yellowness or bronzed hue. It is often first detected in the conjunctivæ. The urine is of a dark amber or blackish color, staining the linen frequently, and with nitric acid shows the play of colors denoting the presence of biliary pigment. The pulse is slow and full; the feces are light in color, on account of the absence of the bile pigment. Often the pigment may be detected in the perspiration, and may be so pronounced as to stain the bed-linen. Usually some form of skin-eruption supervenes, and it may keep the patient irritable on account of its itching character.

The mental symptoms are quite marked, there being great dejection of spirits and despondency. The appetite is lost and nausea is almost constantly present.

Diagnosis.—The yellowness of the skin and conjunctivæ should be distinguished from the greenish appearance in chlorosis, most common in females under 20; and from Addison's disease, in which the pigment is darker and less uniform than in jaundice. Bile is present in the urine of jaundiced patients from obstruction of the bile-ducts, while in Addison's disease it is absent.

Hematogenous Jaundice

Etiology.—(1) It results from rapid destruction of the liver cells, as in hypertrophic cirrhosis of the liver and in acute yellow atrophy. (2) It may be brought about by toxic agents causing a rapid destruction of the red blood-cells, such as is seen in snake-poisoning, yellow fever, malarial hemoglobinuria, relapsing fever, arsenical or phosphorus-poisoning.

Symptoms and Clinical Course.—The jaundice is not so marked as in the obstructive form. Guiteras has often called attention to the fact that jaundice in the patient suffering with yellow fever can only be appreciated at a distance.

In hematogenous jaundice the stools are generally normal in color, pulse may be accentuated, and the skin does not itch.

Prognosis depends upon the cause.

Treatment is the same as in simple catarrhal jaundice. See GALL-BLADDER (Diseases).

Simple Catarrhal Jaundice

Synonyms.—Inflammation of the common bile-duct, catarrh of the bile-duct, catarrhal hepatitis.

Definition.—Jaundice resulting from a catarrhal condition of the biliary passages.

Etiology.—(1) An infectious agent (undetermined); (2) catarrh of the duodenum, extending up the common bile-duct; (3) certain diseases, such as pneumonia, typhoid fever, etc.

Pathology.—The mucous membrane of duodenum and bile-ducts is engorged with blood, the lumen of ducts being occluded by thick tenacious mucus. If of long standing, necrosis may be set up, with consequent formation of ulcers.

Symptoms and Clinical Course.—Jaundice, as the name implies, is the predominant symptom. The onset may be ushered in by a sense of nausea, vomiting, dull frontal headache, mental hebetude, constipation, high-colored scanty urine, slow full pulse, and slight fever. Patients with catarrhal jaundice are fretful and lose all ambition; are careless of the future and most despondent.

The duration is from 1 to 3 weeks.

Diagnosis.—The occurrence of jaundice without pain, feeling of nausea, despondency, slow full pulse, and slight fever (101°) usually distinguishes the disease from other causes productive of jaundice.

Prognosis is favorable.

Treatment.—Rest in bed is demanded. The diet should be regulated, only allowing liquid foods, such as beef-juice or beef-broth, stewed fruits, and cooked vegetables. The patient should be allowed no starches or fats; he should take milk, eggs, oysters, beef-broth; plenty of green vegetables at each meal; use cold water freely, avoid high seasoning in food and all liquors. The common distaste for food in catarrhal jaundice is a good indication to give no food whatever for a day or two and to be content to relieve the thirst with copious draughts of water which are usually relished and well borne. The treatment is that of the gastrointestinal catarrh producing the cholangitis. In the beginning it is advisable to administer fractional doses (1/4 grain) of calomel every hour until 6 or 7 doses have been taken, followed by a saline purge, if necessary. Should the patient show a tendency to remain constipated, the bowels may be kept open with the solution of magnesium citrate or by means of salines. Probably the remedy most used is sodium phosphate in doses of 1 dram, taken 2 or 3 times daily as a laxative. The effervescent salt is quite agreeable. Carlsbad salt (1 dram) may be taken for the same purpose, also the Hunyadi Janos and Saratoga mineral waters in sufficient quantity to produce 1 or 2 stools a day. In the more chronic cases lavage may be practised every 2 or 3 days, the fluid containing about 1 grain of silver nitrate. High enemata, by means of the long rectal tube and fountain syringe, may at the same time be administered 2 or 3 times a week. A series of small blisters over the right hypochondrium may do good. See GALL-BLADDER (Diseases).

Jaundice of the New-born
(Icterus Neonatorum)

Etiology.—It results: (1) *Physiologically* from the destruction of large numbers of red blood-cells during the first few days after birth, or from severance of the placental circulation, permitting absorption from the bile capillaries; (2) *pathologically*, as in congenital absence of biliary ducts, syphilis, or septic poisoning.

Treatment.—Usually medicines are not indicated. If bowels are constipated, castor oil (1 dram) or an enema of soapsuds and lukewarm water may be used. A daily lukewarm bath should also be given to keep the skin active and for its stimulating effect.

JAUNDICE, ACUTE FEBRILE.—See WEIL'S DISEASE.

JAWS, DISEASES.

Diseases of the Gums.—See GUMS.

Alveolar Abscess.—(*q. v.*).

Epulis.—This term, though formerly employed to signify any tumor growing from the gums, is now usually restricted to the variety that was then distinguished as the fibrous or common epulis. An epulis consists principally of fibrous tissue, but may sometimes contain a few myeloid cells. It frequently appears to depend upon the irritation of a carious stump, and springs from the periodontal membrane lining an alveolus. Beginning as a swelling of the little tongue-like process of gum between the teeth, as it increases in size it appears as a hard, fleshy, circumscribed, smooth or slightly lobulated elastic growth, covered by mucous membrane. When it has existed some time, ulceration of the surface may occur, and one or more teeth become loosened or fall out.

Treatment.—It should be excised with bone-forceps or a small saw, care being taken to cut away a small piece of the bone beneath, as otherwise it is likely to return. When quite small it may be shaved off, a thin layer of the bone at its base gouged away, and the offending tooth or teeth removed.

Myeloid sarcoma (*myeloid epulis*) is occasionally found on the gums as a rapidly growing vascular tumor of a purplish-red color and soft spongy consistency. It should be entirely removed with the underlying bone, as otherwise it will return. The hemorrhage during removal is generally free, and may require the actual cautery to restrain it.

Epithelioma (*malignant epulis*) of the gums is rare. In the upper jaw it has a marked tendency to creep up into the antrum (*creeping epithelioma*) and to simulate caries or necrosis of the jaw. Complete excision, with removal of the uppr jaw if the antrum is involved, should be undertaken if there is a fair chance of getting the whole of the disease away and if the glands are not much involved.

Inflammation and abscess of the antrum is generally due to the irritation of the fang of a carious

tooth. It is attended by deep-seated pain, followed by swelling, edema, heat, and redness of the cheek and lower eyelid, and, when very acute, by sharp constitutional disturbance. The pus may overflow into the nose or escape by the side of a tooth; or, in other instances, may distend the cavity and cause the bony walls to bulge.

The treatment consists in providing a free exit for the pus as soon as formed, either by removing the carious tooth, and perforating the antrum through the bottom of the alveolus, or, if the teeth are sound, by perforating the anterior wall within the mouth through the canine fossa. The cavity should then be kept clean by antiseptic lotions.

Closure of the jaws is the term applied to a condition in which the lower jaw cannot be opened, at least not to any extent. It may be due to: (1) Spasm of the masseter muscle consequent upon the irritation attending the eruption of a wisdom-tooth for which there is not room; (2) cicatricial contraction following ulceration of the mucous membrane induced by cancrum oris, syphilis, lupus, the abuse of mercury, etc.; (3) ankylosis of the temporomaxillary joint; (4) hysteria.

Treatment.—When dependent upon the eruption of a wisdom-tooth, the tooth itself, or, under some circumstances, the second molar, must be extracted. When dependent upon cicatricial contractions, the forcible opening of the mouth by a screw-gag and maintaining it open by a cork placed between the teeth will, in slight cases, suffice. In other instances division of the cicatricial bands, and subsequently keeping the jaws separated, is successful, although this proceeding does not appear to have been always successful. When the bands are very dense, or the closure depends upon ankylosis of the temporomaxillary joint, a new articulation must be made by dividing the ramus of the jaw and removing a wedge-shaped piece of bone in front of the cicatricial contractions.

Necrosis of the Jaws.—Necrosis is more common, and, when it occurs, more extensive in the lower than in the upper jaw, a fact due in part to the toorer blood supply of the former, and in part to the predilection of necrosis for compact rather than for cancellous bone. Though the necrosis may affect the whole of the jaw, it is more often limited to the alveolar process or to the anterior wall. The teeth may loosen and fall out; but at times they retain their connection with the gums and remain *in situ* after the removal of the sequestrum.

The causes of necrosis of the jaw, as of necrosis elsewhere, generally depend upon inflammation of the periosteum or bone, which in the case of the jaw appears especially to be induced by the fumes of phosphorus, the abuse of mercury, carious teeth in strumous subjects, syphilis, the exanthemata, cancrum oris, and, lastly, injury, as in extracting a tooth. **Phosphorus-necrosis** is generally believed only to affect the subjects of carious teeth, but some maintain that it is a local manifestation of a general phosphorus poisoning. It is much less common since the amorphous form of phosphorus has been used for making matches. The production of new bone in necrosis of the lower jaw is generally extensive. In the upper jaw new bone is not formed after complete removal. In phosphorus-necrosis a characteristic pumice-like deposit of new bone is formed.

Symptoms.—Necrosis generally begins with severe pain and deep-seated swelling, which may at first be mistaken for toothache or alveolar abscess, followed by suppuration and bursting of the abscess, either in the mouth or externally on the face, and the formation of sinuses. The breath, as a rule, is horribly fetid, and there is sharp constitutional disturbance, which, in phosphorus-necrosis, is sometimes excessive, and may end in septicemia or pyemia. On probing the sinus, dead bone is detected. This sign will usually distinguish necrosis from the creeping form of epithelioma, for which, especially in the upper jaw, it may be mistaken.

Treatment.—The bone, as soon as loose, should be removed, if possible, through the mouth. In the meantime the parts should be kept aseptic by syringing with an antiseptic fluid or carbolic lotion, or by insufflation of iodoform, incisions being made through the periosteum to insure a free drain, or a respirator may be worn to neutralize the fetor. Internally, tonics and stimulants and nourishing diet should be given, and iodid of potassium if there is a syphilitic taint.

Tumors of the upper jaw may be cystic or solid, and the latter innocent or malignant; while cysts may likewise occur in the malignant solid tumors.

Cystic tumors may be produced: (1) In connection with the fang of a carious tooth; (2) by an error in development of the enamel sac covering the crown of a tooth (*dentigerous cysts*); and (3) by obstruction of a mucous follicle in the lining membrane of the antrum. These cysts usually contain a serous, gelatinous, or a brownish fluid, in which cholesterin is often found. The condition known as *dropsy of the antrum*, and formerly believed to depend merely upon an accumulation of fluid in that cavity owing to the occlusion of the opening into the nose, would appear to be due to one of these mucous cysts completely filling the antrum.

Dentigerous cysts, which may also occur in the lower jaw, are due to an error in the development of the enamel sac, usually of the permanent teeth. They differ from the ordinary dental cyst, depending upon the irritation of a decayed fang, in that in the latter the fang will generally be found projecting into the cyst, whereas in the dentigerous variety the crown alone, which has not been cut, or in some cases the whole tooth, will be found in the cyst.

Solid tumors may spring from the periosteum covering the exterior of the bone, or from the mucous or the periosteal lining of the antrum. They may have a fibrous, cartilaginous, osseous, myxomatous, adenomatous, sarcomatous, or carcinomatous structure; but fibrous and sarcomatous tumors are the most common, while cartilaginous are very rare. Ossification of the sarcomatous growths is of occasional occurrence. They may be closely simulated by tumors of a like diversity of structure growing from the malar bone, the sphenomaxillary fossa, or the base of the skull.

Symptoms and Diagnosis.—Clinically, it is not always possible to determine the exact structure of these tumors, nor is it essential, the surgeon's aim being rather to distinguish the solid from the fluid, and the innocent from the malignant, and to make out their origin and present attachments. When the tumor, whether cystic or solid, innocent or malignant, begins in the antrum, it sooner or later fills that cavity, and then in its further growth causes the walls to bulge in various directions. Thus, the bulging of the anterior wall causes a swelling on the cheek; of the internal wall, an obstruction in the nose; of the inferior wall, a depression of the palate; and of the superior wall a protrusion of the eye. A rounded projection on the cheek, a sensation of fluctuation felt through the anterior wall of the antrum with the finger in the mouth, or an eggshell-like crackling produced by the yielding of the thinned and partially absorbed walls, the presence of a carious tooth or the absence of one of the teeth in the series (in the case of a dentigerous cyst), will point to the cystic nature of the swelling, and puncture with a trocar and cannula will clear up any doubt. Should the tumor be solid, it will probably be *innocent* if of slow growth and there is absence of pain and glandular enlargement, nonimplication of the skin, and noninfiltration of surrounding parts; but *malignant* if of rapid growth and there is severe pain, early escape through the walls of the antrum, implication of the skin, involvement of glands, and protrusion of a fungous mass in the mouth, nose, or on the cheek. In malignant disease, moreover, the patient will probably be either young, in the case of sarcoma, or advanced in life, in the case of carcinoma; but if a small piece of the growth can be obtained, a microscopic examination will settle the point. When the growth springs from the malar bone, it may either project forward on the cheek or into the mouth between the cheek and the bone, and the bulging of the walls of the antrum will be absent. When it arises from the sphenomaxillary fossa or base of the skull, it will commonly project into the nasopharynx, where it may be detected by the finger or rhinoscope, while the whole maxillary bone will be pushed forward. It should not be forgotten, however, that tumors beginning in the antrum, especially the fibrous and sarcomatous, encroach upon the surrounding parts, and, conversely, that the cavity of the antrum may be invaded by growths not primarily connected with it; so that when a tumor in this region has attained a large size, it may be impossible to determine its origin, or, indeed, the whole of its actual attachments.

Treatment.—For cystic tumors, excision of a portion of the wall from within the mouth will generally suffice, if a free drain is subsequently insured. At times the thinned walls of the cyst may be crushed together by the fingers with advantage. When the cyst is associated with a solid growth, the latter may sometimes be scraped away, otherwise the upper jaw must be partially or completely removed. When the tumor is *solid* and of an *innocent* nature, and entirely confined to the antrum, it may be removed by excision of the superior maxilla; but, as a rule, no more of the bone should be taken away than is absolutely necessary, the orbital plate and hard palate being preserved if possible. When the tumor arises behind the bone, there is often great difficulty in getting it away, as its attachments may be more extensive than is imagined. If thought advisable to attempt its removal, this may be done by excising the superior maxilla and clearing away the growth; or the maxilla may be turned outward, the growth removed, and the bone replaced (*Langenbeck's method*).

When the growth is *malignant* and confined to the antrum, the superior maxilla may also be excised; but when it has invaded the surrounding parts, it becomes not only a question whether it can be completely got away, but whether the immunity from its return will not be of too short duration for the patient to undergo the risk of the operation.

Complete Excision of the Upper Jaw.—Having extracted the central incisor tooth on the diseased side, make an incision down to the bone in the direction shown by the dark line in the accompanying figure. Dissect back the flap thus marked out from the bone, securing the larger arteries as they are divided. Make a longitudinal incision through the mucous membrane lining respectively the floor of the nose and the roof of the mouth as far back as the soft palate, and then a transverse one along the junction of the soft palate with the hard palate on the diseased side. Now pass one blade of the long jaw-forceps into the mouth and the other into the nose, and divide the alveolar process and hard palate; cut through the nasal process of the superior maxilla, and then through the malar bone, carrying the forceps into the sphenomaxillary fissure. Seize the bone with lion-forceps, and wrench it away from its remaining attachments. The internal maxillary, or any other large artery, should be tied, and hemorrhage from smaller vessels restrained by plugging the wound with strips of iodoform gauze. When the bleeding has stopped, any growth that may remain should be cut away or destroyed with the actual cautery. Unite the edges of the wound with horsehair sutures and the lip with harelip pins. Healing occurs readily and with little deformity. An obturator with false teeth should subsequently be fitted to the mouth.

Lines of Incision for Removal of Upper and Lower Jaws. —(*Walsham.*)

Partial excision of the upper jaw usually consists in leaving the orbital plate, and is done by dividing with a keyhole saw the front wall of the antrum along the margin of the orbit, and completing the operation as above described.

Resection of the upper jaw (*Langenbeck's operation*) consists in turning the maxillary bone outward so as to get at a tumor behind it, and then replacing the bone. As the connections of the

bone along its outer part are left intact, its vascular supply is not completely cut off, and it soon forms fresh adhesions when placed back in position.

Tumors of the lower jaw, like those of the upper, may be cystic or solid, innocent or malignant.

Cystic tumors, as in the upper jaw, may be developed in connection with an uncut tooth (*dentigerous cyst*) or around the fang of a decayed tooth. They are then unilocular. *Multilocular cystic tumors* have a marked predilection for the lower jaw. They are probably due to invasion of the jaw by epithelium from the gum. The epithelial masses undergo degeneration, leading to cysts, often of considerable size. These tumors grow very slowly, and may gradually destroy the whole bone, reducing it to a mere shell; but if completely removed, do not recur locally. They never affect the glands or become disseminated.

The solid tumors may grow from the periosteum covering either the outer or the buccal aspect of the jaw, or from the interior of the bone, which they then expand around them. The osseous tumors usually take the form of exostoses, and are not uncommon about the angle of the jaw. The more regular shape of the lower jaw, its compact structure, the absence of a cavity like the antrum, its more isolated condition, and the absence of surrounding cavities like the nose, orbit, and sphenomaxillary fossa, make the diagnosis of tumors in it more easy. The signs are similar to those of tumors of the upper jaw.

Treatment.—Cystic tumors are best treated by free incision of a portion of their wall. In the case of the multilocular cysts the whole or part of the jaw may be removed. In excising solid innocent tumors no more of the bone should be sacrificed than is necessary to extirpate the disease; and such removal, when possible, should be done from within the mouth. Myeloid growths springing from the interior of bone may often be enucleated, and not recur for many years, or not at all. When the tumor is large and encroaches upon the ramus, the affected half of the jaw, or, if both halves are affected, the whole jaw should be removed by disarticulation, as if the ramus is merely sawed across, leaving the coronoid process and condyle; these are apt to be drawn forward by the temporal and external pterygoid muscles and prove a constant source of annoyance. When the growth is malignant or of large size, and the skin and neighboring soft parts are implicated and the glands extensively involved, no operation, as a rule, is admissible. Cysts developed in connection with solid growths may be laid open and the tumor scraped away, or part or the whole of the jaw, if the growth is malignant, may be removed.

Excision of the Lower Jaw.—Having extracted the central or the lateral incisor tooth, make an incision down to the bone (in the way shown in the black line in the accompanying figure) through the lower lip, along the lower border of the jaw, and thence up the ramus, nearly but not quite to the lobule of the ear to avoid the facial nerve, tying both ends of the facial artery as it is cut. Dissect up the flap thus formed from the bone, and divide the bone with saw and forceps opposite to where the tooth has been extracted. Seize the bone with the lion-forceps, drawing it outward and upward, and divide the soft tissue on the inner surface with a narrow-bladed scalpel, keeping close to the bone to avoid the gustatory nerve and the submaxillary gland. The origin of the geniohyoglossus should be spared, if possible, as otherwise the tongue tends to fall backward, and has before now caused suffocation. If this muscle must be divided, pull the tongue forward by a ligature through its tip. Next separate the internal pterygoid, depress the jaw, and divide the temporal muscle at its insertion into the coronoid process. Open the articulation from the front, divide the external pterygoid, and carry the knife beyond the condyle, taking care not to rotate the jaw outward lest the internal maxillary artery be stretched round the neck of the condyle and be thus torn or divided (Walsham).

JAWS, INJURIES.—Dislocation of the jaw is possible only in the forward direction over the eminentia articularis. It is usually bilateral, although occasionally unilateral and sometimes congenital. The bilateral dislocation is usually brought about by yawning or laughing, or is caused by straining the jaws apart, as in taking too large a bite of fruit.

Symptoms.—Both condyles are advanced between the surface of the temporal bone and zygomatic arch; the mouth is open, and the patient is not able to shut it by pressure made on the chin; the lower teeth are on a line anterior to the upper;

Dislocation of the Lower Jaw.

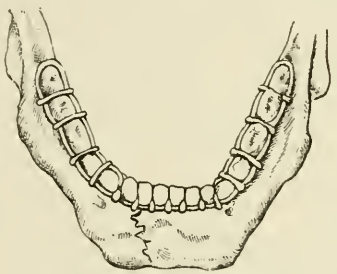
the appearance is that of a person yawning; the pain is severe; the saliva is increased and dribbles from the mouth. If the lower jaw is partially dislocated, one condyloid process only advances, while the other remains in the articular cavity.

Treatment.—To reduce the luxation the patient is seated in a chair with the head against the back of the chair or the body of an assistant. Standing in front of the patient, the operator, with thumbs well wrapped to protect them from the teeth, places them upon the last molar teeth and grasps the chin with the free fingers. Pressure is made downward and backward, and as soon as the condyle is loosened, the jaw is closed by pushing it over the condyle and pressing up the chin, using the thumbs as levers. Failing in this, wedges may be placed between the teeth and the chin pushed up

by the hand or a tourniquet around the head and chin. In unilateral displacement the wedge is to be used only on the dislocated side. After reduction, a bandage, preferably a Barton bandage, should be applied for over two weeks, being changed daily. The use of a liquid diet is advised for 3 weeks after dislocation.

Fracture of the lower jaw is most common through the mental foramen: *i.e.*, near the canine tooth. Occasionally it is through the neck of the ramus, or the coronoid process may be broken off. Fractures of this bone are nearly always compound.

The fractured parts are to be adjusted, the loose and detached teeth pushed back, and the mouth rinsed with hot water to cleanse it and check hemorrhage. It may be necessary to compress the carotid artery to control the hemorrhage. A pad of lint should be placed under the broken parts and a four-tailed bandage applied, the ends crossing each other as they leave the symphysis, the two upper ends being tied at the nape and the two lower over the vertex of the head. A splint may be made out of card-board, soaked and applied to the broken jaw, being shaped to the symphysis and body. It should be lined with lint and held by a bandage, as a four-tailed bandage. Felt or gutta-percha may be molded to the parts and held by a Gibson or Barton bandage. The teeth may be fastened with wire, the fragments themselves be wired together, or an interdental splint employed.



DENTAL SPLINT APPLIED.—(*Spencer and Gask.*)

Liquid food is to be given, and the mouth washed frequently. Dressings may be changed every second day. Union is usually complete in 5 weeks.

Fractures of the Upper Jaw.—The superior maxilla is seldom broken, unless great and direct violence has been employed; its fracture is generally accompanied by an external wound, as in gunshot injuries or a kick from a horse. The fracture is often comminuted and is sometimes attended by concussion of the brain, or by fracture of other bones of the face; it is often produced by force transmitted from the malar bone, the latter remaining sound. The superior maxilla possesses extraordinary reparative powers.

Treatment.—Preserve and replace all fragments and splinters, the tendency to heal being very great. The patient must avoid chewing any hard substances until the detached fragment has become attached to the bone. When the alveolar process is broken into two or more fragments, the pieces must be pressed into place and the jaws closed, so that the lower jaw may serve as a support. To maintain apposition apply a Barton or Gibson bandage. It may be necessary to apply fine wire to the teeth, if displacement continues; or an interdental splint composed of gutta-percha may be used. Loosened teeth must be pressed into their places.

Should the nasal process be broken, a director should be applied through the nose to elevate any depression that may exist.

Fracture of the Zygomatic Arch.—This accident is rare, and is produced by direct violence, usually occurring on the temporal side of the suture.

The signs of this fracture are an irregular projection or depression of the fragments, with rapid swelling of the parts. The displacement will occur either outward or inward. There will be neither motion nor crepitus.

Treatment.—Should there be no displacement, apply an anodyne lotion and keep the parts quiet with a Gibson or Barton roller. If there is outward displacement, the fragments may be adjusted by pressure on the projecting angle, afterward applying a soothing lotion. If the displacement is occasioned by depression of the malar bone, it will be adjusted by restoration of that bone to its proper position, which requires extensive manipulation. The question of surgical interference must depend upon the urgency of the symptoms.

JERK.—A sudden muscular movement. A jerk produced by a sudden or quick stroke over a tendon or region gives an indication of the innervation of a part. This is commonly seen at the knee, and here is known as the **knee-jerk.** The contraction of the quadriceps femoris is then obtained. The legs are crossed one over the other and a sharp blow is made by the edge of the hand or some moderately wide instrument upon the patellar tendon just below the patella. The knee-jerk is usually absent in advanced locomotor ataxia, in diseases of the anterior gray cornua, in infantile paralysis, in the late stages of pseudohypertrophic paralysis, and often in meningitis, in diphtheria, and in diabetes.

The jaw-jerk, or chin-jerk, is a contraction of the muscles of mastication produced by a stroke on the lower jaw or chin when the mouth is opened. It may be obtained in health, but when marked, is indicative of extensive cerebral lesion, such as multiple sclerosis or general paralysis.

The wrist-jerk is obtained by a stroke upon the tendon of the extensor indicis or extensor ossis metacarpi pollicis, when they are made prominent by passive extension of the supine hand of the patient in that of the examiner. It may occur in health.

The elbow-jerk, or triceps-jerk, is obtained by striking the triceps tendon while the arm is supported and the forearm allowed to hang loosely downward parallel with the body.

See REFLEXES.

JOINTS, DISEASES.—Diseases of the joints should be divided into acute and chronic.

Acute Joint-diseases

Simple Synovitis with Effusion.—Acute serous synovitis is the commonest form of joint-disease.

As a rule, it is the result of a contusion or cold, but may arise without any known cause. It may be caused by the infectious fevers, gout, rheumatism, gonorrhea, or syphilis. In point of frequency the joints involved are the knee, the elbow, and the ankle. Among the joints less frequently involved are the hip, the shoulder, and the small joints of the extremities. The pathology of the disease is limited to changes in the synovial membrane, in which the usual manifestations of irritation and inflammation develop according to the cause producing the disease.

The result is an intraarticular effusion, serous or hemorrhagic. From the admixture of lymph flocculi the effusion has a tendency to become turbid. When this effect is the result of an irritation, such as is produced by a trauma, the presence of a blood-clot, the pinching of the synovial folds, or irritation from toxic causes, such as occur in gout and in some cases of gonorrhea, there is a congestion of the synovial membrane, injection of the vessels, with the entire surface reddened, particularly about the line of attachment to the articular cartilages. The cartilages undergo no change, and by their pearliness are therefore in strong contrast to the reddened synovial surfaces. From the synovial membranes there is effused at first an increased quantity of synovia, and soon the exudate becomes closely allied to the serous effusion found elsewhere. Clear at first, it has a tendency to become turbid from the admixture of disintegrated epithelial cells and of leukocytes. The turbidity is often increased by the presence of blood discs, from minute hemorrhages into the joint-cavity. Within the exuded fluid flocculi of fibrin, in greater or less abundance, are usually found. These may be attached to the synodial fringes and to the more dependent portions of the joint, or they may be floating about in the free exudate.

In mild cases of synovitis the condition described lasts from a week to ten days, when, by the gradual absorption of the exudate and the return of the distended vessels to their natural condition, the joint resumes its normal appearance and function. In other cases absorption goes on very slowly or it may altogether fail to take place, under which circumstances there is established the condition known as **hydrarthrosis,** the chief feature of which is the effusion into the joint.

Simple Purulent Synovitis.—In less favorable cases or in consequence of improper management the exudation increases often to enormous proportions. Its character may also change; turbid at first, from the admixture of few cellular elements, these increase until the exudate assumes a purulent character. The rapidity with which the effusion becomes purulent is at times so great that the synovitis in these cases seems to be purulent from the beginning. Except from the latter, the condition of the joint-interior does not vary at first in the simple purulent form of synovitis from the serous.

Particularly in children, as Volkmann and Krause have shown, there may be a purulent effusion into the joint without destruction of the articular surfaces or permanent impairment of synovial membrane, joint capsule, or ligaments, provided spontaneous perforation occurs or an early outlet is made for the discharge.

Dry Synovitis.—In certain cases of acute synovitis the fluid exuded may be very small in quantity or altogether absent. In proportion, the flakes of fibrin are greatly increased, until they may appear as a continuous layer covering the articular surfaces and forming a deposit of varying thickness on the synovial membrane and cartilages. The fibrin thus thrown out shows remarkable tendency toward organization. The smooth, glistening character of the serous surfaces is lost. In its place there are masses of fibrin, often unevenly disposed, and by joint-movement often drawn into shreds of unequal length and adherent at one or both ends. If ankylosis does not occur, these shreds may speedily become detached and present themselves in the form of many small bodies, the size of a pea or bean, round or ovoid, and consisting of concentric rings of fibrin (rice bodies). In other cases the joint surfaces are speedily welded together by the organization of the exuded lymph. Ankylosis may sometimes follow an acute dry synovitis with remarkable rapidity.

Symptoms and Diagnosis of Acute Synovitis.—The superficial position of most of the joints facilitates the recognition of a simple synovitis. Except in the joints deeply seated, like the shoulder and the hip, the four cardinal symptoms of inflammation can be easily recognized. In the latter joints only are we called upon to look to other than the characteristic symptoms for recognition of the condition. As is noted in the symptomatology of joint injuries, the patient first complains of pain, which, as a rule, is proportionate to the rapidity of the joint distention with fluid. Generally the pain is complained of in the joint itself. Only in exceptional cases, as in the hip, is it felt in a part far removed. With the pain there is associated more or less tenderness, often felt at one or more points along the articular line rather than over the entire area. In cases of traumatic origin the reason for this is apparent. In other cases Volkmann has ascribed these special points of tenderness to the deposit beneath them of fibrinous material. It is more probable, however, that these special points of tenderness correspond to the attachment of ligaments or duplicatures of the synovial membrane, which are stretched by unequal tension of the effusion in the joint when pressure is made over them. When pain is not complained of when the limb is at rest, it will often be found to be very severe when any effort at motion, voluntary or passive, is made. The swelling is the most marked feature of a simple synovitis. Often within 24 or 48 hours it is sufficiently developed to have effaced all the normal outlines of the joint.

The development of an acute synovitis is very frequently, although not always, associated with definite change in the position of the limb. For the most part one midway between flexion and extension is assumed, and maintained throughout the entire course of the disease. The knee becomes flexed upon the thigh, the foot becomes

placed in the position of talipes equinus, the hip becomes flexed and abducted. When the shoulder is involved, the arm is held close to the side of the body; in disease of the elbow the forearm is extended at an angle of 140 degrees; in disease of the wrist there is a slight drop, the fingers are maintained almost in extension, and the hand somewhat flexed on the forearm. The assumption of these positions has been accounted for through the fact that by them an equal pressure on different parts of the joint surface is secured, since they are positions taken by the joints when injected experimentally. This explanation does not obtain in cases of synovitis, since in some of great distention with serous fluid no faulty position is assumed. In every case of purulent synovitis this tendency to contracture makes itself apparent early, as it does also in cases of tubercular disease, to be hereafter considered. It is exceedingly probable, therefore, that the contracture is a fixed phenomenon, manifested only when, from the nature of the disease, prolonged fixation in the position in which extensors and flexors are equally favored is to be maintained for a long time.

The symptoms heretofore considered are far more important than the remaining cardinal symptoms of redness and heat. In simple serous synovitis redness, as a rule, is altogether absent. In the purulent form it is present only when preparations are making toward spontaneous perforation. When synovitis is the result of joint contusion, the reaction following periarticular injury is often causative of a redness far in excess of that which follows the synovitis alone. In joints superficially placed, like the elbow, the knee, and the wrist, a local elevation of temperature of from 1 to 2 degrees may usually be recognized.

In cases of suppurative synovitis the general symptoms reflect the greater gravity of the local condition. With the systemic absorption of the products of inflammation, the usual accompaniments of toxemia, chills and continuous fever, coating of the tongue, and anorexia are found.

In the dry form of synovitis many of the local symptoms of the serous and purulent varieties are absent. Pain and tenderness are often very marked, and out of all proportion to the swelling, which, as a rule, is slight. In these cases the tendency to faulty position is very early developed. When efforts at motion are made, crepitus is felt. Movements of the patella upon the front of the femoral condyles may likewise cause such joint crepitus. When the latter is insufficient to be felt, it is distinctly audible when the ear is placed over the joint and the articular surfaces are moved upon each other. Passive movements are more painful than in the synovitis with effusion, and the pain associated therewith increases with the tendency to the formation of adhesions. The latter may form as early as the first week, and be firm enough to demand the anesthetizing of the patient for their severance and the correction of the concomitant deformity. The general symptoms in cases of acute dry synovitis are often out of proportion to the severity of the local condition.

Arthritis is inflammation not only of the synovial membrane, but of all the structures of a joint. It may be acute or chronic and is due to traumatism, extension by contiguity of tissue, nervous influence, or injection by way of the blood as, for instance, infectious fevers (scarlet fever, variola, measles, typhoid fever, pneumonia, erysipelas), gonorrhea, syphilis, gout, tuberculosis, pyemia.

Acute infective arthritis is due to pathogenic organisms. If suppuration occurs, in addition to the synovial lining, the cartilages participate in the morbid process. They lose their pearly hue and assume a reddish or even blue tinge. Blood-vessels appear within them, and absorption, often in patches, takes place, the subjacent bone thereby becoming exposed. Shreds of cartilage are often raised in areas, become necrotic, and are thrown off into the joint cavity. The ligaments become softened and permeated by small purulent foci; the joint becomes loosened and devoid of function.

Displacements of the articular ends of the bones are therefore of early and frequent occurrence. Caries of the articular ends, extending for a greater or less distance into the epiphyses, results. The periarticular structures, bursæ, and tendon sheaths take part in the suppurative process. Abscesses communicating with the joint occur and develop in different places. They are often far removed from the part primarily involved. Unless adequate treatment is instituted, the destruction of the joint invariably follows. If the limb is saved, the suppuration gradually subsides through the drainage given by fistulous formations or by surgical treatment. The joint cavity is almost always obliterated. Ankylosis, fibrous or bony, is an almost inevitable result.

The general symptoms of acute suppurative arthritis are proportionate to the severity of the local condition. Almost from the beginning the temperature rises from 3 to 5 degrees, and continues, with morning remissions, until vent is given to the inflammatory products or until death ensues from exhaustion. The fatality of this condition will be referred to in the section on penetrating wounds of the joints. See JOINTS (Injuries).

Gouty arthritis is but a manifestation of the general condition. It is serous, limited usually to the metatarsophalangeal joint of the left foot, associated with extensive periarticular swelling and redness. Through the soft parts, after the subsidence of the acute disease, nodules of calcareous deposit can often be felt within and about the joint structures, more or less defacing the joint outline and limiting motion to a varying degree. The subjective symptoms of pain and of tenderness are in excess of the local underlying conditions. Both rheumatic and gouty synovitis are further characterized by their tendency to become subacute, and even chronic. The structural changes involve the cartilage, ligaments, and periarticular structures. Both of these forms of synovitis, but particularly the gouty, are characterized further by their tendency to recur.

Gonorrheal arthritis is due to infection from the urethra or rarely from the conjunctiva in gonorrheal ophthalmia. Generally it arises during the subsiding stages of the primary gonorrheal urethritis or in chronic cases. According to symptoms it may be divided into seven varieties, as suggested by R. P. Howard of Montreal:

1. The simple *arthralgic* form, in which there is pain, without fever, with a tendency to travel from joint to joint.

2. *Rheumatoid gonorrheal arthritis*, very similar to acute inflammatory rheumatism. In addition to the local symptoms of rheumatism, fever is present and frequently polyarthritic involvement out of proportion to the severity of other symptoms (maximum 102° F.).

3. *Acute gonorrheal monarthritis*, in one joint only, characterized by severe pain and swelling and moderate fever. The knee-joint is most commonly attacked. Next in order follow the ankle, shoulder, elbow and wrist. Suppuration is rare.

4. *Chronic gonorrheal arthritis*, without or with effusion (chronic hydroarthrosis). Rarely suppuration takes place and pus is found in the joint cavity. There is generally slight rise of temperature.

5. The *periarthritic* variety, characterized by involvement of the periarthritic tissues, including the periosteum, capsule, ligaments, tendons, and adjacent fibrous structures, without the joint cavity itself being attacked

6. A variety that attacks *fibrous tissue not connected with joints*, as the plantar fascia, the sclerotic coat of the eye and iris, the pericardium and endocardium.

7. The *septicemic form*, characterized, in addition to the arthritis, by symptoms of general sepsis and endocarditis.

The diagnosis of gonorrheal arthritis is not difficult when the presence of the primary disease is known. From ordinary rheumatism it may be differentiated by its being monoarticular as a rule, the ankle, knee, and wrist being most frequently involved; by the low range of temperature, the absence of the profuse sweating and heavily loaded urine characteristic of rheumatic disease. Gonorrheal rheumatism, as it is too often misnamed, as a rule retrogrades slowly toward recovery. Often, however, the effusion becomes permanent. In other cases the plastic material thrown out tends toward the formation of fibrous ankylosis. Most ankyloses of the knee that are not the result of tuberculosis or trauma in young male subjects owe their origin to gonorrheal infection. Complications of general infection, such as endocarditis, may occur. Syphilis very rarely produces primary acute articular disease. Occasionally during the eruptive stage joint pains are complained of. Serous effusions do not occur frequently, and are almost altogether limited to the knee. Ordinarily, the joint complications of syphilis are secondary to gummatous deposits in the epiphyses. In the hereditary syphilis of early life multiple joint lesions of this nature are often seen. In doubtful cases aspiration should be resorted to and a study made of the fluid secured.

Treatment.—The treatment of acute *arthritis* has a fourfold object: (1) The limitation of inflammatory process; (2) the removal of the products of inflammation; (3) the prevention of deformity; (4) the restoration of full physiologic function.

Position and rest are important elements of treatment of inflammation of the larger joints. The patient should be put to bed and the limb suspended at nearly a right angle. Suspension alone often cuts short an attack of synovitis. When possible, a proper splint should be applied, and circulation controlled by an elastic bandage. Applications of ice or astringent lotions of acetate of lead and tincture of opium or the chlorid of ammonium will be of service.

To remove the products of inflammation preparations of iodin, of mercury, and of lead may be used. Blisters are often very efficacious, after the acute stage has passed off. Fixation of the joint in plaster-of-Paris, starch, or liquid glass is often very serviceable. Such fixation should not be continued for more than 2 weeks at a time. Massage and elastic compression will likewise prove efficient in removing joint effusions. When the latter resist these measures, aspiration of the joint should be practised. While all of the fluid cannot be removed by aspiration, the removal of only a part will relieve the intraarticular tension sufficiently to permit the function of absorption by the synovial membranes. When one or two aspirations have failed, a permanent cure can be generally secured by injecting into the joint cavity 2 or 3 drams of a 5 percent solution of carbolic acid. Bier's hyperemic treatment (*q. v.*) has been applied with benefit especially in acute gonorrheal arthritis.

In suppurative arthritis efficient drainage must be secured at the earliest possible moment. Without it, joint function cannot be saved. Arthrotomy—*i. e.*, the removal of the entire synovial membrane—often proves a conservative measure.

Deformity is to be prevented by giving the limb a proper position from the onset of the disease, and one, which, in the event of ankylosis, would leave it most useful.

Restoration of function is the most difficult achievement in the treatment of acute joint-diseases. It can be met only by properly conducted passive movements instituted as soon as the height of inflammation has been thoroughly passed.

In gonorrheal arthritis in addition to combating the urethritis, absolute rest of the joints involved, and inunctions of colloidal silver ointment (1/2 ounce into each joint involved three times a day) are recommended, ichthyol ointment (10 percent) being advised in the interval between the inunctions. Reports of the use of antigonococcus serum and vaccine therapy (*q. v.*) are encouraging. Antistreptococcus serum has been used with good results. See SERUM THERAPY.

Chronic Joint-diseases

Hydrarthrosis.—This term is used to designate a serous effusion into a joint with a tendency to chronicity. Strictly speaking, it is not a disease,

but a result common to many conditions in and about the joints.

Often in its inception it follows an irritation or an inflammation, the acute synovitis becoming chronic. On the other hand, effusion is often the result of changes in the vicinity of joints.

A tubercular or gummatous nodule and sarcoma of the epiphysis will often be associated with hydrarthrosis. Chronic articular rheumatism and osteoarthritis, or a retarded circulation, such as occurs in phlegmasia alba dolens, may be followed by hydrarthrosis. In very rare cases the hydrarthrosis is intermittent. It occurs at fixed intervals, and usually in both knees. The knee is more frequently the seat of hydrarthrosis than all the rest of the joints together. The effusion is generally serous. Even after long-continued distention of the joints the important ligaments do not, as a rule, become relaxed, so that pathologic displacements are rarely seen; usually there is some muscular atrophy, but contractures do not take place. The diagnosis of hydrarthrosis of the knee, elbow, wrist, and ankle is easily made.

Effusions into the shoulder and hip can only be recognized when they are quite large. The wave of fluctuation in extensive effusion is distinct. The articular outlines are effaced, and in the knee the ballottement of the patella can be easily demonstrated. The chronicity of the condition, its slow development, the absence of fever and pain, confirm the diagnosis.

Treatment.—In comparatively recent cases of hydrarthrosis absorption may frequently be secured by the treatment advocated for acute synovitis with serous effusion. Friction, methodic massage, repeated blisters, and the continuous application of an elastic bandage will often effect a permanent cure. In the failure of these measures recourse may be had to immobilization, from which the danger of ankylosis is not so great as in the cases of acute disease. In the majority of old standing cases, however, recourse must be had to aspiration of the joint, to be followed by irrigation with a 5 percent solution of carbolic acid, of which from 5 to 10 c.c. may be allowed to remain within the joint. To make the injections painless, a 0.5 percent solution of cocain may be injected before introducing the carbolized water. In cases when even this has failed, the draining of the joint may be resorted to.

Chronic Articular Rheumatism.—This is a condition of advanced life, and often found in the lower social strata. Individuals who have always been well nourished are not often subject to this disease. It occurs oftener in men who have led exposed lives; the earlier decades of life are, as a rule, exempt. The disease may follow in the wake of an acute rheumatic attack; generally it is subacute or chronic from its inception. Like its acute prototype, it is polyarticular. The pathologic changes of chronic articular rheumatism vary with its severity and duration. Joint effusions are ordinarily limited in amount, if at all present. Primarily, the synovial membrane, the capsule, and the periarticular structures are involved. The synovial membrane becomes thickened, the ligaments indurated, and the periarticular fasciæ show a tendency to become fixed.

The symptoms and course of chronic articular rheumatism correspond to the morbid conditions described. Mild or severe pain in one or more joints will be complained of. This is associated with restricted movement in the respective joints. There is usually an absence of redness over and about the joint, and tenderness is never excessive.

Joint-motion is very often associated with a distinct crepitus. With the continuance of the process, restriction of motion and faulty position will often eventuate in the disability of an entire limb. It is in this way that, by the multiplicity of the joints involved, the subject of chronic articular rheumatism is often permanently invalided. Acute exacerbations of the chronic disease are of frequent occurrence.

The diagnosis is ordinarily easily made. The conditions with which it may be confounded are arthritis deformans and the articular affections consequent on diseases of the spinal cord.

The treatment of this condition is chiefly general. During the acute exacerbation sodium salicylate or aspirin is as serviceable as in the typical acute articular disease. During the intervals alkaline waters, particularly those containing lithia, have been found efficient. Sulphur and mud-baths, when long continued, seem also to have proved serviceable. Methodic massage may accomplish much in overcoming joint-fixation, hastening the absorption of effused fluids, and reducing the thickened capsule and periarticular structures. Injections, subcutaneously, of fibrolysin are recommended conjointly with baths, massage, etc. The injections are made twice a week into the arm, leg, or loins, but not near a joint.

Arthritis Deformans

This is also known as osteoarthritis, chronic arthritis, rheumatoid arthritis, arthritis sicca, trophic arthritis. It is a condition of degeneration and proliferation of the structures entering into a joint, the morbid anatomy of which forms a distinct entity. The causes which bring about the changes are far from being clearly apprehended. For this reason the disease has been variously named according to the views entertained concerning its nature. For the most part it develops by predilection in individuals past middle life, many of whom present evidences of arteriosclerosis. Occasionally it develops in young subjects, especially in girls after the appearance of menstruation.

As the immediate cause, trauma plays a most important rôle, particularly about the hip, rapid changes of an osteoarthritis nature following contusions of and about the trochanter. Within 3 or 4 weeks most extensive changes may occur which simulate the conditions following a fracture. Medicolegally, the knowledge of a trauma as the exciting cause is of signal importance.

Since recent studies have shown infectious processes in various cavities and structures as the nose, ear, tonsils, etc., and excessive intestinal putrefaction, the belief in the infectious origin of

the disease is gaining ground, while a chronic toxemia due to perverted metabolism is regarded as the cause by some observers.

Symptoms and Diagnosis.—In its clinical manifestations osteoarthritis, except in the rarest cases, is characterized by its chronicity and the tendency to joint-fixation, not by obliteration of the joint cavity, but by the development of osteophytic processes which mechanically impede motion. Pain is one of the chief symptoms of this disease. The joint, as a rule, shows early the deformation of its contour. The ligaments are thickened, prominent, and indurated; often bony deposits can be felt within them and continued into the periarticular fasciæ and tendons. In the early stages joint distention by fluid can occasionally be made out, although, as a rule, the process is one in which synovial fluid is rather reduced than increased in quantity. In accordance with this, the patient often experiences a distinct creaking or grating when he makes an attempt at motion, and, therefore, stiffness and pain in the part will be complained of in the morning until the joint has been considerably used after a night's rest. Acute exacerbations following a trauma, for example, or a breaking off of one of the osteophytic growths, may be followed by hemorrhage or serous effusion into the joint. This condition usually subsides more readily in cases of this character than in joints that are otherwise normal.

The beginning of arthritis deformans, except when it follows a trauma, is ordinarily insidious. Pains varying in their intensity, but often severe, and associated with creaking of the joints and moderate joint effusion, are among the earliest clinical manifestations. Very frequently the pains are of neuralgic character. In the hip, for example, they are referred to the sciatic nerve. The joint deformity, however, usually manifests itself early. Irregular nodules appear, grow slowly, and show no tendency toward absorption. With the temporary joint effusion and the pain, muscular contraction often manifests itself early, fixing the joint in an abnormal position. The course of the disease is ordinarily chronic, continuing at times for from 3 to 10 years or more. Exacerbations consequent on trauma are frequently shown; severer injuries may produce fracture or dislocation.

Treatment.—The treatment of osteoarthritis is extremely unsatisfactory. Hydrotherapy, spa treatment, and hot-air baths, are recommended. Injections of fibrolysin are advocated by Bannatyne and others. Marked improvement has resulted from the use of Bier's stasis hyperemia (*q. v.*).

In every feasible way joint-movement should be maintained by active and passive movements. Vibration and massage may also be advantageous. Fixation by immobilizing dressing is to be strenuously avoided.

Benefit has resulted from the following treatment: Cod-liver oil, carefully and thoroughly rubbed into the affected joints 3 times a day, with the internal use of effervescent citrate of lithium, 1 dram 3 times a day, and the following tonic mixture:

℞.	Mass of iron carbonate,	gr. v
	Fowler's solution.	♏ v
	Sherry wine, } each,	ʒ j.
	Water, }	

After meals, well diluted.

Sodium salicylate or preferably aspirin, is recommended early in the disease. Complete recoveries are reported from the long-continued administration in small doses of Fowler's solution.

Attention to diet and hygiene are also necessary. Removal of infection from any portion of the body, correction of digestive disturbances and the internal administration of tincture of iodin in increasing doses in plenty of water one hour before or two hours after meals and increasing to point of tolerance will be found valuable in many cases.

Cataphoresis combined with radiant heat is recommended highly. The patient, nude, rests within a cabinet entirely exposed except his head to the radiant heat from incandescent lamps. After a 20 minute sitting, cataphoresis with iodin ions is employed, the constant current being applied to the part after it has been painted with iodin liniment, or surrounded by compresses containing a solution of potassium iodid. See CATAPHORESIS. When structural changes have destroyed portions of the joint, palliative treatment is the only indication. Thorough blistering or the actual cautery will often remove local tenderness and afford much relief. See RHEUMATISM.

Neuropathic Joint-diseases

Joint affections may follow any injury of the peripheral nerves or of the spinal cord. For the most part they are associated with either locomotor ataxia or syringomyelia. Neuropathic arthritis appears clinically under two forms—the benign and the malignant. The former begins as an acute or subacute swelling of the joint and the periarticular structures. There is a serous effusion into the joint which is unattended by fever, pain, or redness. It may become rapidly absorbed. The malignant type is found exclusively in tabetic subjects. With or without absorption of the serous effusion the joint capsule remains relaxed and weakened, the ligaments show a tendency to undergo softening, and the ends of the bones are rapidly destroyed by absorption.

In very rare forms of the disease there is a hypertrophy of the articular ends. In the atrophic form the head of the femur may be absorbed, with or without leaving a trace. When the knee is affected, the entire condylar end of the femur and the head of the tibia may disappear. The joint becomes flailed, and there is a tendency to displacement. In over half the cases the knee is affected, the hip, shoulder, elbow, and foot being involved in the order named.

In very rare cases, either spontaneously or through trauma, the joint has been opened. Such a condition is very apt to be followed by very serious consequences as traumatism is decidedly injurious to these cases. Not infrequently these joints recover entirely from the

softening and absorption processes and become again useful, though deformed.

Treatment.—This is palliative. When the effusion is extreme, temporary benefit may be obtained by tapping and the injection of carbolic acid. Joint-fixation by retentive dressing aids locomotion. Operative interference is contraindicated in these cases as the traumatism of opening these joints will cause very serious and frequently fatal results.

Hysteric Joints

As a result of slight trauma, of overexertion—as, for example, in dancing—and very frequently without any exciting cause, there develops in hysteric subjects a train of symptoms which, to casual observation, may closely simulate organic joint-disease. From the time of Brodie the joints thus apparently affected have been designated hysteric joints. The individuals afflicted are usually girls and young women, sometimes pregnant, otherwise well nourished, and generally in the higher walks of life. They may or may not display other phenomena of hysteria or allied neuroses. The joints most frequently involved are the hip, the knee, and the ankle. Clinically characteristic of a hysteric joint is the disparity between the intensity of pain complained of and the local manifestations.

Another clinical characteristic of the condition is the variability of the position assumed by the limb. The variations often follow each other at short intervals. A sign to which Brodie called particular attention is the intense hyperesthesia of the joint and the overlying integument. This is more marked even than the tenderness of the joint in organic disease, in acute articular rheumatism, or in an acute periarticular abscess about to rupture. The pain of hysteric joints manifests itself only during the waking hours. The starting-pains complained of at night, so characteristic of some forms of organic disease, may be complicated by the exaggerated suffering of hysteria, but here the permanency of muscular contractures, joint-fixation in one position, and the test by anesthesia will make the diagnosis clear.

The progress of a hysteric joint keeps pace with that of other manifestations of hysteria. As a rule, under proper treatment it disappears rapidly, although in exceptional instances it continues for months and even years. A hysteric hip has been known to withstand all forms of treatment during 4 years, to become finally dissipated in a single night through imagination.

The treatment of a hysteric joint should be directed toward the psychic condition of the patient. When once thoroughly assured that there is no serious disease present, applications of electricity and massage will ordinarily speedily cause the symptoms to disappear. Too much attention should not, however, be given to local treatment, and retentive appliances and dressings should be strenuously avoided.

Loose Bodies in Joints

In previously healthy joints or joints that have been diseased there are frequently found bodies varying in size, number, and histologic construction, either loose and contained within the joint cavity, or adherent at some point by a pedicle of varying length and thickness. The joints oftenest the site of loose bodies are the knee and elbow. The former is involved in nearly 86 percent of all cases. In joints that have been free of disease these loose bodies—or floating cartilages, as they are often termed—are invariably the result of a trauma.

Allied to this class is that known as the internal derangement of the knee, in which, in consequence of a violent wrench, one of the semilunar cartilages, usually the internal, has been loosened from its moorings to the tibia and the coronary ligament, and is deflected toward the joint-interior. Primary laceration of the synovial fringe, or its infiltration with blood and consequent exfoliation, may likewise be the source of a foreign body in a hitherto normal joint. In diseased joints foreign bodies may develop as a consequence of fibrinous deposits on the joint surfaces. By organizations and long-continued attrition the deposits are broken up, as a rule, into large numbers of minute bodies varying in size from a grain of mustard to a bean. They compress each other into ovoid biconvex forms, and occasionally fill the joint cavity.

These *corpora oryzoidæ*, or rice bodies, have been so called from their shape, size, and pearly appearance.

The hyperplastic synovial fringes observed in many of the diseases of the joints form another common source of these loose bodies, many of them floating freely within the joint, others fixed by more or less attenuated pedicles to the joint-wall. These synovial fringes may present all the histologic variations of the connective-tissue types found in the make-up of the joint; therefore, these foreign bodies may be cartilaginous, contain true bone, consist of a mass of fat, present a cyst within their interior, and, in very rare cases, a mass of mucoid connective tissue.

Symptoms.—The symptoms of loose bodies vary with their size, situation, mobility, and the conditions under which they were developed. When they are small and numerous, as in cases of hydrarthrosis, tubercular disease, and arthritis deformans, they produce few symptoms, and rarely of themselves require attention. When the bodies are larger, the symptoms are far more pronounced. Frequently their existence does not make itself manifest until the immediate results of the accident to the joint have largely disappeared. Thus, after a fall upon the knee, for example, a loose cartilage will occasionally be discovered a week or ten days after the injury, and after a partial subsidence of the articular distention with serum and blood. In other cases months and years may pass after an accident before the loose body is discovered. In the largest number of cases the symptoms manifest themselves in consequence of the locking of the foreign body between the articular surfaces and the consequent violent stretching of the joint ligaments. An individual makes a misstep or an awkward movement, and suddenly feels an excruciating pain, which compels him to stand

where he is or possibly to sink to the ground. The limb itself usually remains fixed nearly in extension in the knee; in the elbow, at an angle of 130 degrees or 140 degrees. By a little manipulation the patient, or some one assisting him, brings the joint surfaces again into position, and, except for some tenderness of the part and temporary effusion into the joint, a return to an approximately normal condition follows. This incarceration of the foreign body occurs at intervals varying between a few weeks and as many years. Between the attacks the joint function, however, is rarely normal. Limitation of motion is very common. In the knee—the foreign body being usually in the anterior portion of the joint or in the subquadricipital pouch—complete extension is not easily accomplished. In the elbow—the foreign body lodging more frequently in the anterior pouch—flexion to a right angle cannot be made. In cases of partial detachment of the semilunar body it can often be felt in its abnormal position, and is but slightly movable.

A positive **diagnosis** of a loose body can only be made when it is subject to palpation. When felt, it appears as a hard, round body under the soft parts, usually over the interarticular line or in relation with the condyle of the femur. Its position can ordinarily be shifted, and, as a rule, it disappears from observation, often for long periods. Through long experience the patient himself is often more successful than the surgeon in bringing it to the surface. As to the nature of the foreign body, preoperative diagnosis cannot be made.

Treatment.—The multiple bodies which belong to the graver joint-diseases, like tuberculosis and osteoarthritis, very rarely require surgical intervention. In the larger bodies, which are the important factors in a diseased condition of the joint, the treatment is palliative or radical. The former consists in the wearing of an elastic bandage, which will, in a measure, keep the foreign body from lodging between the joint surfaces. The radical measure applicable to-day is extirpation. To transfix them by needles and bury them without the joint by subcutaneous measures should not now be practised. The excision, as a rule, should be made by an ample incision directly over the foreign body, which is held by an assistant, or, for the time being, transfixed by a needle. When, after the incision is made, the foreign body is not visible, manipulation of the joint surfaces will either bring it to the surface or expose it somewhere in the interior. In the latter event it can readily be drawn into the wound by means of forceps or blunt hook. If there is a pedicle, this should be cut off as close as possible, and preferably without previous ligation. It is always wise as far as possible to explore the interior of the joint for other foreign bodies, one of which might be readily overlooked in its more hidden recesses.

Tuberculous Arthritis

Synonyms.—Among the numerous names which have been given this disease are: Tumor albus, or white swelling; scrofulous or strumous disease; fungous disease of the joint; caries; and spina ventosa. Since the important investigations of Friedlander and the discoveries of Koch and the causative relation of the specific bacillus to tuberculosis, the term properly reserved for this destructive disease is tuberculous arthritis. This disease may attack individuals at any time of life, but is most frequently seen before the period of puberty. It may develop in infants; 84 percent of cases occur in children under 14. In them the hip, the knee, and the ankle are most frequently affected. In adults the wrist, the elbow, and the shoulder are often involved. Usually the disease is limited to one joint. In 5 percent of all cases it is polyarticular. Heredity plays a predisposing rôle.

An injury *per se* produces tuberculosis only through the infection of a blood-clot or the formation of an infective thrombus in the epiphyseal end of the bone. In children the source of tuberculosis is, as a rule, a latent tuberculosis of the bronchial lymph-nodes.

Pathology.—In advanced cases tuberculous arthritis includes in its destruction all the joint structures. In its inception, however, it begins in the epiphyseal end of the bone, when it is called osteopathic, or in the synovial membrane, when it is known as arthropathic. In children the disease is almost always of osseous origin, whereas in adults the synovial type predominates.

1. *Osteopathic Arthritis.*—This begins, as a rule, as a small nodule of reddish-gray or yellowish color in the epiphysis. It is situated near the epiphyseal cartilage or directly underneath the articular line. Whereas the tuberculous nodule is usually single, there may be many. The bone about the nodule is distinctly hyperemic. The bone trabeculæ are thickened, the cancellous spaces are devoid of fat-cells, and within them are often found miliary tubercles. They are often the means of extension of the disease. As the central focus increases in its dimensions it becomes yellowish in spots, both from deficient nutrition and fat necrosis. Thus there are found nodules varying in size from a pea to a nut, consisting of soft, cheesy material, containing spicules of bone that have resisted absorption. This material has been erroneously called tuberculous pus. The tuberculous nodule becomes surrounded by a layer of granulation tissue, which in turn becomes invaded with tubercles, and it is through the growth of this granulation tissue that bone absorption takes place. Through the growth of the primary focus in the direction of the incrusting cartilage the joint itself sooner or later becomes involved.

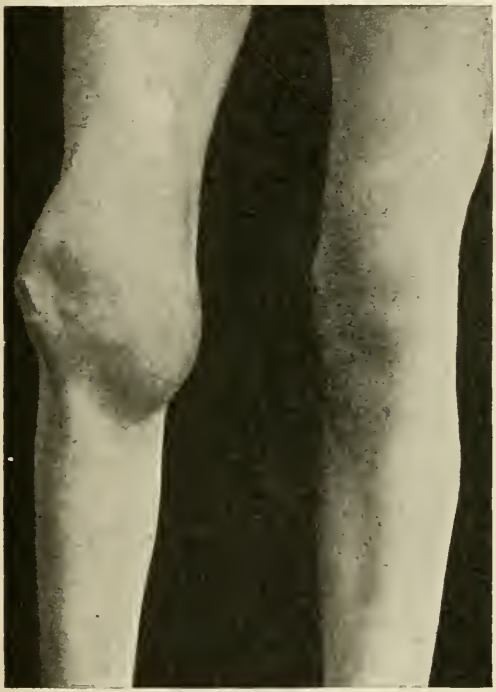
With the penetration of the disease into the joint a panarthritis is speedily developed. The synovial membrane loses its smooth appearance and becomes covered with fungous granulations. Within the joint there is found, as a rule, some fluid which is not strictly fluid, but is the product of the liquefaction of the cheesy foci and the cellular output of the fungous granulations.

The symptoms of this condition are a manifest enlargement of the joint, which is early emphasized by the wasting of the muscles, above and

below. Usually spindle-shaped, covered by an anemic, often glistening and adherent skin, underneath which a few of the larger veins will be seen, the joint now presents the typical appearance of tumor albus, or white swelling. In the majority of cases the capsule itself is softened at one or more places, whereby the granulation process becomes extraarticular. Sooner or later the skin is broken through, and the products of the tuberculous disease escape. Before the rupture of such abscesses they are sometimes designated cold abscesses.

As in other abscesses that have discharged, contraction usually takes place until a fistulous opening is left. In long-standing cases many sinuses are often found undermining the periarticular tissues. With the breaking of the abscess secondary infection takes place, and the destruction of the joint is more rapid than before.

2. *Arthropathic Arthritis.*—When the synovial membrane is primarily attacked, the tuberculosis may be diffusely disseminated over more or less



Tuberculous Hydrops of Knee.

of the entire area or be limited to one portion thereof, preferably one of its reflections or a synovial fringe. In the diffuse form there may be deposited a large number of miliary tubercles, without much change in the intervening tissue. The joint itself is not much altered. It is occasionally found in general miliary tuberculosis, of which it is only one of the many manifestations of infection. In other cases the diffuse tuberculosis of the synovial membrane is associated with increased vascularity, as a product of which an extensive serous or serofibrinous exudation is found within the joint. This latter, which is known as hydrops tuberculosis, must always be taken into consideration in the etiology of chronic articular effusions. The capsule itself is very often thickened by excessive vascularization, and as a product of this a more or less extensive deposit of fibrin will be found covering the synovial membrane and the articular cartilages. This may be extensive enough to cover completely the tuberculous nodules. The partial organization of fibrinous deposit from proliferation of endothelial layers underneath will often give rise to the development of rice bodies in large numbers, to which consideration has already been given. In the majority of cases the synovial membrane is very much thickened and softened, and within it there are disseminated tuberculous foci of larger size, which also invade the subsynovial tissues. Commonly, there is only a slight increase of the synovial fluid, which soon becomes turbid and pyoid. As in the osteal form of tuberculosis, granulation tissue develops from the surface of the synovial membrane, and soon occupies the joint-interior. From it are invaded the incrusting cartilages. Ordinarily, these present a distinctly worm-eaten appearance, and it is from the periphery toward the center that the process of invasion takes place.

Repair in tuberculous arthritis follows the paths by which recovery takes place in tuberculosis elsewhere. Its first evidences are found in the granulation tissue, which loses its succulence from decreased vascularity, and shows a tendency toward conversion into fibrous tissue. In this process small caseous masses are often left for years, and account for the tendency to recurrence of the disease. While it is certain that the bacilli do not live throughout such long periods, it is probable that their spores live and develop actively after a slight trauma, sustained sometimes years after an apparent cure has been effected. (Although this explanation is hypothetical, it best accords with the clinical facts as often seen.)

Symptoms.—The early stages of tuberculous arthritis are, as a rule, vaguely indicated by symptoms. With its progress the symptoms become more pronounced. Those to which attention is earliest directed are defective movements, swelling, deformity, and muscular wasting. The first of these is among the most valuable aids in diagnosis. There is early seen a limitation of movement, which is most marked in the shoulder and in the hip, almost always present in the knee, and to a less extent in the wrist and ankle. Tuberculous hydrops, which is oftenest found in the knee, may exist without limitation of joint-movement. Swelling and deformity are seen early in all cases of tuberculous arthritis, except in cases of the hip and shoulder. Though seemingly the deformity may be due to an enlargement of the bones, this, in reality, rarely takes place, and then only as an excessive repair. In very exceptional cases there is an absolute elongation of bone in consequence of tuberculous arthritis. The deformity is very frequently enhanced by partial or total luxation

In the knee there is a tendency toward subluxation backward of the tibia on the femoral condyles, the latter becoming abnormally prominent. In the hip what is left of the femoral head often leaves the deformed acetabulum, thereby producing great deformity, with shortening. The deformity is almost always enhanced by vicious joint-fixation.

Reflex contractures, invariably of the stronger flexor muscles, and angular deformity speedily ensue. The knee is flexed upon the thigh; the elbow becomes flexed at an angle of 120 degrees to 130 degrees; the wrist drops; the hip is flexed upon the abdomen; and the foot assumes the talipes equinus position by the contracture of the stronger muscles which act upon the joints named respectively. The contracted muscles can always be felt early as well-defined ridges in close proximity to the angle in which the limb is fixed. With the contracture there is often associated an atrophy of the muscles as an early evidence of the disease. Although the degree of atrophy may not at first be measurable, the flabby condition of the muscles is significant of its presence.

Pain varies materially at different periods of the disease and in the various types. It is most marked in the osteopathic form of the disease. In the synovial type, even when associated with large effusion, it may be slight or altogether absent. Whereas, as a rule, the pain is experienced in the joint involved, it may be reflected, as is the case notably in the hip, to parts far removed. Through fixation of the limb by muscular contracture motion does not necessarily increase pain. Children with advanced disease of the hip or of the knee often do not suffer at all, even from violent exercise. By substituting the functions of other joints for that of the one diseased, motion in the latter is involuntarily reduced to a minimum.

The constitutional complications of tuberculous arthritis are rarely marked in the early stages. Adults and children are seemingly in perfect health, except for the local condition. In proportion as this extends the general condition suffers.

The diagnosis of tuberculous disease is, as a rule, easy. In fully 90 percent of the cases it is almost self-evident. Far more difficult is it to distinguish the individual types of the disease. The fungous variety of the superficial joints, like the knee, elbow, wrist, and ankle, is very easily recognized by the swelling, the deformity, and the sense of false fluctuation. More difficulty attaches to the recognition of a deep-seated tuberculous nodule within the epiphysis. The condition with which this is most easily comfounded is the epiphyseal gumma of late inherited syphilis. The presence of corroborating evidences of syphilis, rapidity of development, and, above all, the therapeutic test, will, as a rule, make the diagnosis clear. The perfection of the X-ray now renders possible the very early discovery of a focus of disease in a bone end or joint and readily differentiates it from the possible complications.

From arthritis deformans tuberculous disease is easily distinguished by the chronicity of the former, the enlargement of the articular ends of the bones, and the tendency to osteophytic growth.

Prognosis.—The prognosis of tuberculous arthritis depends very largely upon the treatment instituted and upon the degree of local disease when it first comes under observation. With proper treatment the disease may be arrested in its incipiency, and it is possible for complete restitution to occur. In the great majority of cases, however, the best that can be hoped for is a limitation of joint-function, either from the partial obliteration of the joint cavity or from the development of fibrous adhesions.

Treatment.—The treatment of tuberculous arthritis must be based on the natural tendency of the disease toward recovery. With or without deformity such recovery ensues—in disease of the spine, for example, when operative influence cannot be resorted to early. Conservatism, therefore, must be the rule of treatment, and only after failure should there be resort to active interference.

Since tuberculous arthritis is but the local expression of an infectious disease, *general measures* are not to be overlooked. An abundance of fresh air, a suitable diet, and attention to cleanliness are of first importance. The internal administration of guaiacol and of creosote has been found beneficial. In the hands of very many Continental surgeons the modified tuberculin treatment has also been followed by excellent results. See TUBERCULOSIS.

The local treatment of tuberculous arthritis should, in the first place, be directed toward securing absolute rest for the joint. A prolonged rest in bed will often at once relieve pain and swelling, and even if prolonged through many months, will not interfere with the nutrition of the patient. Local rest is best obtained by the use of a retentive dressing of plaster-of-Paris, of starch, or of silicate of sodium, applied with sufficient snugness to distinctly compress the distended joint. In the joints of the lower extremity, except the hip, and of the upper limb, except the shoulder, and in tuberculosis of the spine, such retentive dressings are often the most serviceable of the methods of treatment.

In the inception of the disease traction (extension) is also very serviceable, particularly in overcoming the tendency toward the contracture of the flexor muscles. During the acute stages such traction can be best maintained with the patient in the recumbent posture, whereas later some form of traction splints can be successfully used. In tuberculous arthritis of the upper extremity the use of extension is far less valuable. When the contractures are firm enough to resist traction, an open division of the contracted parts should be made.

In very many cases it is advisable to attack the tuberculous disease directly by agents which distinctly destroy the bacillus or unfit its soil for necessary sustenance. Such agents are zinc chlorid, balsam of Peru, and particularly iodoform. The direct injection of either of these agents into a tubercular focus at intervals varying from 4 to 5 days to as many weeks will often obviate the necessity of a more or less crippling operation. The zinc chlorid may be used in the saturated or

50 percent solution, and from 4 to 5 minims injected. The balsam of Peru is injected undiluted. Iodoform may be employed in 10 to 20 percent solutions in sterilized glycerin or olive oil, and injected in quantities varying from 1 dram to 2 ounces. To avoid iodoform intoxication it is best to begin with a smaller quantity. While the injections are being made the urine should be carefully examined, since the gravest result of intoxication has been found to be parenchymatous nephritis. The iodoform solution should always be sterilized by submersion of the iodoform during 4 days in a 1 : 1000 solution of corrosive sublimate; it should then be thoroughly washed in sterilized water. The glycerin, and particularly the oil, should be sterilized by boiling.

Bier's hyperemic treatment (*q. v.*) and open air are valuable adjuncts to the iodoform injections. The suction cup is especially beneficial in open lesions.

When many fibrinous shreds come away through the cannula, it is advisable to incise the joint freely, with proper aseptic precautions, and thoroughly irrigate it with a saturated boric solution before making the iodoform injection. If necessary the incision may be sufficiently enlarged to make the operation exploratory, the incision being closed immediately after the injection has been completed. For a cure of tuberculous arthritis from 3 to 20 injections may be necessary, and the time required to effect a cure varies from 2 months to 1 year.

Hydrops tuberculosis will often disappear under rest and compression. In the failure of this, aspiration should be resorted to, to be followed by the injection of carbolic acid or iodoform. The so-called cold abscesses require special attention in many cases although when they are limited in size, they may be allowed to take care of themselves. Through defective operative treatment, septic infection, which may rapidly be destructive to joint and life, has often been induced in the past.

If conservative and mechanic measures fail, *operative treatment* must be resorted to. A free incision of the joint (arthrotomy) is the simplest measure. By arthrectomy, or joint erasion, the removal of fungous masses from the synovial membrane and the incrusting cartilages is made possible. If necessary the entire synovial membrane may be removed, and with the chisel or sharp spoon tubercular foci can be taken from the epiphysis. This operation is an atypical resection. The wound may be entirely closed or provision made for drainage by a strand of silkworm-gut.

Resection for tuberculous arthritis, formerly very extensively practised, is for good reasons less and less employed. If done before puberty, a great shortening of the limb will often result. Resection is indicated in children and young adults only after arthrectomy has failed. In persons beyond the age of puberty excisions are more often called for. Excision for tuberculosis of the larger joints is often reserved for the correction of deformity after the tuberculous process has healed spontaneously or through the methods of treatment, operative and otherwise, already mentioned. In tuberculosis of the wrist and of the foot total excision of the bones involved is to be resorted to, rather than the excision of the focus and its evacuation by curette or chisel. It is particularly in these cases that operative infection of contiguous joints and of overlying tendon sheaths is likely to occur.

In the absence of such infection the shell of bone which is left after the operation is filled with a clot which readily becomes infected, and in the contrary event is difficult of organization.

In severer cases of tuberculosis of the wrist or tarsus amputation will often afford the patient the quickest and safest road to recovery. Amputation must likewise be resorted to at times in children in whom the tuberculous and secondary suppurative processes have left the region of the joint riddled with sinuses and the bones destroyed over extensive areas. In the lower extremity such amputations must be made oftener than in the upper, but in both, with the improved surgical technic of recent years, the mortality following them has been reduced to a minimum. See Hip-joint (Disease).

JOINTS, EXCISION.—See Excision of Joints.

JOINTS, INJURIES. Contusion.—This is the simplest injury to which a joint is liable. It usually results from direct violence, such as a blow or fall. Occasionally it is the result of indirect violence. This is generally the case in contusion of the small joints of the hand and foot. When severe, a contusion makes itself manifest by hemorrhage into the periarticular tissues. Within 24 hours or more the blood permeates the subcutaneous layer and appears in the form of ecchymoses of greater or less extent. In the severe forms of contusion considerable hemorrhage into the interior of the joint takes place. Swelling of greater or less extent, with loss of the normal joint outline, will make easy the recognition of this condition. Pain, as a rule, is never very severe, the inconvenience of the joint-movement and tenderness on pressure being the only subjective symptoms. In exceptional cases, however, pain is often severe enough to produce faintness. Even in these cases its duration is short. When there is an extensive hemorrhage into the joint, a slight rise of temperature may result during the first 24 or 48 hours.

The treatment of contusion consists of rest, evenly applied bandages, and elastic compression. If much pain is complained of, applications of ice during the first 24 hours will often give great relief. After the lapse of 2 or 3 days, passive movements should be made and systematic massage of the joint practised.

Sprains of joints are considered under Sprains (*q. v.*).

Penetrating Wounds.—The injuries of joints hitherto considered may prove serious to the function of the limb, but being subcutaneous, they never, *per se*, jeopardize either limb or life. In strong contrast to these, therefore, are the wounds in which communication is established between the external air and the joint-interior. Penetrating wounds, particularly of the larger joints, like the knee, the hip, the shoulder, and the ankle, may, and often do, become among the gravest of the

injuries to which the body is subject that are not immediately fatal.

A joint wound becomes dangerous only through infection. That mere opening into a joint is free of danger is displayed daily in the operating-room. Aspiration, puncturing with a trocar, free incision for the removal of foreign bodies, with the proper precautions as to asepticism, involve no danger. A wound of the synovial membrane heals by primary union, as does a wound of the skin. The great danger of infection of a joint from a penetrating wound lies in the complicated construction of many of the joints, the difficulty in securing adequate drainage, the communication normally present between the joint and surrounding bursæ, and the ease with which the connective-tissue planes about the joint are involved in the diseased process.

Penetrating wounds of the joint may be divided into the incised, the punctured, the lacerated, and the gunshot injuries. In very many instances the wound is complicated with more or less extensive injury to the surrounding structures, particularly the bones, the larger blood-vessels, and the nerve-trunk. For practical purposes simple incised wounds may be differentiated from the complicated forms, for in the latter the opening of the serous cavity is less significant than the concomitant injury to bone, blood-vessel, or nerve. In civil practice the injuries most frequently seen are of the punctured or incised variety. The shoemaker thrusts an awl into his knee, or the woodman sinks his ax into ankle or knee; the mechanic occasionally thrusts a pointed instrument into the wrist-joint. The wound of communication, it will therefore be seen, varies in its size, being often so small as to be just perceptible, or large enough, on the other hand, to afford a view of the joint-interior. In the latter instance the diagnosis is, of course, simple; in the former, on the other hand, it may be difficult to recognize the penetrating nature of the injury, and often it is impossible.

Symptoms.—Cardinal signs indicative of penetrating joint-injury have been said to be the outflow of synovial fluid, pure or mixed with blood, and, in the absence of this, the rapid filling up of the joint cavity with blood. Neither of these signs is pathognomonic. The opening of a periarticular bursa or of a tendon sheath will permit the outflow of a fluid closely allied to the synovial. When the perforation is small, the opening in the joint closes, and will allow no permeation of fluid through the wound tract. The accumulation of fluid within the joint, on the other hand, will often attend contusion of the joint without perforation. It is not uncommon, for example, to find, in consequence of falls upon the knee, a contused and lacerated wound of the periarticular structures, followed by hemarthrosis, without penetration of the joint.

In compound fractures of the epiphyses joint-penetration may often be suspected, but is rarely subject to demonstration until, in neglected or badly treated cases, the joint reacts to septic infection. When the diagnosis cannot be otherwise established, the careful use of a sterilized probe may bring certainty. In small, punctured wounds the displacement of the tract between muscles and tendon sheaths will often render the search futile. If indications arise demanding a positive diagnosis, an enlargement of the wound under anesthesia and exploration of its course must be made as the preliminary step of the proper operative treatment.

Punctured and small incised wounds of even the largest joints are not, as a rule, attended by severe constitutional disturbance. A man with a punctured knee may follow his vocation for a day or two without any marked local or general disturbance. In the lacerated wounds, on the other hand, there is, as a rule, very great depression. Being often associated with fracture or dislocation, and accompanied by profuse bleeding, the shock manifested is often extreme.

The clinical course of these injuries depends wholly on the presence or absence of primary wound-infection. In the latter even large wounds heal by first intention without local or general reaction. The continued outflow of synovia for several days, while it jeopardizes so fortunate a result, does not annul it.

In the presence of infection the course will be determined, to a large degree, by the nature of the infection, the facility for drainage, and the treatment instituted. The introduction of the less virulent pus-microbes into punctured wounds may be followed by a period of quiescence varying from 2 days to a week. The vascularization of the synovial tunic is then made evident by a serous articular effusion, which speedily becomes turbid and contains flakes of lymph. The joint and periarticular tissues become reddened, disfigured, painful, and tender. Often a chill announces the inception of the suppurative process. In evidence of systematic toxemia there is a continuous fever with morning remissions, which continues while intraarticular pus-retention exists. In these milder forms of traumatic synovitis, if ample opportunity for drainage is afforded, the integrity of the joint may still, to a large extent, be maintained. The outflow of the pus through one or more openings reduces the intraarticular tension, the discharge in the course of a few weeks becomes reduced to a minimum, the cartilaginous covering may even be left intact, and the joint saved with a fair degree of function.

In the cases of grave infection with insufficient drainage, the joint structures soon undergo changes that place them beyond repair. The synovial membrane becomes greatly thickened, the surrounding ligaments become softened, the cartilage covering the bones raised at first in areas, then separated altogether from the underlying bone. The joint structures thus become almost altogether unrecognizable. Communications are established between the pus-cavity into which the joint has been converted and the bursæ originally communicating with the joint tendon sheaths overlying them. In this way a joint-abscess finds its way to the surface, often in as many as from 3 to 6 places, removed from each other by considerable distances. While this process in and about the joint is going on, the limb becomes often enor-

mously swollen, the general septic manifestations are very marked, and, unless relief is afforded, death may sooner or later occur. But even in such unfortunate cases life and limb are often preserved after protracted suppuration, lasting at times for many months.

As in wounds of the soft part, those of joints that are primarily infected with the more malignant pus-formers (the streptococcus infection), if left to themselves, often run a more rapidly fatal course. From the very beginning the general manifestations of sepsis are graver. Within 24 hours of the injury the joint is already enormously tumefied. Within 48 hours the discharges are slightly putrid, and often an examination of the joint reveals free gases in the interior. In these cases ascending phlebitis of the deeper veins often leads to rapidly spreading gangrene of the extremity. In one case of a wound of the knee with such grave primary infection gangrene had developed within 24 hours; within 30 hours the gangrene had spread to the hip, ending fatally within 33 hours from the infliction of the injury. Between these extremes in the clinical course of penetrating wounds of the larger joints there are all degrees of rapidity and virulence of symptoms consequent on infection.

In penetrating wounds of the smaller joints, particularly of the hand and foot, owing to their greater simplicity, the local and general manifestations are proportionate to the size of the joint injured. Whereas, as a rule, the function of the joint involved is permanently restricted, the infection remains localized and limited, and life is rarely threatened. But even in this regard caution in prognostication is essential, since the extension of disease to parts far removed from the primary injury occasionally ensues.

The treatment of penetrating wounds of the joint must have for its objects: First, the securing of primary union through the prevention of infection; and, second, the treatment of the traumatic arthritis when the infection has already taken place. To meet the first condition is simple when the diagnosis is clear. Like wounds in other parts, joint wounds must be thoroughly cleansed. Unevenness of the surface and contused edges must be removed by clean incisions, and the joint should be thoroughly explored for parts of the vulnerating body which have possibly remained embedded in it. To accomplish this, the wound into the joint may, without fear, be very much enlarged. The joint cavity is then to be thoroughly irrigated with a sublimate solution of 1 to 4000. If there has been much oozing, a silkworm-gut strand may be left for drainage. The wound is closed by sutures, and the joint, being aseptically dressed, kept at rest.

When the diagnosis of joint-penetration is in doubt, the treatment should depend largely upon the facilities for aseptic exploration at the command of the surgeon. Without such facilities it is probably wiser to await the development of symptoms indicative of infection before resorting to operative interference. When the surgeon has control of his surroundings, it is advisable, as in cases of doubt pertaining to penetrating wounds of the abdomen, to enlarge the punctured or incised wound, to trace it to the joint capsule, and, if this is found to be penetrated, to treat it as in the cases just considered. With the first evidences of septic infection, in either class of cases, the treatment must consist of the antiseptic management of the joint-interior. By this is meant a free incision for the removal, through drainage, of the contents of the diseased joint and antiseptic irrigation of the joint-interior. In proportion as these objects are sought early or late, the integrity of the joint will be more or less maintained or entirely lost.

In the management of traumatic suppurative arthritis the position of the limb should be kept in mind, with a view to probable future ankylosis. Left to itself, a suppurative arthritis of the knee will invariably leave the limb much flexed; of the elbow, the arm slightly so. An early regard for the position to be attained is therefore an essential element of treatment.

When the penetrating wound of a joint is only one feature of a complicated trauma, the question of primary excision, or even of amputation, may arise. For uncomplicated wounds of the joint neither of these operations is primarily indicated. In cases of compound dislocation, with fracture into the epiphysis, particularly in the upper extremity, a primary excision will often save a useful limb. The same is ture of compound dislocations of the ankle. In a compound dislocation of the knee the force producing it is necessarily so great as to make the joint injury of secondary importance. In such a case primary amputation must, as a rule, be resorted to.

Gunshot Injuries.—Gunshot wounds of the joints are always lacerated and contused, and for this reason alone afford a better soil for infection. In the wounds made by larger missiles there is always added considerable injury to the epiphyseal ends of one or both of the contiguous bones. In these wounds the epiphyses are often shattered beyond repair, and the larger vascular or nerve-trunks are often involved to a degree calling for immediate amputation. A gunshot wound of a larger joint by a ball of larger caliber, when left to itself, often pursues a rapidly fatal course. Of 271 joint injuries in the Russo-Turkish war (tabulated by Reyher), 146 proved fatal; mortality, 54 percent. From the very first day the joint becomes tender, the slightest movement giving rise to excruciating pain. The integuments become discolored, the veins distended, and gas-formation in and about the joint rapidly takes place. The constitutional symptoms accord with the degree of the local infection: the temperature ranges between 103° and 105° F., the sensorium becomes obtunded, delirium develops, and the patient, if unrelieved, often dies, in from 3 to 5 days, of acute septicemia. In the gunshot wounds of joints made by small arms, as seen in civil practice, the symptoms are far less pronounced. They accord with those described of the milder infected wounds that are penetrating from other sources; but even in these, owing to the damage done to contiguous bones and the presence

of foreign substances, the symptoms develop more rapidly. In wounds produced by the larger missiles fired from modern arms there is usually perforation, under which circumstances, as in gunshot injuries elsewhere, the wound of entrance is smaller than that of exit, and has a tendency to contract. The wound of exit is larger, often gaping, and on exploration presents detached spicules of bone. In wounds made by missiles of small caliber, perforation of the larger joints is not common. The missile may rarely be found loose between the joint surfaces. Often it is found firmly embedded in the epiphysis, after having produced more or less splintering.

The diagnosis of gunshot injuries of the joints by larger missiles is always simple. The probe, or preferably the finger, thoroughly sterilized, can be made to freely enter the joint cavity and detect the damage done. In the injuries produced by balls of small caliber the diagnosis is likewise, as a rule, easily made. The outflow of synovia mixed with blood, the rapid filling of the joint with fluid, the crepitus detected by manipulation, the impairment of joint-motion due to the presence of the missile or fragments of bone, make the diagnosis clear. There are, however, cases in which doubt must remain, as in the cases of other than gunshot wounds in the cavity of joints. In these cases, the X-ray will entirely clear up any possible doubt and should be used whenever possible. Wounds made by the smallest caliber revolvers or rifles ordinarily do little damage, the propelling force being slight, and they rarely carry before them particles of infected clothing. If left to themselves, primary union or healing under a blood-clot ensues, as in similar wounds of the soft parts. In wounds by larger missiles, even those from large revolvers, the source of wound contamination is chiefly in particles of clothing penetrating with the ball. The ball, as it comes from the manufacturer, has been shown to be almost sterile; the temperature to which it is raised in its course and by impact is insufficient to sterilize the foreign substance which it carries into the wound before it. In 3 out of 5 pistol-shot wounds of the knee recently recorded, particles of clothing were found in the track of the wound.

In joints with subtendinous pouches, like the elbow and the knee, penetration not infrequently occurs without injury to the bone. A similar penetration may occur, for example, from a wound in the anteroposterior axis of the knee without injury to the bone when the leg is flexed at an angle of about 140 degrees.

Treatment.—The course of healing is greatly influenced by the initial treatment. This is particularly true of gunshot wounds of joints. Except when profuse hemorrhage calls for immediate care, the first attention should be limited to the application of an antiseptic dressing. More should not be done until the best possible facilities are afforded for antiseptic and aseptic manipulations. Above all things, probing with finger or instrument can only be harmful unless every precaution toward surgical cleanliness is observed. Conservatism in the sense of antisepsis and immobilization is indicated in cases of smaller wounds, such as are seen in civil practice. In all other gunshot injuries of joints conservatism is probably most favored by primary operative treatment. Delay until the manifestations of infection compel a tardy interference entails disaster to life and limb more often than in joint wounds from other causes. This has been established beyond a reasonable doubt.

According to the varying conditions found, recourse must be had to exploration and lavage of the joint, atypical excision, or amputation. In civil practice the latter will rarely be demanded; even in military practice it will probably be reserved for the complicated injuries, of which the joint-penetration is only one element. Extensive injury to the soft parts, communication of both epiphyses and fracture extending into the diaphysis, injury to larger nerves and vascular trunks, are the conditions demanding primary amputation. As for severe injuries from other causes, amputations of the lower extremity, other things being equal, will be more often demanded than those of the upper. In the smaller wounds seen in civil life, when the diagnosis is clear, the facilities for asepticism should determine the course; without them, an expectant treatment limited to thorough cleansing of the wound and immobilization should be trusted to, rather than exploration.

With facilities for aseptic work at hand even the smaller wounds seen in civil life should be subjected to immediate exploration. The wound should be enlarged and the site of joint-penetration thoroughly exposed. When it is required for further manipulation, a free incision into the capsule must be made. With the parts so exposed the course of the ball can ordinarily be easily followed. If it has plowed its way into an epiphysis, the canal should be enlarged with chisel and sharp spoon until it is found and dislodged. Loose spicules of bone are to be removed with the forceps and uneven projections chiseled away. An atypical resection may thus be made. Particular care must be given to the removal of foreign substances carried in with the missile. If, in perforating wounds the manipulations have brought the operator near the distal side of the joint, a counter-opening should there be made. Ample facility for drainage is the condition on which success depends. After such atypical resection fair joint-motion is often retained. If both epiphyses are injured, it is probably wiser to make a formal excision, in order to obtain ankylosis. See GUNSHOT WOUNDS.

JUGULAR VEINS, SURGERY.—The physical signs of importance in connection with the jugular veins are distention, pulsation, and venous hum.

Venesection of the external jugular vein is performed in cases in which congestion of the brain, asphyxia, or similar indication exists, and is done at the root of the neck. The patient usually is reclining, a pillow beneath the shoulders and the head turned to the opposite side. A small cork or pad of lint (hard) is placed over the vein as it dips under the clavicle at the outer border of the sternomastoid muscle and held by the thumb or a

bandage passing beneath the opposite axilla. The vein is to be opened as it lies on the surface of the sternomastoid, the incision in the same direction as the fibers of the muscle. To arrest the bleeding, a compress is placed on the wound and held by the thumb until the pad has been removed. It is important to avoid the possibility of air passing down the vein.

Wounds of the external jugular are usually quickly fatal, owing to the great loss of blood or to the entrance of air into the circulation. The direction of the wound is important, as a transverse wound is held wide open by the action of the deep cervical fascia, and a longitudinal wound will not gape. If the internal jugular is wounded near its entrance into the skull, septic infection, venous and sinus thrombosis are additional dangers to the loss of blood and entrance of air. See NECK (Injuries).

JUNIPER.—The fruit of *Juniperus communis;* its properties are mainly due to a volatile oil, and it is a stomachic tonic, diaphoretic, diuretic, and aphrodisiac. The oil is eliminated by the kidneys. It is valuable in chronic pyelitis and cystitis; but is contraindicated when acute nephritis is present. **J., Olo.,** the volatile oil. Dose, 1 to 5 minims. **J., Spt.,** 5 parts of the oil in 95 parts of alcohol. Dose, 1 to 4 drams. **J., Spt., Comp.,** the gin of commerce; oil of juniper 8, oil of caraway 1, oil of fennel 1, alcohol 1400, water sufficient to make 5000 parts. Dose, 1 to 4 drams. *J. oxycedrus* affords oil of cade. **Oil of Cade,** a tar-like substance obtained by the distillation of juniper wood; it is sometimes used externally in eczema and psoriasis.

JUNKET.—Curds and whey; a delicacy for invalids, prepared by taking 1/2 pint of fresh milk heated to an agreeable temperature, adding 1 teaspoonful of rennet or essence of pepsin and stirring well. Let the mixture stand until curdled, and serve with sugar and nutmeg.

SAYRE'S JURY-MAST.—(*Stewart.*)

JURY-MAST.—An appliance devised to produce fixation of the spine, when the disease is above the middorsal region of the back, supporting the head and neck. The jury-mast consists of a vertical steel bar shaped to the curves of the head and neck, and attached to this steel bar is a sling which supports the chin and occiput. The lower end of the bar may be incorporated with a plaster jacket or riveted to a leather or poroplastic jacket. See SPINE (Caries).

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KAKKÉ.—See Beri-Beri.

KALA-AZAR. A chronic infectious disease widely distributed in certain parts of the tropics and characterized by persistent remittent fever, great splenic as well as hepatic enlargement, anemia, emaciation, and dysenteric symptoms. Hemorrhages into the skin and mucosa may be observed. Ulcers may appear on the skin or mucosa. The disease is probably caused by the Leishman-Donovan parasite, a form of trypanosome. The organism is obtained by splenic or hepatic puncture. This procedure should be resorted to for accurate diagnosis after the possibility of leukemia has been eliminated. The parasites are also found in ulcerations, bone marrow, and lymph glands near lesions and rarely in the peripheral blood. These bodies are round or oval, sharply outlined when stained, usually grouped in rosettes. Concurrent with this disease, malaria or hookworm disease may be found. The disease is fatal, death ensuing sooner or later from exhaustion or intercurrent disease. Isolation and quarantine should be insisted upon. Quinin is indicated for the fever; atoxyl and other organic preparations of arsenic, and salvarsan have been suggested, but little has been accomplished in the way of checking the disease.

KATATONIA (Alternating Insanity).—A mental disease characterized by irregular cyclic symptoms, ranging from melancholia to mania, followed by stupidity and confusion, with cataleptoid phenomena, and by lucidity for a time, recovery, or passing to a dementia. There may be a hereditary predisposition. The exciting causes are usually the result of some excess. It is rarely associated with organic brain-disease. No characteristic lesions have been found associated with katatonia.

A typical case begins with melancholia, the mental depression, uneasiness, and distress followed after a variable period by mania, associated with hallucinations and delusions. This period is followed in turn by a condition of attonita, or rigidity and immobility, or a cataleptoid paroxysm. Any of the stages may be succeeded by confusional symptoms, or a true dementia may develop. During the maniacal stage there is a tendency in many cases to histrionic and sermon-like declamation, or the speech may be of the verbigeration character—that noisy, incoherent, and meaningless speech seen in many manias, composed largely of the constant repetition of a few words or phrases. During the stage of attonita the presence of the so-called mutism, or mutacismus, "a pathologic tendency to be silent," may continue for days, weeks, or months, or it may be interrupted by periods of verbigeration. The immobility or rigidity so characteristic of a period of katatonia is frequently alternated with automatic, incessant, and monotonous movements—the stereotyped movements.

Patients suffering from katatonia often refuse food for days at a time, and then suddenly present symptoms of bulimia. Vasomotor and trophic changes are frequent, one of the most constant being cyanosis of the hands and other peripheral parts. Hematoma of the ear, insane ear or perichondritis of the auricle, is frequent. Epileptiform attacks may usher in the disease or occur during any of its stages. Katatonia differs from circular insanity in the absence of a genuine lucid interval, and the presence of the stage of attonita and catalepsy. The disease may continue for a number of years and recovery follow, but, as a rule, the prognosis is unfavorable.

Treatment consists in attention to the general condition, and combating the various symptoms as they arise. In cases associated with anemia, arsenic and strychnin seem to be valuable. Two cases were rapidly improved with small doses of hyoscin hydrobromid, 1/300 to 1/200 of a grain, morning and evening.

KÉFIR.—A fermented drink prepared from the milk of a cow or mare by the addition of a mushroom-like ferment found in the Caucasian Mountains. It is used by the natives of the Asiatic plains as a remedy for struma, anemia, lung and stomach diseases. Kéfir is richer in albuminoids than Kumyss, is less alcoholic and less acid.

The following table shows the average composition of Milk, Kumyss and Kéfir:—

	Cow's milk.	Kumyss.	Kéfir.
Albuminoids (casein, etc.)	4	1	4
Butter,	4	2	2
Sugar of milk,	5	2½	2
Lactic Acid,	—	1	1
Alcohol,	—	1½	1
Water and salt,	87	92	90

KELENE.—See Ethyl Chlorid.

KELOID (Cheloid).—A tumor of the skin resulting from overgrowth of connective tissue within the corium, arising from preexisting scar tissue or inflammatory exudation. The scars from lupus, burns, and syphilis are especially prone to it, and it may arise from the scars of boils. Colored races are more affected than the white, brunettes more than blonds. It is most common in the middle-aged. It is more frequent over the sternum and about the shoulders and neck.

Keloid seldom gives rise to much inconvenience, and when left to itself, progresses slowly or remains stationary for life or years, and may disappear spontaneously. It has no tendency to desquamation or ulceration.

Keloid formed in scar tissue should never be removed by the knife or caustics, since it always returns quickly. Left to itself, it has a tendency

to undergo slow atrophic changes. Mercurial or lead plaster will sometimes check a keloid growth. Belladonna plaster is useful in alleviating pain, and occasionally recourse must be had to morphin. Linear scarification and electrolytic puncture have been advised.

KERATITIS.—See CORNEA (Diseases).

KERATOGLOBUS.—Distention and protrusion of the cornea. The sclerotic may also become distended in severe cases. When so extensive as to prevent closure of the lids, it has been called **buphthalmos.** When the distention is transparent, regular, and cone-shaped, the apex of the cone being the center of the cornea, it is called **keratoconus,** or **conic cornea.** When the protrusion is opaque or connected with synechia of the iris, it is called **staphyloma** of the cornea, or anterior staphyloma. When due to increase in the fluids of the eye, with increased tension and uniform ectasia, it is called **hydrophthalmos.** Enlargement of the cornea is also called **megalocornea.**

KERATOSIS PILARIS.—A cutaneous affection characterized by pin-head sized papules situated at the mouths of the follicles, and resulting from epidermal accumulations or hypertrophy. The lesions are grayish, whitish, or blackish in color and are found most frequently on the extensor surfaces of the extremities. The skin is dry and rough, but there is no itching. Infrequent bathing is believed to be the most common cause. Bathing with soft soap and alkaline water, followed by vigorous friction, and inunctions of petrolatum constitute the treatment.

KERNIG'S SIGN.—See CEREBROSPINAL MENINGITIS.

KIDNEY, CONGESTION. Varieties.—(1) Acute congestion; (2) chronic congestion.

Acute Congestion of the Kidney

Synonyms.—Active hyperemia; active congestion.

Etiology.—(1) Irritant poisons; (2) surgical operations; (3) exposure to the cold and wet; (4) pregnancy; (5) eruptive fevers.

Pathology.—The kidney is slightly enlarged in size from an excessive amount of blood, and of a dark red color. The renal epithelium shows evidence of parenchymatous degeneration.

Symptoms and Clinical Course.—There is dull pain over the lumbar region, and pressure over the abdominal wall in the region of the kidney may occasion pain. The urine is diminished in amount, sometimes suppressed, darker in color, of high specific gravity, containing albumin, often blood and epithelial casts.

Prognosis depends upon the cause. In most cases it is favorable.

Treatment demands rest in bed and a liquid diet. The bowels should be kept active with Rochelle or Epsom salts (4 drams). Water may be given in abundance to aid in eliminating the effete products in the kidney.

Hot baths or vapor baths, by opening the pores of the skin, aid the affected renal organs in this work. The baths should not be prolonged over 10 minutes.

The following may be given:

℞. Sweet spirit of niter, ℥ vj
Solution of potassium citrate, ℥ ijss
Simple elixir, ℥ iij
Water, enough to make ℥ iv.

Or—

℞. Citrated caffein, ℥ ss
Water, ℥ ij.

Two teaspoonfuls every 3 or 4 hours.

Chronic Congestion of the Kidney

Synonyms.—Passive hyperemia; enlargement of kidney; passive congestion.

Etiology.—It is often the result of (1) venous stasis, as from disease of the heart, lungs, or liver; (2) of pressure of tumor on the renal veins or in the region of the kidney.

Pathology.—The kidney is swollen and of a dark brown or purple color. Hemorrhages occur in the cortex and beneath the capsule, and often in Bowman's capsules. The tubules may be distended with blood. In cases of long standing the kidney may become fatty, necrotic, or there may be an overgrowth of the connective tissue, and the affected organ will become smaller in size and very hard. This change is called *cyanotic induration.* Many of the epithelial cells of the tubules are fatty and contain oil droplets.

Symptoms and Clinical Course.—There is dull pain or feeling of weight over the loins. The urine is dark in color, scanty, and of high specific gravity (over 1020). Uric acid is increased; urea is normal or slightly increased. In the early stages albumin may be detected at certain intervals; later, it is found constantly. Hyaline casts and red blood-corpuscles are often present. There may be edema and anasarca.

The condition may terminate in true nephritis.

Diagnosis.—

CHRONIC CONGESTION OF THE KIDNEY.	NEPHRITIS.
1. Congestion in other organs.	1. Kidney often first affected.
2. Urine high specific gravity.	2. Urine high specific gravity at first, then gradually falling.
3. Transient albuminuria.	3. Albumin nearly always present,
4. Hyaline casts.	4. All varieties of casts, especially granular casts.
5. Urates and uric acid increased.	5. Diminished.

The prognosis and **treatment** are the same as in acute congestion of the kidney. See NEPHRITIS.

KIDNEY, EXAMINATION. Normal Position of the Kidneys.—The kidneys are situated in the right and left lumbar regions respectively. The right is somewhat lower than the left, on account of being pushed downward by the liver. The left is immediately adjoining the spleen.

The kidneys extend from the upper border of the twelfth dorsal vertebra to the third lumbar vertebra. Posteriorly, they rest upon the lower portion

of the diaphragm and the fascia covering the quadratus lumborum and the psoas magnus muscles. Anteriorly, the right is covered by the right lobe of the liver, the descending portion of the duodenum, and the ascending colon; the left one has in front the fundus of the stomach, the tail of the pancreas, and the descending colon. Both kidneys descend about 1/2 of an inch during inspiration.

Physical Examination. Palpation.—The abdominal walls should be relaxed by drawing up the knees when the patient is in the dorsal position. Bimanual examination is the best. One hand should be placed, posteriorly, over the region of the kidney, while the other, anteriorly, makes firm pressure downward upon the organ, and by a rotatory pressing movement the correct outline is determined.

At times it may be necessary to have the patient turn from one side to the other, or even upon the abdomen, in making the examination.

Percussion.—In persons with very thin abdominal walls percussion may be made anteriorly. Usually, however, this method of diagnosis must be applied posteriorly, by having the patient lie face downward and placing a cushion across the abdominal region. The cushion should be of sufficient height to press the kidneys against the muscles of the back. Strong percussion should be made, beginning from below upward, to find the lower border of the kidney. To find the external border, begin at a point farthest away from the organ, gradually moving toward it. It is practically impossible to detect the upper margin of each kidney, owing to the close relation to liver on the right and to spleen on the left. See Kidney (Surgery).

KIDNEY, INFLAMMATION.—See Nephritis, Pyelitis.

KIDNEY, INJURIES.—The kidney may be wounded, either through the loin or the abdomen; in the latter case the peritoneal cavity is opened, and probably other organs injured as well. In one or two cases prolapse has occurred, the whole organ being squeezed out through a wound in the loins.

The symptoms are the same as in contusion of the kidney, with, in addition, those due to the wound.

The prognosis depends upon the nature of the injury; incised wounds heal readily; gunshot injuries, on the other hand, are very likely to be followed by suppuration and sloughing; but extensive urinary infiltration is not common. The lumbar plexus may be torn, the colon opened, and even the peritoneal cavity traversed by a bullet, without the result being fatal. Fistula, however, and serious bladder troubles, phosphatic calculus and cystitis, not infrequently make their appearance afterward.

Treatment.—Hemorrhage should be checked as soon as possible, and any foreign bodies that can be found removed at once; but prolonged exploration with a probe in order to find a bullet is not advisable. The wound should be left open; and, as there is always a tendency for it to become valvular, a large tube should be introduced down to the bottom. Later on, if suppuration occurs, free incisions are necessary. In prolapse of the kidney, if it is much injured, a ligature should be placed around the pedicle and the organ removed; in other cases an attempt may be made to return it. See Kidney (Surgery).

KIDNEY IN PREGNANCY.—See Nephritis of Pregnancy, Eclampsia.

KIDNEY, MOVABLE. Synonyms.—Floating kidney; wandering kidney; ectopia renis; nephroptosis.

Definition.—A condition of the kidney, either congenital or acquired, in which the tissues around the organ are so lax and the renal vessels so elongated as to permit the kidney to be moved in certain directions, causing a movable tumor in the abdomen.

Etiology.—The kidney is normally held in position by the layer of peritoneum attached to the anterior surface of its adipose capsule. In movable kidney the adipose tissue in which the normal kidney is embedded partly or wholly disappears. The renal vessels are in many cases abnormally long. Relaxation of the abdominal walls from pregnancy or other causes; the use of tight corsets or girdles about the waist; violence; increased weight of the organ from disease; the pressure of tumors growing in the neighborhood of the kidney; and the traction of hernias, are all causes. The condition may be congenital or acquired; more frequently the latter. It is far more frequent in women than in men.

Recent anatomic studies have shown that the perirenal fascia contributes materially to the fixation of the kidneys. This fascia is a specialized portion of the retroperitoneal connective tissue, which descending from the lower part of the diaphragm, splits into two layers above the superior pole of the kidney, one passing in front and the other behind. The anterior layers blend with one another over the lumbar vertebræ. The posterior layer on each becomes attached to the vertebræ along the inner border of the psoas magnus muscle. Excessive development or acquired relaxation of this fascia, is now considered by many to be the sole cause of movable kidney.

Symptoms.—Floating kidney may and often does exist without any noticeable symptoms, the condition being unknown until accidentally discovered by the physician while making a physical examination of the abdomen. As a rule, however, patients experience a heavy, dragging pain in the abdomen, aggravated when walking or standing. There are also present gastrointestinal symptoms, more or less constant, with melancholia, aggravated by the mental anxiety over the presence of a tumor in the abdomen.

At times, from some unknown or unrecognized cause, the movable kidney swells and becomes very sensitive to the touch, and migrates a considerable distance from its normal position. Such an occurrence aggravates all the symptoms mentioned. This condition has been ascribed to a twisting of the ureter and consequent retention of the urine in the pelvis of the kidney, or to localized peritonitis, or to a partial strangulation of the kidney from compression or twisting of its

blood-vessels. Hysteric symptoms are frequently observed in women suffering from wandering kidney.

Diagnosis.—The possibility of dislocation of the kidney is to be borne in mind in determining the nature of obscure tumors within the abdomen. Flint based the recognition of this variety of abdominal tumor on the following diagnostic points: "It is situated in the hypochondriac region. It has the size and shape of the normal kidney, and this may be determinable by palpation, which is most advantageously employed by placing one hand over the lumbar region and the other in front on the abdominal walls, and then making counter-pressure from one hand to the other. It is generally movable, and in some cases the organ can be restored to its proper situation." Other tumors are to be excluded by the absence of their diagnostic characters.

It is a rare occurrence to have a fatal termination from movable kidney *per se*.

Treatment is symptomatic. Some of the inconvenience, and sometimes the suffering, attending movable kidney may be lessened by means of an abdominal bandage, belt, or supporter. Stengel proposes two plans of treatment: (1) Overfeeding, to restore the necessary perirenal fat—which, however, was not successful; (2) artificial support by an abdominal belt and kidney-shaped pad so constructed as to exert pressure upward, backward, and to the right, instead of directly upward, as is usual. If attacks of pain and swelling occur, the patient should be placed in bed, have hot applications over the abdomen, opiates ordered, and attempts made to replace the organ. Extirpation of a movable kidney has been successfully performed a number of times. Nephrorrhaphy is an operation for fixation of the kidney to the parietes by means of sutures. See KIDNEY (Surgery).

KIDNEY, PAIN.—There is great disposition among the laity to attribute any pain in the loins to kidney-disease. Very often **lumbar neuralgia, lumbago,** or **muscular rheumatism** is the source of the trouble. **Chronic nephritis** is not generally associated with localized pain. **Acute nephritis** may be accompanied by severe pain in the region of the kidney. **Chronic renal congestion** is accompanied by dull pain and a feeling of weight over the loin. **Movable kidney** may produce similar symptoms.

Renal colic, due to the passage of a calculus from the pelvis of the kidney through the ureter, is the most common cause of pains in the kidney. The history of previous attacks of a similar character, the radiation of the pain downward into the groin and testicle, or to the end of the penis, aid in deciding the diagnosis; while the presence of blood in the urine, the irritable bladder, and the intense agony in the paroxysm, in contrast to the remissions, and the sudden onset, still further point to this condition. These symptoms are not, however, always present in sufficient degree or in association to make the diagnosis easy, and the absence of one prominent sign may seriously impair its certainty. **Somewhat similar pains** arise from pyelitis with possible nephritic abscess, from neuralgia of the kidney or the tissues near by, from nerve pains due to spinal caries or irritation, and, more rarely, from tumors adjacent to or in the gland, or from aneurysm of vessels: as, for example, aneurysm of one of the branches of the mesenteric artery. A calculus embedded in the kidney may be found, or excessive deposits of oxalic acid or other crystals, manifesting themselves in gouty kidney, or, finally, aortic valvular disease. Chronic pain in the kidney is ascribed to slight injury, and is said to be commonly met with in young women who endeavor while wearing corsets to take violent physical exercise.

The presence of **pyelitis** rarely produces great pain, and the appearances of the urine point clearly to the cause of the discomfort, though if the attacks are sudden in onset, the cause may be calculus in the pelvis of the kidney, surrounded by septic changes. The failure of health and the possible febrile movements and chills still further point to pyelitis. So, too, nephritic abscess is accompanied by so much systemic disturbance in many cases as to make the diagnosis clear.

The presence of spinal tenderness on pressure or motion in the dorsal or lumbar regions, and the history of **spinal irritation** or **disease,** decides this as the cause of the pain. The discovery of **aneurysm** of any of the abdominal vessels may be impossible, unless it is large enough to manifest itself through the viscera or abdominal wall on palpation.

The diagnosis of **stone embedded in the kidney** is very difficult and uncertain, but the onset of an attack of renal pain arising from oxaluria or an attack of gout is usually bilateral, and is associated with a scanty urine of high specific gravity, and with much lumbar soreness. A gouty history or that of having eaten large amounts of oxalic-acid bearing foods, such as pears, tomatoes, and cabbage, may be recognized as the predisposing causes of attack.

Fenwick asserts that there are two great groups of renal stones, and that in each class characteristic pain may be felt. In the cortical stones the pain is fixed and continuous, and is liable to exacerbation on movement, but does not depend so much upon changes in the diet. On the other hand, pelvic stones cause obstruction and colic, the pain radiating down into the groin and testicle, while the urine becomes bloody, purulent, or scanty. Fenwick also believes that the posture of the patient in bed is typical. In 9 out of 12 cases his patients could sleep only on the affected side. Cortical stones, in his opinion, never cease to give discomfort, but pelvic stones may become embedded, and the patient go for long periods of time free from any discomfort.

Many years ago attention was called to the fact that **aortic valvular disease** often caused pain to be radiated into the hypochondrium. Ralfe thinks that aching kidney is often due to **unrecognized trauma.** He has known of cases of young women who, by wearing tight corsets while playing tennis or other violent games, have so bruised the right kidney by some sudden and violent movement as

to suffer seriously for days afterward. Again, Ralfe asserts that sharp renal pain sometimes arises in cases of obstinate **constipation,** in which are accumulated in the colon hard scybalous masses which, by their pressure, produce reflex irritation and pain.

KIDNEY, STONE (Nephrolithiasis; Renal Calculus).—A condition in which concretions or calculi form in the kidney structure, pelvis of kidney, or ureter.

Etiology.—(1) Early infancy; (2) gout; (3) old age; (4) lithemia.

Pathology.—Renal calculi may be composed principally of uric acid, oxalate of lime, or phosphates of calcium, magnesium, and potassium.

They may be of different sizes and shapes, some having pointed edges, giving rise to excruciating pain as they pass into the ureter. If the stone forms in the pelvis of the kidney or the ureter, some foreign body, such as a blood-clot, generally acts as a nucleus.

Phosphatic stones are whitish or grayish-white, and soft in consistence. They are the largest variety. The uric acid stones are dark red or reddish-brown in color, very hard, and often pyramidal in shape.

Symptoms and Clinical Course.—In some cases no symptoms arise. The most common symptom is pain in the region of the kidney, aggravated by exercise or sudden jarring of the body. If the ureter is totally occluded, hydronephrosis occurs. When the calculus passes into the ureter, true renal colic ensues.

This begins with a distinct chill, blueness of the extremities, and agonizing pains in the lumbar region, radiating toward the umbilicus, down the ureters, and into the testicles, which may become retracted. Nausea and vomiting come on, accompanied by increased micturition, a feeble pulse, and symptoms of collapse. Occasionally after the paroxysm has ended, blood may be detected in the urine, and in some cases the stone is passed by the urethra.

Diagnosis.—(See also Colic.)

Renal Colic.	Intestinal Colic.	Biliary Colic.
1. Sudden onset....	1. Premonitory symptoms, such as nausea, borborygmi.	1. Sudden onset.
2. Chill, subnormal temperature, collapse.	2. No chill.....	2. Chill and collapse, followed by jaundice.
3. Pain begins in region of affected kidney, radiating down thigh and testicle, which may retract.	3. Pain begins in abdominal region, radiating toward umbilicus.	3. Pain begins in region of stomach on right side, radiating toward umbilicus.
4. Micturition frequent.	4. Micturition normal.	4. Micturition normal: urine contains bile.
5. Blood in urine....	5. No blood in urine.	5. No blood in urine.
6. Presence of stone in urine.	6. No stone in urine.	6. Stone often passed in feces; stools devoid of bile.
7. Pain continues for a day or two in affected ureter.	7. Pain uniform over abdomen.	7. Pain uniform over abdomen.

Prognosis is guardedly favorable.

Treatment.—For the acute attack of renal colic morphin (1/4 of a grain) and atropin (1/125 of a grain) should be given at once, and repeated in 2 hours, if necessary, to relieve the extreme agony of the patient. Hot flannel cloths, stupes, or poultices should then be placed over the affected area, and may aid in rendering the patient comfortable.

In the constantly recurring attacks, in which the symptoms are not so violent, much may be done by means of dieting. Meats, tea, and coffee should be greatly restricted; alcohol and tobacco should be avoided. Milk, soups, fruits, vegetables, eggs, and an easily assimilable diet is best.

Bathing in lukewarm water 2 or 3 times a week, followed by massage, will stimulate the skin and keep the circulation active.

The bowels should never be allowed to become constipated, and saline purgatives, such as Rochelle salts (4 drams), Epsom salts (4 drams), and Carlsbad salts (1 to 2 drams), may be given.

Alkaline diuretics may be valuable.

℞. Potassium acetate,
Potassium bicarbonate, } each, ʒ ij
Potassium citrate,
Fluidextract of triticum, ʒ iv
Water, enough to make, ʒ iv.

One teaspoonful every 3 or 4 hours.

Failing to secure relief by medicinal measures, surgical interference should be effected and the stone removed. See Kidney (Surgery).

KIDNEY, SURGERY.—Although the kidney had occasionally been the subject of surgical operation in early times, premeditated kidney surgery may be said to have begun with Gustav Simon's successful extirpation of the one kidney for ureterouterine abdominal fistula in 1869. He did this operation after a demonstration of the healthy condition of the other kidney, and after a series of experiments on dogs showing that the removal of one kidney was a practicable procedure. Two years later Simon removed another kidney for calculi and suppurative pyelitis. The patient unfortunately died of pyemia on the twenty-first day after the operation. At that time surgeons were unacquainted with antiseptic methods. Since the publication of Simon's work on the surgery of the kidney, in 1871 ("Chirurgie der Nieren" Erlangen), the methods of diagnosis have been so much improved in scope and precision by the ureter cystoscope, by the X-ray photographs, and by the study of clinical and pathologic material that the radical operations of 20 years ago have given way to partial nephrectomies, nephrotomies, and various reparative operations on the ureter and pelvis of the kidney.

Location.—The kidneys are located in the back in such a position that a little more than one-half of each is exposed below the last rib. The hilus or root of the kidney, into which pass the renal arteries and out of which pass the renal veins and the ureters, is directed toward the vertebræ and a little downward, so that a line passing longi-

tudinally through the middle of one kidney from pole to pole would meet a similar line, passing in the same way through the opposite kidney, somewhere in the region of the body of the sixth dorsal vertebra.

The ureters are small tubes, 30 cm. long, the wall composed of 2 layers of muscle and a thick layer of mucous membrane. They are supplied with blood-vessels from the kidney and bladder and from the adjoining connective tissue. The ureters are not of uniform caliber throughout their length, but are funnel-shaped at the kidney, and meet with a constriction as they pass over the brim of the pelvis, and another upon entering the bladder. The pelvis of the kidney is continuous with the ureter, and is connected with the several calices by infundibula. The relation of these parts is not uniform.

The kidney may be approached through an incision 4 to 6 inches long along the outer border of the quadratus lumborum muscle, or it may be reached through a laparotomy wound. The lower 3 cm. of the ureter may be approached in women by way of the vagina, and the rest of the ureter can be easily examined, both in men and women, through a laparotomy wound.

Operations.—Aspiration of the kidney may be performed either for the purpose of diagnosing a renal swelling, or for the relief of such affections as hydronephrosis, pyonephrosis, or hydatid or blood cysts. It should be done with the ordinary precautions, any prominent or fluctuating spot being chosen for the puncture.

Nephrotomy consists in making an incision into the kidney for the purpose of evacuating and draining the fluid or pus in the case of hydronephrosis, pyonephrosis, hydatid cyst, abscess, etc. The tumor may be exposed by the lumbar or lateral incision, as described in nephrectomy. An incision is made into the kidney, the fluid allowed to run out, the wound thoroughly irrigated with some antiseptic solution and insufflated with iodoform, a large-sized drainage-tube inserted into it, and voluminous dressings of absorbent cotton and the like applied to receive the subsequent discharges.

Nephrolithotomy consists in cutting into a kidney for the purpose of extracting a calculus. The kidney may be exposed either by the lumbar or lateral incision, as described in nephrectomy. If a stone is felt, an incision should be carefully made over it, the finger or forceps introduced, and the stone extracted. If one cannot be felt, a needle should be thrust into the kidney at several situations, and, this failing, an incision should be made into it, and the finger and a probe introduced to search for stone. A drainage-tube should be placed in the wound, and an antiseptic and absorbent dressing applied. The urine will at first escape through the wound, but will cease to do so, as a rule, after a longer or shorter interval.

Nephrectomy, or removal of the kidney, may be done without opening the peritoneum, either by a lumbar or lateral incision, or through the peritoneal cavity, the incision being then made either in the linea alba or linea semilunaris.

The Extraperitoneal Operation.—If the incision is made in the lumbar region, it may be vertical, T-shaped, or oblique, like that of colotomy. If the lateral incision is chosen, it should be made obliquely from near the tip of the last rib toward the anterior superior spine of the ilium. Its advantages are that it combines the facilities of the intraperitoneal and the greater safety of the lumbar incision, as it does not involve opening the peritoneal cavity. The kidney having been exposed by any of these incisions, the capsule should be opened, the finger introduced, and the kidney enucleated from its capsule; the renal artery and vein should then be securely tied with a silk ligature passed round them by an aneurysm needle, and the ureter separated in a similar way. The kidney is removed by cutting through the pedicle with scissors, and the wound drained and dressed antiseptically.

The Intraperitoneal Operation.—This consists in opening the peritoneal cavity by one of the incisions mentioned above, drawing the intestines aside, and then exposing the kidney by cutting through the peritoneum in front of it, external to the colon. The vessels are then tied separately, the kidney removed, and the peritoneum united, the same precautions being adopted as after an ovariotomy. A drainage-tube is passed by some surgeons through a counter opening in the loin, and the end of the ureter brought out of the wound.

The dangers of nephrectomy are: (1) Severe shock; (2) excessive hemorrhage; (3) suppression of urine from disease or absence of the opposite kidney; (4) peritonitis from wounding the peritoneum; (5) laceration of the colon; (6) inclusion of the vena cava in the ligature of the pedicle and injury of the duodenum in operating on the right side.

Nephrorrhaphy is an operation for fixing a floating or movable kidney by exposing the kidney in the loin and attaching it with sutures to the parietes. It should only be done when there is intense pain and constant suffering which palliatives have failed to relieve.

Surgery of the kidney may be necessary for (1) Congenital malformation, (2) for injury of the kidney, (3) for disease of the kidney, or (4) for deformity of the kidney or ureter, the result of injury or disease.

When a kidney is found abnormally placed in the pelvis of a woman likely to bear children, it must be removed to make parturition possible. When a congenitally cystic kidney grows after birth so as to interfere with the development of the child, it must be removed. When a ureter congenitally misplaced discharges urine into the vagina or urethra, the ureter must be implanted into its proper place, or the kidney tributary to it must be removed. When there is a congenital deformity of the ureter or kidney which results in complete or partial hydronephrosis, the deformity must be corrected or the whole kidney or part of it must be removed.

There are two sorts of **injury of the kidney** requiring surgical treatment. The kidney is sometimes driven out of place by a blow, a fall, or a slow

compression, as between two freight cars. A suddenly displaced kidney without rupture has gives rise to: (1) No symptom except pain; (2) to pain and obstruction of the ureter by torsion or kinking, and the rise of temperature attendant; and (3) to pain, tumor, and bloody urine, or these symptoms with a perirenal or abdominal hematoma.

The kidney is sometimes ruptured by the direct action of a blow, a fall, or a broken twelfth rib. The result is a hemorrhage either outward into the perirenal tissues or inward into the pelvis of the kidney or one of the calices; in the latter case there is bloody urine. Sometimes the rupture extends entirely through the cortex, and both blood and urine are then found in the perirenal tissue. In children the perirenal peritoneum is often ruptured by the same insult that ruptures the kidney. Then the blood and urine are extravasated into the general peritoneal cavity. The perirenal hematoma, especially if mixed with urine, is almost sure to become infected and produce a perirenal abscess if the patient lives so long. The patient is likely, however, to die of hemorrhage. This is sure to be the case when the renal vein itself or one of its larger branches is ruptured. Death comes on in the course of 24 or 48 hours.

When the kidney has been displaced, either slowly (floating kidney) or suddenly, and great pain persists, either with or without rise of temperature, indicating pyonephrosis, the kidney should be approached by an incision beginning on the outer margin of the overlying quadratus lumborum muscle just below the edge of the last rib, and extending downward to the crest of the ilium and then curved outward for about half a finger's length. Through this opening the kidney should be carefully reached (by dividing the perirenal fat with dull instruments or with the fingers) and carefully drawn out through the fat, and even out of the depressed edges of the wound. It will stay in the wound if it is slightly twisted like a button. Here it can be examined. The ureter should be found on the lower side. There should be no blood. The kidney is then allowed to sink back under the skin, but should be held within the muscular wound by a strip of gauze passed under the upper pole. The skin and muscle should then be partially coapted with sterile silk or silver wire. The gauze should be carefully and slowly removed about the fourth day, when the sutures are removed, and the resulting wound allowed to close slowly, with a diminishing iodoform gauze tampon.

When an injury of the kidney results in a large **hematoma,** without bloody urine, without symptoms of severe hemorrhage, and without any rise of temperature indicative of sepsis, it is enough to keep the patient in bed, apply cold, and wait.

When, however, a perirenal hematoma is accompanied by symptoms of gradually increasing anemia, rapid pulse, thirst, low temperature, pallor, and delirium, the kidney must be approached at once by the method mentioned and the ruptured kidney tamponed, or the bleeding vein compressed by a forceps left on for 24 or 48 hours. When the ruptured kidney cortex is tamponed with iodoform gauze, it may sometimes be necessary to pass one or two large silk sutures through the kidney from side to side to hold the tampon in the rupture. In such a case it is necessary to drain the perirenal space for a week or more.

When the cortex of the kidney is completely ruptured and the hematoma contains urine as well as blood, the treatment mentioned is imperative, but the drainage must be continued much longer.

When a large or small hematoma becomes infected after weeks or months, it gives rise to sepsis and abscess formation—the so-called perirenal abscess—and it must be opened and drained. The incision need not be quite so extensive as that described, but should be in the same line, and 3 inches or more in length. Perirenal abscess often occurs without the history of injury; the treatment is the same.

The diseases of the kidney for which surgical treatment is necessary may be grouped under three heads: (1) Pus-diseases; (2) tubercular diseases; (3) tumors.

Pus microbes may reach the pelvis of the kidney by way of the urethra, bladder, and ureter, and, having injured the ureter by forming granulations and obstructing the outflow of urine, **pyonephrosis** results. The pus, which had probably been noticed in the urine, stops; chills and fever come on; a large tumor, at last, after weeks or months, appears in the lumbar and outer abdominal region. In such a case the cortex of the kidney becomes very much thinned out, and its secretion stopped. The heart is usually hypertrophied. The treatment is obvious. The dilated kidney should be at once carefully opened, as in the case of, and in the same place as, rupture, even though it seems to "point" in front. Drainage must be kept up, and, if necessary, a subsequent operation done to remedy any defect in the ureter.

Pus infection sometimes reaches the kidney, especially in the course of typhoid or other infectious diseases, by way of the circulating blood, producing an infarct, and afterward an abscess, which may rupture outwardly and result in a perirenal abscess, or into one of the calices and produce a pyonephrosis. Multiple abscess of the kidney with pyonephrosis follows infection of the urethra, bladder, and ureter, especially in certain cases of gonorrhea and in catheterization during confinement, and as a part of a general pyemia. In the former case nothing avails except the complete and prompt removal of the whole kidney, while in the latter case we are hopeless to offer any relief at all.

In some persons, in certain conditions of digestion and elimination, and in certain locations the crystallizable matter of the urine in precipitated in the renal tubules, in the calices, or in the pelvis of the kidney. When these crystals are small, they pass off in the urine without being noticed. Sometimes they remain behind and furnish centers about which, according to well-known principles of crystallization, further deposits take place.

Such masses of crystals are called **renal calculi** when they are found in the calices or pelvis of the kidney, ureteral calculi when they are found in the ureter, and vesical calculi when they are found in the bladder. They often remain unrecognized for years, and grow to a large size (2 to 5 ounces). They make themselves known by terrible pain whenever they pass down the urinary tract or obstruct the flow of urine. Small stones less than a centimeter in diameter pass down the ureter in the course of 10 to 40 hours of great agony, and are then passed out of the bladder through the urethra with relative ease, especially if the urethra is cocainized and dilated with a large sound. The patient should take such a position as to bring the stone into the urethra at the beginning of emptying a full bladder. When a larger or smaller stone is retained in the bladder, it grows, and sooner or later gives rise to the symptoms of vesical calculi.

Even a very small stone passing down the ureter may give rise to unendurable pain, coming on in paroxysms at intervals of a few minutes, or it may pass off after many paroxysms weeks or months apart. Sometimes the passage of quite a large stone through the ureter is unnoticed or produces only a dull pain in the side and back. The pain is, however, usually worse at the beginning of the ureter, at the constriction at the brim of the pelvis, and at the perforation of the bladder. The pain is often referred to the inside of the thigh, to the testicle, or to the labia, but as it grows severe it settles in the side and is accompanied by tenderness over the ureter and kidney. The treatment is warm baths, hot applications, and large doses of morphin. Vigorous catharsis and a liberal liquid diet, with rest in bed, must be prescribed. If the pain continues longer than 2 days, and the temperature rises more than a degree or two, the region of the stone has probably become the site of infection.

One of the most serious consequences of calculi in the urinary tract is the almost inevitable microbic pus infection which sooner or later surrounds the stone. Suppuration about the stone produces pyonephrosis, either complete or partial. When the pus stops discharging itself through the bladder, either because the stone acts as a valve in the ureter or because the ureter has been deformed and obstructed, the kidney becomes distended and the patient has all the symptoms of sepsis. Then the kidney must be approached as described above, the stone or stones removed, and the pelvis of the kidney drained. A subsequent operation may be required to repair any remaining obstruction of the ureter.

The removal of a stone in the ureter requires unusual operative procedure, which can be undertaken only on very exact diagnosis and under most favorable circumstances. At the bladder end of the ureter in women the stone may sometimes be easily helped into the bladder by simple digital manipulation through the vagina or rectum.

Tubercular infection reaches the kidney through the circulation, when it produces a double-sided and inoperable miliary tuberculosis or a tubercular disease confined to a single focus of infection, primarily through the external génitals, the urethra, prostate, bladder, and ureter. Primary renal tuberculosis, the so-called renal phthisis, is a little less frequent than renal tuberculosis, going on after tubercular epididymitis, tubercular prostatitis, and tubercular cystitis. This condition is slow in its onset, insidious in its progress, and, after both kidneys are attacked, absolutely unfavorable in prognosis. The diagnosis is made by discovering tubercular nodules in the epididymis, seminal vessels, and prostate, by recognizing tubercular bacilli in the semen or urine, by discovering tubercular ulcers of the bladder, and by finding the ureter from the tubercular kidney enlarged. The crucial test is made by catheterizing the ureters and finding tubercle bacilli on the one side, with diminished urine, and healthy and increased urine on the other side. The treatment for tuberculosis of the kidney is removal of the tubercular kidney and ureter and all peripheral tubercular tissue, the seminal vesicles, the prostate, the testicle, and the cord.

Hydronephrosis.—Complete hydronephrosis is due to partial obstruction of the ureter. Its treatment is repair of the ureter, a difficult and complex operation. Partial hydronephrosis is due to partial obstruction of one or more of the infundibula. It may be treated by exposing the kidney, as described before, and cutting away with the scissors the wall of the cyst and destroying the remaining mucous membrane with a solution of zinc chlorid 1 : 40.

The adrenal tumors of the kidney usually grow in adults from remnant of adrenal tissue left between the lobules of the kidney. They do not, as a rule, invade the kidney substance, but displace it. They can generally be enucleated, and after such removal they show no tendency to recur. When they are of large size, they are likely to break down, and extensive hemorrhages occur in the tumor substance, sometimes invading the surrounding tissues. If one of these adrenal tumors growing near the pelvis of the kidney breaks through into the pelvis itself, bloody urine follows immediately. These tumors sometimes produce the normal secretion of the adrenal gland in too great a quantity. Then the patient's heart is slowed, his capillaries contracted, and his skin blanched. He has severe headaches. His arteries rapidly undergo sclerosis, and apoplexy is apt to occur even in the young. Some adrenal tumors show a tendency to metastasis in which the lungs and bones are usually conspicuous.

These tumors should be enucleated from the kidney when possible; when this procedure is impossible, a part of the kidney should be removed.

Malignant tumors in the adult are usually hypernephromas, or carcinomas. The former are the more common. Many tumors formerly supposed to be carcinomas were undoubtedly hypernephromas. Sarcomas are rare. In children they may attain a very large size in a short time. Secondary or metastatic carcinomas of the kidney are not fit for surgical treatment. In primary carcinoma the right kidney is a little more frequently at-

tacked than the left. Men are more often affected than women. Carcinoma sometimes follows long-neglected stone in the kidney and pyonephrosis. Primary carcinoma appears about the age of 50 to 60. Less than 1 percent of all primary carcinomas appear in the kidney. The diagnosis is made by the appearance of blood in the urine, pain in one side, tenderness and tumor in the region of the kidney, loss of weight for several months, and slight cachexia. Some latent cases show no blood in the urine and no tumor: say, one-third of all. Some cases show no tumor, but exhibit more or less frequent hematuria: say, one-tenth. Perhaps one-third of all cases exhibit both bloody urine and palpable tumor (these are the ideal cases for diagnosis), while the remainder show palpable tumor but no hematuria. The crucial test is the discovery of shreds of carcinoma tissue in the bloody urine. The tumor is usually nodular, attached to the kidney, moving with respiration. When obstruction results from clots in the ureter, the symptoms are like those in the passage of small renal stones. The blood-clot then resembles a black earthworm of enormous length.

Every case of hypernephroma and primary carcinoma of the kidney should be treated by complete removal of the affected kidney after the health and competency of the opposite kidney have been demonstrated.

The diagnosis of disease of the kidney is made by palpation, which in thin persons will discover the normal kidney and any tumor of considerable size; by percussion, which will sometimes discover the normal and always the greatly enlarged kidney; by urinary examination; by exploratory puncture; by photography or fluoroscopy with the X-rays, which will often discover stone; and by incision and direct palpation.

Summary.—The following adages should be considered in all cases requiring operations on the kidney.

1. One healthy kidney should be demonstrated by catheterizing the ureters before any considerable operation is undertaken on the opposite organ.

2. The kidney should be extirpated only for malignant disease, for tuberculosis, for rupture of the renal artery or vein, for irreparable loss of the ureter and for pyonephrosis when the kidney is riddled with multiple foci of suppuration, for the removal of which a nephrotomy has proved inadequate. Even a small portion of cortical substance should be left, as it shows great reproductive power.

3. In pyonephrosis the abscess should be freely opened and drained, and all reparative procedures on the obstructed ureter should be left to a subsequent operation.

4. An operation on a healthy kidney is more likely to precipitate an acute nephritis in the opposite kidney than a much more severe operation on a sick kidney.

5. The emergency operations on the kidney are for hemorrhage about the kidney in rupture of the kidney or rupture of the renal vein, torsion of the ureter in wandering kidney, and pyonephrosis.

6. Chloroform is the best anesthetic for kidney operations, but a pyonephrosis may be opened with Schleich's local anesthesia or with the use of ethyl chlorid spray.

7. Hypertrophy of the heart is usually observed in any disease impairing the function of the kidney.

8. Renal hematuria from an apparently healthy kidney has been repeatedly observed.

9. Operations on the kidney by the abdominal way are much more dangerous to the patient than similar operations by the lumbar incision.

10. Hydronephrosis is the result of partial obstruction of the ureter. Complete obstruction without infection results in atrophy and disappearance of the kidney.

11. Percussion is of little use in diagnosis.

12. Only in thin people can the lower pole of the normal kidney be palpated, and then only on inspiration and expiration.

13. Auscultatory percussion is of much value. See KIDNEY (Stone, Movable), NEPHRITIS, PYELITIS, etc.

KINO.—The inspissated juice of *Pterocarpus marsupium*, found in India, and similar in action to tannic acid. It contains 75 percent of a variety of tannin named *kinotannic acid*, which gives a greenish precipitate with persalts of iron; also a crystalline, neutral substance, *kinoin*, and *kino-red*, gum, pectin, etc. Dose, 5 to 10 grains. It is used mainly as a constituent of gargles and diarrhea mixtures. The tincture in dram doses is one of the best remedies for the diarrhea which results from the disuse of opium or morphin. K., Tinct., 5 percent of the drug. Dose, 1/2 to 2 drams.

KNEE-JERK. See JERK, REFLEXES, NERVOUS DISEASES (Examination), LOCOMOTOR ATAXIA.

KNEE-JOINT, DISEASE.—See JOINTS (Diseases), EXCISION OF JOINTS.

KNEE-JOINT, INJURIES.—**Fracture of the patella** is a frequent injury due to direct violence, producing an oblique or stellar fracture or to indirect violence, sudden muscular traction of the quadriceps, producing transverse fracture (traction fracture).

TRANSVERSE AND VERTICAL FRACTURE OF THE PATELLA. —(*Spencer and Gask.*)

Fracture the result of direct violence is seldom accompanied by the same degree of diastasis of fragments as fracture the result of muscular contraction, in which there frequently occurs an extensive laceration of the aponeurotic layers passing alongside the patella; without this laceration wide separation of the fragments cannot occur.

The patella is fully inclosed in the capsule of the joint, and hemorrhage is into the joint. Excep-

tionally, this may be excessive and distend the capsule.

When only a small piece at the edge of the patella is separated, and if the periosteal covering remains intact, the diagnosis may be difficult and doubtful. But when the fracture is transverse and is accompanied by some diastasis of the fragments, the diagnosis lies immediately at hand. This fracture is peculiar in that there may result a very good and useful limb, with comparatively wide separation of the fragments and fibrous union entirely, while sometimes well-placed fragments united by bony union occasion a permanent impairment functionally.

Ununited Fracture of the Patella.—(*Spencer and Gask.*)

Treatment.—In fractures from direct violence, when there is likely to be little or no separation, treatment is comparatively easy, consisting in fixation by means of a posterior splint and roller bandage. The danger here is not nonunion, but ankylosis. If a distending hemorrhage has occurred into the joint, it should be removed by aspiration. Massage of the quadriceps should be practised almost daily, and passive motion begun as early as the third week. At the end of 6 weeks dressings can be discarded and the patient permitted to go about.

It is in the transverse fracture, the result of muscular traction, that the serious difficulty occurs. Here the fragments are likely to be widely separated, owing to the tearing of the lateral aponeurotic layers along the sides of the patella. The aponeurosis covering the patella becomes first very much stretched, and when it finally tears, a retracted fringe projects between the fragments. This fringe sometimes prevents an osseous union, even when the fragments can be closely apposed.

Above all, it is the condition of the quadriceps extensor muscle which most demands attention. Even when comparatively good union is attained, a useless limb may result because of the atrophic condition of the muscle which has occurred as the direct result of the treatment that brought the fragments close together and permitted a good union. To effect apposition of the fragments it is necessary to practically paralyze the muscle with the roller bandage. The nutritive disturbance thus brought about, together with the atrophy resulting from the prolonged inactivity of the muscle, leaves the muscle in a crippled condition, from which it does not recover. This fact has led to the treatment of this condition by daily massage alone (kneading and tapotement), the effort being made at the same time to bring the fragments nearer together. Very good functional results are reported as a result of this treatment. A better plan of conservative treatment is to combine this valuable method with the effort to approximate the fragments directly. This is accomplished by means of a posterior splint, applied with the leg extended and the thigh flexed, so relaxing the quadriceps. Straps of adhesive plaster now catch the upper and lower fragments, cross each other, and are stuck fast over the posterior aspect of the splint, so pulling the lower fragment up and the upper fragment down. A circular strip over the fragments may be found necessary to keep them from tipping. A figure-of-eight bandage may reinforce these straps. The quadriceps is now to be massaged daily, chiefly from above downward, seeking thus to bring down the upper fragment. Complete failure of union and adhesion of the upper fragment to the anterior surface of the thigh are rare and, of course, very unfavorable occurrences.

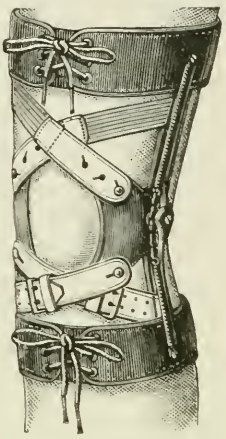
Subcutaneous suture by means of wire, tendon, or silk is recommended; but of operative measures only the open **bone suture** is to be advised. Chromicized catgut answers this purpose well. The sutures need not penetrate the fragments of bone; by being passed through the aponeurotic layers over and to the sides of the patella, they are able to bring the fragments in apposition. This procedure is only to be attempted by a skilled surgeon, as the knee-joint is necessarily opened, and the occurrence of sepsis here may be fatal either to the usefulness of the joint or to the life of the patient. When this operation is undertaken, it is advisable to use rubber gloves, as thereby the chances of infection are undoubtedly diminished. Taking into account the danger of this operation, and the comparatively useful limbs which result from intelligent and careful conservative treatment, the conclusion is clear that conservative treatment is best for the large majority of cases. In special cases, as in robust young men who are dependent on strong legs for their daily bread, the direct suture in competent hands is certainly advisable.

To perform this operation, a longitudinal incision is made over the center of the joint, which is opened, and the fragments of the patella are exposed; any blood-clot which is present in the joint or between the fragments is turned out, and the fragments themselves are cleared of any aponeurotic and fibrous tissue which may be found lying between and over their broken surfaces. Each fragment is then bored obliquely with a drill, taking care not to reach its cartilaginous surface. Sutures of silver wire or of heavy catgut are then passed through the drilled holes, and the fragments having been drawn together, the ends of the wire are twisted, cut short, and then hammered down on the bone, where they may be allowed to remain permanently, without causing any irritation.

Kocher's method of treating fractured patella

consists in passing a stout silver wire completely around the bone. A needle in a handle is passed through the ligament of the patella, through the tendon of the quadriceps, and out through the skin. It is then threaded and drawn back again; the broken fragments are drawn together, the wire twisted up over something, to protect the skin, and the openings dusted with iodoform. The limb is then placed upon a back splint, bandaged, and kept in this position for 3 weeks; at the end of this time the wire is cut, drawn out of the wound, and the sore points that are left dusted with iodoform until the parts are healed.

Knee-joint dislocations are very rare, though displacement of the semilunar cartilages, especially following violent rotatory movements with flexed knee, are more frequent.



Brace for Dislocated Semilunar Cartilage. The mechanism permits flexion and extension, but prevents rotation.—(*Walsham.*)

Dislocation of the semilunar cartilages of the knee joint (*subluxation, internal derangement of the knee*) follows a twist of the partly flexed knee. The cartilages are torn from the tibia by rotation of the leg; the internal cartilage being the one usually affected. Any of its attachments or even the cartilage itself may be ruptured.

The **symptoms** are severe pain in the knee and effusion into the joint which is locked in flexion; extension being impossible. This locking may not be present; such cases are sometimes diagnosed as sprains. In the latter tenderness is more generalized and extension may relieve rather than increase the pain. The displaced cartilage may be felt, but more often palpation will reveal nothing but marked tenderness along the front of the upper surface of the tibia. Recurrences are frequent.

The **treatment** is reduction by increasing the flexion, rotating the leg, making firm pressure over the situation of the displaced cartilage, and extending the leg. Often spontaneous reduction occurs before the surgeon is called. The synovitis should be treated and the knee immobilized for five or six weeks. In order to prevent recurrence an elastic knee-cap should be worn for several months. If relapses are frequent a brace may be applied, or the joint may be opened by a curved incision along the upper edge of the tibia, and the cartilages stitched to the periosteum with catgut, or excised if they are ruptured.

Complete displacements may occur **forward, backward,** and **laterally;** they are combined with tearing of the lateral and crucial ligaments, result from the direct application of great force, and hence are usually complicated injuries. Such an injury is, of course, easily manifest. Reduction is by direct pressure and traction. **Rotatory dislocation,** from twisting, also occurs. In all dislocations of the knee the patient should wear an elastic knee-cap or a brace for several months after restitution of the joint.

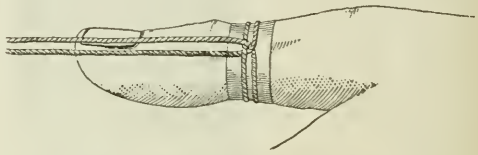
Dislocation of the patella may be outward, inward, and vertical (rotated about the long axis, this embracing also its complete reversal). The outward displacement is more frequent. These conditions are easily recognized, except the completely reversed form, which is the greatest rarity. Complete extention of the leg with flexion of the hip will usually permit reduction.

The fibula may be dislocated from the tibia at its upper (and lower) extremities. The head may be dislocated forward and backward. This injury may be associated with isolated fracture of the upper tibia. There is inability to bear weight with mobility of the head. After reduction a molded splint should be applied to fix the head.

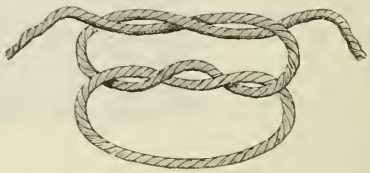
For further discussion of injuries of the knee-joint, see Joints (Injuries).

KNOCK-KNEE.—See Genu Valgum.

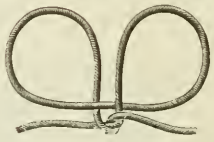
KNOT.—An interlacement of ends or parts of one or more cords or threads so that they cannot be readily separated. **K., Clove-hitch,** a knot



Clove-hitch Knot.



Combined Surgeon's and Reef Knot.



Staffordshire or Tait's Knot.

Granny Knot

Surgeon's Knot.

Reef Knot.

consisting of two single, contiguous loops, the free ends toward each other. It is used for making extension in the reduction of dislocations. **K., Double.** Same as K., Friction. **K., False.** Same as K., Granny. **K., Friction,** one in which the ends are wound twice around each other before they are tied. **K., Gerdy's Extension,** resembles the clove-hitch; it is employed in making extension of

the leg at the ankle. **K., Granny,** a tie of a cord in which in the second loop the end of one cord is over, and the other under, its fellow, so that the two loops do not lie in the same line. This knot may easily be converted into a slip-knot. **K., Reef,** a knot so formed that the ends come out alongside of the standing parts and the knot does not jam. It is also called square knot. **K., Sailor's.** Same as K., Reef. **K., Square.** Same as K., Reef. **K., Staffordshire,** a knot used in ligating the pedicle in ovariotomy. The ligature is passed through the pedicle, and withdrawn so as to leave a loop, which is passed over the tumor and one of the free ends is then drawn through the loop; both ends are then passed through the pedicle, tightened, and tied. It is also called Tait's knot. **K., Stay,** a term applied by Ballance and Edmunds to a knot formed by two or more ligatures in the following way: On each ligature separately is made the first hitch of a reef knot, which is tightened so that the loop lies in contact with the vessel, without constricting it; then, taking the two ends on one side together in one hand, and the two ends on the other side in the other hand, the vessel is constricted sufficiently to occlude it, after which the reef knot is completed. The simplest method of completing the knot is to treat the two ends in each hand as a single thread, and to tie them as if completing a single reef knot. **K., Surgical,** a double knot made by passing the thread twice through the same loop. **K., Tait's.** See K. Staffordshire.

KOCH'S POSTULATES.—See Bacteriology.

KOLA.—The nut or seed of *Cola acuminata,* used in parts of central Africa as a substitute for tea and coffee. It contains both *caffein* and *theobromin, tannic acid* and a glucosid substance named *kolanin,* which, in the presence of a ferment, splits up into free caffein and glucose. The Kola nut is said to be stimulant and aphrodisiac. It improves the appetite and the digestion, and is useful in gastric catarrh and in the dyspepsia of alcoholic subjects, as an adjunct to other treatment; also in asthma of both the nervous and cardiac forms. It is especially efficient in atonic diarrhea; and in gastrointestinal irritation with looseness of the bowels, a restricted diet and Kola-wine are frequently all that is needed.

KOOMISS.—See Kumyss.

KOUSSO.—See Cusso.

KOPLIK'S SPOTS.—See Measles.

KRAMERIA (Rhatany).—The dried root of *Krameria triandra.* It contains 20 to 45 percent of *rhatania-tannic acid,* also *rhatantin,* an alkaloid, and wax, gum, etc. Dose, 10 to 20 grains.

It may be employed for the same purpose as tannic acid except as an antidote to antimony. It has been used as an injection for fissure of the anus, as a local application to spongy gums, as a tonic for debilitated subjects, in chronic diarrhea, also in passive hemorrhages and mucous discharges, as menorrhagia and leukorrhea.

Preparations.—**Extractum K.,** aqueous. Dose, 5 to 10 grains. **Fluidextractum K.** Dose, 5 to 20 minims. **Tinctura K.,** 20 percent. Dose, 1/2 to 2 drams. **Syrupus K.,** has of the fluidextract 45 parts, with syrup 55. Dose, 1/2 to 4 drams. **Trochisci K.,** each troche contains nearly 1 grain of the extract, with tragacanth, sugar and orange-flower water.

KYPHOSIS.—See Spine (Curvature).

KUMYSS (Koomiss).—An effervescing fermented liquor originally prepared by the Tartars from mare's milk, but now imitated with cow's milk by adding sugar of milk, fermenting in open tanks, skimming off the casein and butter, then bottling during active fermentation. Its successful preparation depends on its undergoing slow fermentation for 5 to 10 days in a cold room, at 40° F. If the temperature be higher than 50° the fermentation will be of the acetous variety, and will result in sour milk with heavy curd, feeble effervescence and repulsive taste. Kumyss has an acidulous and peculiar taste. It is a powerful diuretic, especially in cold weather, and in warm weather it causes free perspiration. It is stimulant and tonic, increases the nutrition of the body and produces considerable somnolence. The stomach tolerates it well, even when it rejects all other food. It is easily assimilated and very nutritious.

Kumyss is an invaluable article of diet in many wasting diseases, especially phthisis. It is of great benefit in dyspepsia, the diarrheas of children, convalescence from acute maladies, chronic affections of the kidneys, and other cachexiæ. In cases of feeble digestive power an ounce every hour is sufficient, but as its digestion and assimilation increase it may be given almost *ad libitum,* and when used with other food a half-pint may be taken after each meal. Each quart is estimated to contain four ounces of solid food, besides from 1 to 3 percent of alcohol. See Kefir.

L

LABARRAQUE'S SOLUTION.—Solution of chlorinated soda; an aqueous solution of several chlorin compounds of sodium, containing at least 2.4 percent by weight of available chlorin prepared by adding together aqueous solutions of monohydrated sodium carbonate 65, and chlorinated lime 90, then adding water to 1000. Dose, 10 to 30 minims (average, 15 minims) in 20 parts of water. See DISINFECTION.

LABIA, DISEASES.—There is a type of inflammation of the labia that resembles erysipelas in its extensive swelling and redness, but differs from it in the fact that it does not spread. It subsides in a few days, but if severe, it may produce sloughing. It is seen in typhus and small-pox, and after delivery. A wound may be found, or no history of any violence is to be elicited, without pregnancy or previous illness. The affection is usually bilateral. Treatment requires separation and support of the labia, and the application of an evaporating lotion like the following:

℞. Solution of lead acetate, } each, ʒ ss
Rectified spirit of wine, }
Water, O j.

If a tendency to gangrene is seen, the actual cautery is needed to separate the slough, followed by cleansing by frequent antiseptic lotions.

Erysipelas may attack the labia, as any other part of the body.

Herpes of the labia runs its usual course, requiring drying and sedative applications, such as bismuth, lead ointment, or an ointment containing bismuth, 30 grains; morphin, 10 grains; and vaselin, 1 ounce.

Abscess of the labia is usually unilateral, generally in Bartholin's gland, and is due to gonorrhea or traumatism. It forms a tender, fluctuating, and nonreducible swelling which, if left alone, will burst and refill, and thus continue indefinitely. The gland must be dissected out to obtain effectual cure. See BARTHOLIN'S GLANDS.

Eczema of the labia is often found in elderly, plethoric, and gouty women and in the subjects of diabetes. Antacid remedies and purgatives are given, combined with rest, the avoidance of alcohol, and a restricted diet.

℞. Magnesium sulphate, ʒ j
Magnesium carbonate, gr. x
Aromatic spirit of ammonia, ♏ xx
Water, ʒ j.
Give twice daily.

For local application, lead ointment, zinc ointment, and an ointment of the nitrate of mercury and zinc ointment in equal parts may be used, the last being used in chronic and indolent conditions, the first when the parts are very sore. Silver nitrate, 20 grains to 1 ounce of water, may be applied once or twice a week.

Warts on the labia, when nonsyphilitic, are acuminate, and not flat and overhanging. They are associated with uncleanliness and unchastity, but are not proof of the latter. A powder of calomel and zinc oxid may be used; they may be cut off if large, the hemorrhage being controlled by pressure, styptics, or the Paquelin cautery.

Syphilitic warts, mucous tubercles, or condylomata are moist, broad, overhanging, white patches. Locally, black wash should be applied, and mercury given by the mouth.

Epithelioma of the labia occurs as a warty growth, accompanied by ulceration, which shows no tendency to healing.

The treatment of epithelioma is removal of the growth—best by the knife or Paquelin cautery—together with a good margin of healthy tissue. The inguinal glands on the corresponding side should be removed also if the growth is at all advanced.

Innocent growths, as lipomata, are met with in the labia; and **elephantiasis** of the labia is occasionally encountered. These growths are to be treated by removal, if their bulk causes inconvenience. The labia may also be the seat of lupus and swelling or of hematoma. Boils sometimes are found here, and are distressing because of pain and the suspicion they suggest. Hydrocele of the labia must be carefully differentiated from hernia, and probably the safest practice is to cut down on the tumor, open it, and remove the sac. See VULVA.

LABOR.—That natural process by which the fetus and its appendages are expelled from the uterus and vagina at the normal expiration of pregnancy. This should be about 280 days after appearance of the last menstruation.

Causes.—Just why labor should occur at this particular time is unknown. It has been thought to be due to: (1) *Periodicity*, the muscular action of the uterus being particularly strong at the tenth period; (2) *overdistention of the uterus*, which is followed by retraction of the uterine muscle and expulsion of the fetus; (3) *maturity of the ovum*, the decidual cells undergoing fatty degeneration toward the end of pregnancy, thus causing a "loosening" of the ovum; (4) *nervous impulse*, reflected from the central nervous system through the sympathetic to the uterus; (5) when the uterus is incapable of further distention the fetus becomes practically a *foreign body*, and as such is expelled.

Signs. 1. Subsidence of the Uterus.—This occurs about 4 weeks before term in primiparæ, 2 weeks before term in multiparæ. It is due to retraction of the abdominal muscles, which forces

the presenting part and lower uterine segment into the pelvic cavity. The size of the abdomen is decreased, the pressure-symptoms above, such as irritability of the stomach and difficult breathing, are relieved; and the pressure-symptoms below, as edema and excessive vaginal secretion, are increased. Should subsidence of the uterus not occur, it usually indicates a malposition of the child or some obstruction, as a contracted pelvis or oversized head.

2. **Pains.**—These are felt over the sacrum and lower part of the abdomen. They are intermittent in character, occurring at first about every 15 minutes, and lasting about 1/2 to 1 minute. They should not be confounded with pains due to intestinal colic or to rheumatism of the uterine muscle.

3. **Show.**—This is a small plug of blood-tinged mucus which has occluded the cervical canal during pregnancy, and which is now expelled with the first few pains.

4. **Dilatation of the Os.**—This is by far the most important sign, and when accompanied by effacement of the cervical canal, is a positive indication of labor.

Stages.—Normal labor may be divided into 3 stages:

1. **The Stage of Dilatation and Effacement.**—This begins with the first pain and lasts until full dilatation of the os is accomplished. The average time required for the completion of the first stage is, in primiparæ, 10 to 12 hours; in multiparæ, 6 to 8 hours.

2. **The Stage of Expulsion.**—This begins with full dilatation of the os, and lasts until the child is expelled from the vagina. Its average duration is, in primiparæ, 2 to 4 hours; in multiparæ, 1 to 2 hours.

3. **The Placental Stage.**—This covers the period which elapses between the birth of the child and the expulsion of the placenta and membranes. Its average duration is 15 minutes.

Management.—A call to an obstetric case should be answered immediately. The strict observance of this rule may prevent many complications, such as malpresentations, lacerations of the perineum, postpartum hemorrhage, and asphyxia of the new-born.

Certain articles are indispensable to the proper management of an obstetric case. **The patient should provide** the following: A half-pound can of ether, 2 ounces of brandy, 4 ounces of vinegar, 4 ounces of tincture of green soap, 1 dozen tablets of mercuric chlorid, a large new sponge, a skein of bobbin, a fountain syringe, a bed-pan, a new soft-rubber catheter, 4 ounces of absorbent cotton a bottle of carbolized vaselin, 2 yards of unbleached muslin, 1 pound of salicylated cotton, 5 yards of carbolized gauze, 8 yards of nursery cloth, and 2 dozen clean towels.

The physician's **obstetric bag** should contain 2 pairs of forceps, preferably the Simpson and the Tarnier axis-traction; a Sims speculum; perineal needles and needle-holder; half a dozen hemostats; a pair of blunt-pointed scissors; a set of Barnes' bags; a hypodermic syringe; iodoform gauze; fluidextract of ergot; tablets of nitroglycerin; and a 2 percent solution of silver nitrate.

The lying-in room should be large, sunny, and well ventilated, preferably by an open fireplace. It should not contain a stationary wash-stand, nor should it have any connection with a sewer, bath-room, or water-closet. If it is heated by a hot-air furnace, the intake for the air and the sanitary condition of the cellar may need investigation. No decomposing food, unemptied bed-pan or commode should be left in the room for any length of time.

The water used for douches or for washing off the vulva or perineum should be sterilized by boiling it for at least one-half hour.

The patient should receive a full bath before labor (special attention being given to the genital region), and be supplied with clean clothes. The mattress on which she lies should be clean and not soiled with discharges of previous labors or other putrescible material; it should be protected by a perfectly clean rubber cloth. The pads on which the buttocks rest during and after labor should be of nursery cloth, previously boiled and dried. The material used to wipe off the genital orifice, mouth of the urethra, and perineum should be absorbent cotton, soaked in mercuric chlorid solution (1 : 1000) for one-half hour. After labor an antiseptic vulvar pad, composed of salicylated cotton and carbolized gauze, should be worn during the continuance of the lochial discharge. These pads should be changed and the vulva cleansed 4 to 6 times in the 24 hours. If there is any pathologic discharge, the vagina should be thoroughly cleansed by scrubbing with tincture of green soap, hot water, and pledgets of cotton, followed by a mercuric chlorid douche (1 : 2000); this followed by a douche of sterile water.

The physician should not carry infectious germs upon his person or clothing. He should not attend an obstetric case after seeing a contagious disease without first taking a full bath and changing his clothing. The preparation of his hands should consist of 10 minutes' scrubbing with tincture of green soap, hot water, and a stiff nail-brush followed by scrubbing in alcohol, and immersion in mercuric chlorid solution (1 : 1000) for 2 minutes.

The instruments used about the patient should first be boiled for 10 minutes. If boiling injures them, they should be immersed in mercuric chlorid solution (1 : 1000) for one-half hour.

Examination of the patient must be made to determine the position and presentation of the child, its approximate size, the condition of the perineum, the dilatability of the vagina, the size of the pelvis, the amount of dilatation of the cervix, and the effectiveness of the pains. To ascertain the above facts an abdominal examination should first be made, the patient lying upon her back, with knees drawn up and shoulders slightly raised; followed by a vaginal examination, the patient lying in the Sims position. The vaginal examinations should be made as infrequently as possible, and always visually, so that the finger may not be contaminated by groping over the perineum or vulva before entering the vagina. By observing

these two precautions the dangers of sepsis are greatly reduced.

During the first stage of labor the patient should be allowed to occupy her time very much as she pleases. The lower bowel should be thoroughly emptied by an enema of a pint of warm soapsuds and a dram of turpentine. The vaginal examinations should be made only when necessary and when the os is dilated to the size of a silver dollar, she should be placed in bed, lying upon that side toward which the fetal back looks. If the patient is nervous, or if she complains very much of the severity of the pains, she may be given chloral hydrate, in 15 grain doses, every 20 or 30 minutes, until she has taken 45 grains. A cup of beef-tea or a glass of sherry or milk will oftentimes act beneficially.

During the second stage of labor the examinations should be made only when necessary.

If, in a multipara, the membranes have not ruptured, they should be perforated with the finger or with some aseptic instrument. Care should be exercised that the child's scalp or the lower uterine segment may not be injured.

If the pains are very severe and if the patient complains excessively, chloroform or ether may be given. The latter is probably the safer. It should be given only during the second stage, and never in sufficient quantity to produce complete anesthesia. See Anesthesia; Twilight Sleep.

During this stage the expulsive force of the abdominal muscles may be much increased by the use of a "puller." As the head advances toward the vulvar outlet, precaution must be taken to prevent laceration of the perineum. This is best avoided by making firm backward and upward pressure against the occiput during pains; by restraining voluntary expulsive efforts during pains; and by securing expulsion of the head between pains.

When the head is born, support it with the hand, wash the eyes carefully with warm sterile water, and if the cord is coiled about the neck, loosen it or slip it over the head. By this time the next pain, which secures delivery of the shoulders, will occur. Should this be delayed, stimulate the uterus by friction through the abdominal wall; or grasp the sides of the child's face with the two hands, make downward and forward traction until the anterior shoulder appears under the symphysis, then upward and forward traction, until the posterior shoulder appears, finally downward and forward traction, the anterior shoulder and remainder of the body being extracted in rapid succession. As the child is born one hand should grasp the fundus to secure and maintain firm contraction. The child should be placed by the mother's side, with its face turned away from the maternal discharges. As soon as the cord stops pulsating it should be ligated and cut.

During the third stage of labor the patient should be carefully guarded against hemorrhage. A dram of the fluidextract of ergot should be administered to aid firm contraction; and irritation of the uterus, by friction through the abdominal wall, should be persisted in for 10 or 15 minutes. If, at the expiration of this time, the placenta has not been voluntarily expelled, the fundus should be grasped firmly between the thumb and 4 fingers; as soon as the uterus is felt to harden the fundus is compressed tightly, and firm downward and backward pressure is made in the direction of the pelvic axis. Very slight traction is made on the cord with the other hand, to guide the placenta through the cervix and vagina. The placenta should be received in some sort of a receptacle as it emerges from the vulva, and should then be carefully inspected; if it and the membranes are intact, and if the womb is firm, an abdominal pad and binder should be applied, all blood and discharges cleaned away, and the patient fixed comfortably in bed.

For immediate care of the infant see New-born Infant.

LABOR, COMPLICATIONS AND SEQUELS.—See Eclampsia, Perineum (Injuries), Postpartum Hemorrhage, Puerperal Fever, Uterus, Vagina, etc.

LABOR, DIFFICULT.—See Dystocia, Fetus (Positions and Presentations), Pelvis (Contracted), etc.

LABOR, PREMATURE.—Expulsion of the fetus after it has become viable—after the sixth month of gestation.

The causes and clinical phenomena of premature labor have been discussed under Abortion (*q. v.*).

The treatment is the same as labor at term.

Induction of Premature Labor.—This becomes necessary at times for the preservation of the mother's life. Not infrequently, too, it offers to the child its best or only chance for safe delivery.

Indications for the Induction of Premature Labor.—Besides the indications which were mentioned for the induction of abortion, we have the following: (1) Certain degrees of contracted pelvis (8 to 9.5 cm.); (2) placenta prævia; (3) grave systemic disease, as phthisis and advanced heart-disease; (4) habitual death of fetus just before term.

Method of Inducing Premature Labor.—The most satisfactory method is by catheterization of the uterus. The steps of this method are as follows: (1) Disinfect the cervical canal, vagina, vulva, pubes, and inner part of thighs by scrubbing thoroughly with tincture of green soap and pledgets of cotton, followed by a vaginal douche of mercuric chlorid (1:4000); (2) two fingers of the left hand, previously sterilized and well lubricated with 5 percent carbolized oil, should now be introduced into the vagina, the middle finger pressed against the external os, which will gradually dilate until the tip of the finger is at or beyond the internal os; (3) an elastic silk bougie (No. 17 French), previously sterilized by soaking in cold mercuric chlorid solution (1:1000) for one hour, is now passed along the groove between the middle and index-fingers until it enters the uterine cavity and extends from 7 to 9 inches between the decidua vera and decidua reflexa; (4) finally, the bougie is kept in position by a vaginal tampon of iodoform gauze. The patient then lies quietly in bed, labor beginning after a variable period, the average being 12 hours. If, at the end of 12 hours, there are no

signs of beginning labor, a second and larger bougie may be inserted by the side of the first. If this fails, after the lapse of another 12 hours the cervix, which has become very much softened, may be easily dilated by means of Barnes' bags.

If there is any necessity for immediate delivery, the patient should be anesthetized, the cervix dilated with fingers or dilators, the membranes ruptured, and podalic version performed.

LABOR, TWIN.—See PREGNANCY (Multiple).

LACQUER POISONING.—Workers in lacquer, the base of which is the balsam of rhus vernicifera, are subject to a disease which resembles ivy poisoning, though the symptoms are more intense. It is met with especially in China and Japan. There is severe pruritus with edema and papules of the face and extremities and probable involvement of mucous membranes and conjunctivæ.

Treatment.—Soothing lotions such as lime water and sodium thiosulphate solution (1 to 8) or solution of aluminum acetate are indicated.

LACRIMAL DISEASE.

Diseases of the Lacrimal Gland

Abscess and inflammation of the lacrimal gland are very rare. The diagnosis depends on the presence of swelling or the signs of abscess in the region of the gland. An abscess should be incised, and any inflammation of the gland treated with a mercurial ointment or potassium iodid.

New growths are mostly **adenomata. A chloroma** is a malignant greenish tumor which sometimes attacks the lacrimal gland. **Sarcoma** and **carcinoma** are also occasionally found in this location. However, disease of the lacrimal gland is so rare an affection that many men of vast experience have never seen a case. The treatment of a tumor is prompt excision.

Dacryops is a condition in which a lacrimal duct becomes occluded and the lumen full of secretion, forming a bluish tumor on the outer upper fold of the conjunctival sac. It should be opened with a fine needle.

Fistula of the lacrimal gland is usually the result of injury or operation. The fistula should be connected with the conjunctival sac, after which the dermal opening soon heals.

Diseases of the Lacrimal Passages

The all-important sign of diseases of the lacrimal passages is the overflow of tears, or **epiphora.** The first purpose in treatment of such cases is to clear the passages so that the tears will run into the nose. However, we must remember that in oversecretion the tears will run over the cheeks. Thus, on a windy day or in emotional weeping there is not only extra secretion into the nose, causing sniveling, thus proving that the nasal duct is patulous, but, in addition, epiphora. Oversecretion of tears may be due to conjunctivitis, keratitis, an especially irritable trigeminus nerve, uncorrected ametropia, and a number of other causes.

Eversion of the puncta, or even of the lower punctum alone, will cause epiphora. We should immediately endeavor to correct any malposition, as the sequences of epiphora are very serious, eventually leading to ectropion. In cutting operations on the lids, or in the application of caustics, we must always be careful that the puncta are not involved, as eversion, with its annoying sequels, will result if this precaution is not taken.

Although it is always well to preserve the puncta, which have a physiologic function of importance in keeping solid, irritating bodies from the nasal duct and lacrimal sac, it is often necessary, for immediate drainage, to **slit the canaliculus** involved. This simple operation is performed as follows: The lower lid is drawn downward and outward, and slightly everted by the thumb of one hand, while the probe point of a canaliculus knife is introduced vertically with the other hand. When the knife is well inserted into the canal, its point is turned inward and slightly backward, reaching the inner wall of the lacrimal sac. During this maneuver the edge of the knife is turned toward the conjunctiva, and the whole length of the canaliculus is divided, close to the mucocutaneous junction by bringing the knife up boldly from the horizontal to the vertical position. In dividing the upper canaliculus the upper lid is made tense, and the knife is introduced into the upper punctum and passed into the sac in a direction downward and inward. If the canaliculus is very small, a fine-pointed conic probe should first be used to dilate it. There are various modifications of the operation—with a grooved director, fine scissors, etc. The wound should be examined at short intervals, and kept open with a probe.

Affections of the Canaliculus.—Obstruction of the canaliculus is often due to a foreign body, such as an eyelash, which not only occludes the canal, but scratches the cornea. The obstruction may be due to a stone in the canaliculus, called a **dacryolith.** Polypi of the canaliculi may grow so luxuriantly as to protrude from the puncta. The treatment in these cases is to remove the foreign body if it protrudes from the punctum; or, if the obstruction is due to a stone or polypus or there is absolute stenosis or obliteration of the canaliculus, it should promptly be slit to its full extent.

Affections of the Lacrimal Sac.—The lacrimal sac is lined with mucous membrane, which is subject to inflammation and catarrh like any other mucous membrane. Any condition which obstructs the free passage of the tears predisposes to disease of the sac, and particularly if the obstruction is in the nasal duct. The sac also becomes diseased by extension of any inflammatory process from the nose. **Inflammation** of the sac leads to **blennorrhea,** and this, in its turn, leads to **dacryocystitis,** or abscess of the lacrimal sac. The contents of a constantly suppurating tear-sac are very infectious, and although the patient may go on for many years with epiphora, conjunctivitis, and crusting of the lids in the morning, yet the infection may be so severe as to set up an inflammation which will eventually destroy the

eye. The slightest abrasion of the cornea may become infected and a dangerous ulcer result.

Dacryocystitis.—The initial symptoms are conjunctivitis, local pain, and redness of the skin. The distended sac soon appears as a tumor involving the tissues near the inner canthus of the eye. If left to itself, this tumor may ulcerate and the pus burrow through the skin, establishing what is known as a **lacrimal fistula**, which may remain a lifetime, and become in itself a safeguard against a new attack. Often the distended sac loses its elasticity and becomes a permanent tumor, called **hydrops sacci lachrymalis.**

The diagnosis of simple catarrh, blennorrhea, or *hydrops* is easily made by emptying the sac with pressure of the finger: in catarrh, a watery secretion appears at the punctum; in blennorrhea there is more or less pus; in hydrops, the sac may empty into the nose and no secretion appear. Dacryocystitis and fistula need only be seen to be recognized.

Treatment.—Any nasal affection should be corrected, and a free passage for tears into the nose established. The latter is generally effected by the passage of sounds. Bowman's sounds or probes are usually employed. The canaliculus should be slit, and the following day the passage of probes commenced. It is optional which canaliculus is used, but the upper is shorter and easier to sound.

To pass a lacrimal sound or probe, the point of the sound must be passed along the floor of the slit canaliculus to the nose, until it is felt to strike against bony resistance; the sound is then rotated until it points downward; keeping close to the inner wall of the sac, the sound is then firmly pushed along. Under ordinary circumstances, if the probe is in the right position, it will pass along the nasal duct with a moderate pressure; undue resistance to a small probe indicates stricture of the duct or a false passage; in either case the pressure should be used cautiously. If the sound has passed easily, it should be left in position several minutes; in fact, it may remain one-half hour often to advantage. If the passage has been tight, the sound should be immediately withdrawn. The sounding of the passage should be repeated every 3 or 5 days, and the size of the sounds progressively increased. In some cases it is well for the patient to wear a leaden stilet constantly for several days. Theobald and others advocate the use of very large lacrimal sounds. A special probe-pointed knife has been devised for slitting strictures of the nasal duct. In treatment of the lacrimal passages we should resort to frequent syringing, various astringent and antiseptic preparations being used. Weak solutions of silver nitrate are of benefit in blennorrhea.

Recently there has been a reaction against promiscuous probing in lacrimal disease. The results are generally unsatisfactory and the case is often protracted. As a substitute there has lately been advised copious syringing with a fountain syringe attached to a hollow No. 4 Bowman's probe. The canaliculus need only be split halfway, and in some cases not at all. Boric acid and weak antiseptic solutions are used in the irrigations.

A simpler treatment of lacrimal obstruction, which dispenses with mutilation of the puncta and canaliculus and probing, consists in the following manipulations:

First empty the sac and canaliculi by dexterous pressure, and cleanse the eye and palpebral pockets of the unhealthy material. Then cant the patient's head back and to one side, or have him lie so that a teaspoonful of liquid will be held in the depression formed by the nose, orbital border, and superior maxilla. Fill this space with a weakly antiseptic solution. A good solution is composed, to the ounce of distilled water, of boric acid, 10 grains; common salt, 3 grains; chlorid of zinc, 1 grain—all deeply tinted with pyoktanin-blue, and doubly filtered after long standing. With the little finger again slowly empty the sac and canaliculi by pressure, and then, as slowly lessening the pressure, allow these spaces to refill, by suction and capillary attraction, with the solution under which the puncta are submerged. Again, in half a minute, empty the canaliculi and sac by pressure, but this time beginning the pressure from the canthus toward the nose and downward, so as to force the antiseptic solution downward into the duct. These alternate emptyings and refillings of the sac may be repeated several times and as often as desirable to meet the indications of the case. It will usually be found that the sac will soon become healthy, and that pressure upon it will not cause regurgitation of morbid material through the puncta.

A certain number of cases, however, will not yield to this treatment. There is too great stenosis or spasmodic contraction of the muscular sphincter of the punctum, etc., so that the cleansing solution cannot be forced into the sac and duct. In such case it is well to insert one sharp point of the iris-scissors into the punctum, and snip it open about 1/8 of an inch, perpendicularly downward toward the conjunctival fold. This gives a larger opening for the indrawal of the solution.

Obliteration of the lacrimal sac is a questionable procedure. **The treatment of acute dacryocystitis** consists in voiding the pus, either through the canaliculus or by an incision through the skin. The fistula is treated like other fistulous passages, and will generally heal if the obstruction to the passage of tears is removed. Repeated irrigation, syringing, and probing are the important after-treatments of all these affections.

LACTATION.—See Breast, Infant Feeding, Milk (Mother's), New-born Infant.

LACTIC ACID.—A liquid composed of 75 per cent by weight of absolute lactic acid, and 25 percent of water; nearly colorless, syrupy, odorless, of acid taste and reaction, freely miscible with water, alcohol and ether, but nearly insoluble in chloroform. It is produced by the lactic fermentation of sugar of milk or grape sugar, and is difficult to obtain pure. It enters into syrupus calcii lactophosphatis. Dose, 20 minims to 1 dram (average, 30 minims), well diluted.

It aids digestion and promotes the appetite, but in large doses causes flatulence and much epigastric pain. It dissolves false membranes and also

calcium phosphate. Hypnotic properties have been ascribed to it.

Lactic acid is used with benefit in diabetes, atonic dyspepsia, oxaluria, and in the lithic and phosphatic diatheses, when due to imperfect digestion and assimilation. As a solvent of false membrane in diphtheria it is unquestionably of great service, but painful. In chronic cystitis it arrests the ammoniacal decomposition in the urine. As the acid found in the shops is generally of poor quality, disappointment in its use may be expected. It has been used in tuberculous ulceration of the tongue: lactic acid, 80 parts; water, 20 parts, brushed daily over the ulcerated surface with a camel's-hair brush.

LACTOPHENIN.—A phenetidin derivative containing a lactic acid radicle instead of the acetic acid one of acetphenetidin (phenacetin). Its action is analgesic, antipyretic, and hypnotic; and it has been recommended as a substitute for phenacetin because of its greater solubility. Dose, 8 grains to begin with (for adults); maximum daily dose, 45 to 75 grains in wafers.

LACTUCARIUM (Lettuce).—The concrete milk-juice of *lactuca virosa*. It is partly soluble in alcohol and in ether, and yields a turbid mixture when triturated with water. Lactucarium is a mixture of several substances, the most important being *lactocin*, which is thought to be the active principle. It occurs in white scales, is soluble in water, and is used as a sedative and hypnotic in doses of 1 to 5 grains. Lactucarium also contains three bitter principles, *lactucin*, *lactopicrin* and *lactucic acid;* also *lactucerin*, an inert, waxy substance, constituting nearly one-half of the drug. A minute quantity of a mydriatic alkaloid, believed to be *hyoscyamin*, has been found in the plant, but not in commercial lactucarium. Dose, 10 to 20 grains.

Lactucarium is feebly hypnotic, somewhat sedative and diuretic. It is supposed to act similarly to opium, but very feebly and without depressing after-symptoms. Its preparations are very uncertain in activity, and are chiefly used as placebos, to allay cough and quiet nervous irritability. The syrup is a good vehicle for expectorants and antispasmodics.

Tinctura L., 50 percent. Dose, 10 minims to 2 drams according to the activity of the drug. **Syrupus L.**, has of the tincture 10 percent. Dose, 1 to 8 drams.

LAGOPHTHALMOS.—A condition in which the eyeball is so extruded that the lids cannot be completely closed. The exposure of the eye following this condition is accompanied by the greatest danger to the cornea. Lagophthalmos may be due to staphyloma of the cornea, ocular or orbital tumor, exophthalmic goiter, or paralysis of the orbicularis muscle.

LA GRIPPE.—See Influenza.

LAMBERT'S TREATMENT FOR NARCOTIC ADDICTION.—This treatment, originated by Mr. C. B. Towns of New York, has been described by Dr. Alexander Lambert, of the same city, and is best known under his name. Previous to its publication, the usual treatment had been to deprive the patient slowly or quickly of his narcotic on the theory that deprivation from a narcotic would soon wear off the desire for it. But deprivation instead of obliterating the craving, intensified it. A patient deprived of his morphin or alcohol counts the days or hours until he can return to his narcotic, and this longing for it and looking forward to it has been known to last for weeks and months. After this treatment has been correctly given the desire for the narcotic is gone, and although the patient may feel weak and relaxed, he does not feel the craving. This treatment will take a morphinist from his drug without undue suffering, and will put him in a position in which he may be built up and given a chance to be free from his drug. It will do the same for the man who takes cocain. It has also been successfully used for tobacco, and the habits of the coal-tar hypnotics such as veronal and trional. This treatment will put an alcoholic on his feet, make him absolutely sober, and with all desire for his alcohol gone. It will give the man who wishes to be helped a chance to be free from his habit. After a man has been freed from the desire for his drug—the after treatment is of the greatest importance. The patient should be made to realize that he is mentally just unpoised, and his nervous system cannot as a rule stand the strain of worry and work. He must be built up physically into as perfect a condition as circumstances will permit, and this will take usually three weeks or a month, or longer. If this is done, the physical condition will not tempt the mind back into the seductive taking of little nibbles at his drug, which to his mind don't count, but which in reality are the beginning again of all the old habit. It is useless to compromise; the man who has taken alcohol to excess, or morphin or cocain to excess, cannot again touch these things without great danger of relapse to all their excesses. The first drink will start up all the old desires with the same inevitable results. To the man who has indulged excessively, his nervous system and alcohol are chemically incompatible. The alcohol forms a poisonous combination with the brain cells which perverts the normal reaction of these cells. There is no question that it poisons the higher functions of the brain and perverts them. It is useless for him to ever hope to drink again in moderation. Many alcoholics have the faint hope back in their minds, against everything that is told them, everything they have experienced, and everything which their own judgment dictates, that some day they may be able to drink without going to excess. This *summum bonum* of their desires is always being sought for and never attained, and the self deception goes on; they are always trying to see if the first few drinks cannot be taken with impunity. This is one of the reasons why so many men revert. It is useless to endeavor to help a man who does not want to be helped. It is useless to waste time giving a treatment to take away the craving for narcotics to an individual who has no intention of trying to stop. The Lambert treatment is distinctly contraindicated in those who are

not willing to help to stay sober. It is also contraindicated in pregnant women, as the very active cathartics may sometimes produce a miscarriage. The method of administering this treatment has been most recently described in the Journal of the American Medical Association of February 18, 1911, and is as follows:

The belladonna mixture of two parts 15 percent tincture of belladonna, and one part each of the fluidextracts of hyoscyamus and xanthoxylum, has proved itself an essential part of the treatment. When the 10 percent tincture of belladonna has been used, or when even a 12 percent tincture has been employed, the results obtained were not clear-cut, but left the patients with an indefinite nagging longing for their narcotic. It seems necessary to push this mixture to the physiologic tolerance of the belladonna. This tolerance, of course, varies with the individual, and some of the best results have been obtained with patients who could not tolerate as an hourly dose more than from 2 to 4 drops of this mixture, while others easily tolerated from 18 to 20. It would seem, judging from clinical results, that there are some properties in this mixture which are necessary to a successful carrying out of the treatment. The bottle containing this mixture must be kept well corked, and shaken before using. The method which Lambert pursues is as follows:

A patient addicted to morphin is given five compound cathartic pills and 5 grains of blue mass, and, six hours later, if these have not acted, they are followed by a saline; after three or four abundant movements of the bowels from these cathartics, the patient is given, in three divided doses at half-hour intervals, two-thirds of the total daily twenty-four-hour dose of morphin or opium to which he has been accustomed. Observe carefully after the second dose has been given, as the amount then equals four-ninths or nearly one-half the total twenty-four-hour dose. Some few patients cannot comfortably take more than this amount. At the same time with the morphin, 6 drops of the belladonna mixture are given in capsules. This belladonna mixture in doses of 6 drops (and by drops are not meant minims, but drops dropped from an ordinary medicine dropper, which is about half a minim dose) is given every hour for six hours. At the end of six hours the dosage is increased 2 drops. The belladonna mixture is continued every hour of the day and every hour of the night continuously throughout the treatment, increasing 2 drops every six hours until 16 drops are taken, when it is continued at this dosage; it is diminished or discontinued at any time if the patient shows belladonna symptoms such as dilated pupils, dry throat or redness of the skin, or the peculiar and incisive and insistent voice, and insistence on one or two ideas. It is begun again at reduced dosage after the above symptoms have subsided.

At the tenth hour after the initial dose of morphin is given, the patient is again given five compound cathartic pills, and 5 grains of blue mass. These should act in six or eight hours after they have been taken. If they do not act at this time some vigorous saline is given, and when they have acted thoroughly the second dose of morphin is given, which is usually about the eighteenth hour. This should be one-half the original dose; *i. e.*, one-third of the original twenty-four-hour daily dose. The belladonna mixture is still continued, and ten hours after the second dose of morphin has been given, that is about the twenty-eighth-hour, five compound cathartic pills are again given and 5 grains of blue mass, these again if necessary followed by a saline seven or eight hours later. At times when the C. C. pills are not acting well, or too slowly, five or six "B. B." pills are given from two to three hours after the C. C. pills. These "B. B." pills are the pilulæ catharticæ vegetabiles of the pharmacopeia with 1/10 grain of oleoresin of capsicum, 1/2 grain of ginger, and 1/25 minim of croton oil added to each pill. After these have thoroughly acted at about the thirty-sixth hour, the third dose of morphin is given, which is one-sixth of the original dose. This is usually the last dose of morphin that is necessary. Again, ten hours after this third dose of morphin, *i. e.*, the forty-sixth hour, the five C. C. pills and 5 grains of blue mass are again given, followed in seven or eight hours afterward by a saline, and one expects at this time to see the bilious green stool appear. When this appears, after the bowels have moved thoroughly, ten or twelve hours after the third dose of morphin, about the fifty-sixth hour, two ounces of castor oil are given to clear out thoroughly the intestinal tract. During this last period when the bowels are moving from the C. C. pills and before the oil is given, the patients have their most uncomfortable time. Their nervousness and discomfort can be controlled usually by codein, which can be given hypodermically in 5 grain doses and repeated if necessary, or some form of the valerianates may help them. About the thirtieth hour these patients should be stimulated with strychnin or digitalis, or both. After they are off their drug, the tonics which do them the most good are those which contain some form of phosphorus and arsenic; and here a warning must be given as to the danger of these patients overeating, and thus bringing back all their withdrawal symptoms due to the disturbance of digestion. They have been in the habit of referring all uncomfortable feelings to those of the withdrawal symptoms of morphin, and digestive disturbances feign these withdrawal symptoms. Sometimes about the thirty-sixth hour the stools become clay-colored. Some form of prepared ox-gall is most effective to stimulate further biliary secretion given in small doses every hour for five or six doses.

In treating an alcoholic, the belladonna mixture and the five C. C. pills and 5 grains of blue mass are given simultaneously at the first dose. The belladonna mixture is continued every hour of the day and every hour of the night the same as with the morphin patients, and twelve hours after the initial dose patients are again given from three to five C. C. pills, and at the twenty-fourth hour after the initial dose, they are again given the cathartics followed by salines if necessary, and again

at the thirty-sixth hour. After these cathartics, the bilious stools will appear, and by the forty-fourth or forty-fifth hour the castor oil is given. Sometimes it is necessary to carry on the treatment over another period, and the C. C. pills and blue mass are again given at the forty-eighth hour, which would bring the end of the treatment about the sixtieth hour.

Elderly or very nervous patients who have been on a prolonged debauch are tapered off with 2 ounces of whisky for four or five doses through the first twenty-four hours. If these patients are excessively nervous it is necessary also to see that they sleep, and the mixture of chloral hydrate, 20 grains; morphin, 1/8 grain; tincture of hyoscyamus 1/2 dram; ginger, 10 minims; and capsicum 5 minims; water 1/2 ounce; which was recommended before is the best hypnotic for them. These patients should also have cardiac stimulants such as strychnin and digitalis after the first twenty-four hours, sooner if they are weak. If the patient has an alcoholic gastritis and cannot retain medicine, it is wise to give him 5 grains of Tully's powder (pulvis morphinæ compositus) with 5 grains of sodium bicarbonate about every two hours for two or three doses, as this seems to be the most effective method of allaying the vomiting of an alcoholic gastritis.

The cocainist can be treated like the alcoholic, except that no cocain is given at any time, and strychnin or some such stimulant must be given from the beginning of the treatment.

The lasting effects of this treatment are of course greatly influenced by the environment in which the patient must live after he has had the treatment. As was said before, if he be in as fine physical condition as is possible, he stands the best chance of being able to resist. Except in the elderly, and those in whom there is danger from cardiac degeneration physical exercise is the very best after treatment. They should not be treated with a rest cure, but should be built up by physical exertion. As soon as they are in good physical trim they will do better if the responsibility of some occupation is given them, rather than distrust and idleness. It is a very noticeable feature in treating these patients, especially the alcoholics, that those who are addicted to a cigarette habit are much more prone to relapse than those who do not smoke at all, or even than those who smoke cigars or a pipe. It is the constant poisoning by an incessant accumulation of small doses of tobacco poison, which finally amounts to a chronic tobacco poisoning. This wears on their nerves, and their nerves must be quieted by some narcotic and they turn to the one to which they are most accustomed and moving in the line of least resistance drop back into their old habits. If a man who drinks to excess can be treated at the same time for his cigarette habit, it increases the probability of his remaining abstinent. This treatment must not be considered as a cure-all and a regenerator of the weak-minded and congenitally unfit members of the human race, but it will give those who desire to break away from narcotic addiction a chance to do so, and a chance to go on in life successfully where they might otherwise fail.

LAMINARIA (Sea-tangle).—A seaweed, *Laminaria digitata*, found upon the shores of Great Britain. It has a stem from 6 to 15 feet in length, and about 1 inch to 1 1/2 inches in diameter at its largest part. The stem shrinks to a marked degree in drying. The dried pieces, when again moistened, quickly regain their natural size. This property makes laminaria valuable for the manufacture of tents and bougies. The plant is one of the sources of iodin, which it contains in large proportion. When burned, it produces a superior, fine-grained charcoal. See TENT.

LAMINECTOMY.—See SPINE (Injuries).

LANDRY'S PARALYSIS.—See PARALYSIS (Acute Ascending).

LANOLIN (Adeps lanæ hydrosus).—The purified fat of the wool of sheep, mixed with not more than 30 percent of water. A yellowish-white, ointment-like mass of faint, peculiar odor, insoluble in water, but miscible with twice its weight thereof. It is a cholesterin fat, differing from other fatty substances chiefly in resisting saponification and the action of water, and having no tendency to become rancid. It readily passes through the integument, carrying with it any medicament with which it is charged. It is a neutral base, and not likely to decompose any substance. It is peculiarly useful in chronic skin-disease where there is infiltration. It is inferior to lard, vaselin, or cold cream when a simple protective action alone is desired.

LAPAROTOMY.—See ABDOMINAL SECTION.

LAPPA (Burdock).—The dried root of *Arctium Lappa*, and of other species of *Arctium*. It contains a bitter principle, traces of a volatile oil, also inulin, resin, tannin, mucilage, sugar, etc. Dose, 20 to 45 grains.

Lappa promotes all the secretions and is considered aperient, diuretic and diaphoretic, without irritating qualities. In decoction it has been a popular domestic remedy for many morbid conditions, especially rheumatism, gout, pulmonary catarrhs, and chronic cutaneous affections. It has been used as an alterative in constitutional diseases, as syphilis and scrofula, also as an external application to swellings, hemorrhoids and chronic sores.

Fluidextractum Lappæ, made with diluted alcohol. Dose, 20 to 45 minims.

LARD (Adeps).—The prepared internal fat of the abdomen of the hog, purified by washing, melting and straining. It occurs as a soft, white, unctuous solid, of bland taste and neutral reaction, entirely soluble in ether, benzin, and bisulphid of carbon; composed of 38 percent of stearin and margarin, and 62 percent of olein. Lard forms 50 percent of ceratum, and 80 percent of unguentum, and enters into the composition of several of the official cerates.

Preparations.—**Adeps benzoinatus,** *benzoinated lard*, has 2 percent of benzoin in powder, incorporated by stirring. **Oleum adipis,** *lard oil*, is a fixed oil expressed from lard at a low temperature.

LARGIN.—A silver-albumin compound, which

in the air-dried condition contains 11 percent of silver. It forms a gray powder, which is soluble in 10 parts of water. Largin is a powerful bactericide and astringent, like silver nitrate, but is nonirritant, and is not precipitated by sodium chlorid or albumin. It is chiefly used in gonorrhea in 1/4 to 1 1/2 percent solution.

LARYNGEAL MUSCLES, PARALYSIS. Etiology.—Central nervous lesions, as bulbar paralysis; perpiheral nervous lesions, affecting the recurrent laryngeal nerve (such as aortic aneurysm, tumor of mediastinum, diphtheritic paralysis); local lesions of the vocal cords (such as ulceration due to syphilis, or tuberculosis); and hysteria.

The nerves involved are the superior laryngeal and the recurrent laryngeal (both branches of the pneumogastric nerve).

The following oftquoted table from Gowers shows the symptoms, laryngoscopic picture, and lesions.

Treatment, is that of the cause; electricity and strychnin have also been employed.

Vocal Cords (Diagrammatic Mirror Picture). 1. Normal position in breathing and phonation respectively. 2. Adductor paralysis (left); 2′. bilateral adductor paralysis. Both in phonation. 3. Unilateral abductor (left) and 3′. Bilateral abductor paralysis both during breathing. 4. Left recurrent paralysis phonation. 4′. Same in respiration. 4″. Recurrent bilateral in both respiration and phonation. 5. Arytenoid paralysis phonation. 5′. Thyroarytenoid paralysis phonation. 5″. Arytenoid and thyroarytenoid paralysis.—*Greene.*)

Symptoms.	Signs.	Lesion.
(*a*) No voice; no cough; stridor only on deep inspiration.	Both cords moderately abducted and motionless.	Total bilateral palsy.
(*b*) Voice low-pitched and hoarse, no cough; stridor absent or slight on breathing.	One cord moderately abducted and motionless, the other moving freely and even beyond the middle line in phonation.	Total unilateral palsy.
(*c*) Voice little changed; cough normal; inspiration difficult and long, with loud stridor.	Both cords near together, and during inspiration not separated, but even drawn nearer together.	Total abductor palsy.
(*d*) Symptoms inconclusive; little affection of the voice or cough.	One cord near the middle line, not moving during inspiration; the other normal.	Unilateral abductor palsy.
(*e*) No voice; perfect cough; no stridor or dyspnea.	Cord normal in position and moving normally in respiration, but not brought together on an attempt at phonation.	Adductor palsy.

LARYNGISMUS STRIDULUS.—A peculiar form of laryngo-respiratory spasm, occurring almost exclusively in rickety children. There is no lesion of the larynx, it being usually a pure neurosis. The characteristic feature of the attack is a sudden "holding of the breath" for a few seconds; the glottis is then burst open, the air rushing in with a stridulous sound. In a severe attack not only the glottis, but the epiglottis, is closed, and the respiratory muscles are in a state of spasm. The exciting cause is most commonly some emotional disturbance, while dentition, irritation of the larynx or pharynx, nasal adenoids, or constipation may act as exciting causes.

The following table gives the chief points of diagnosis:

Laryngismus (Spasm of the Glottis).	Spasmodic Laryngitis.	Membranous Croup.
Occurs in rickety children 18 months of age.	Rarely occurs under 2 years of age; commonest 2 to 7 years.	Occurs at all ages during childhood.
No fever, no coryza and no laryngeal catarrh.	Slight fever, mostly coryza and laryngeal catarrh.	Variable amount of fever and perhaps some diphtheria of fauces.
Occurs at any period of the 24 hours, and often many times.	Attack occurs at night.	Mostly worse at night.
No cough; inspirations are stridulous.	Metallic cough, stridulous respirations, variable dyspnea.	Metallic cough, stridulous respiration, progressive dyspnea.
Contraction of the limbs or general convulsions not uncommon.	Convulsions rare.	Convulsions rare.
The attack lasts a few seconds and then recurs frequently.	Attack passes off in the course of an hour or two.	Becomes steadily worse, though variations occur in its progress.
Occasionally fatal...	Rarely fatal.....	Very often fatal.

Treatment.—During the spasmodic stage, while the breath is being held, attempts to excite the inspiratory center reflexly must be made. Cold water may be dashed in the face, the back may be patted, or a vigorous shake be given. Fanning the face vigorously during an attack is also useful. Hooking back the epiglottis with the forefinger is usually followed by an inspiration. A catheter may be passed into the larynx, or intubation performed, while quick tracheotomy is indicated if other means are not speedily followed by relief. The most useful medicines to check attacks are chloral, bromids, and minute doses of morphin. Potassium (or sodium) bromid, with chloral, may be given to an infant of 6 months, and repeated every 6 hours.

℞. Potassium bromid, ʒ ij
Chloral, gr. xxxij
Peppermint water, ʒ ij.
Teaspoonful every half hour.

The diet and surroundings are most important. Fresh air is imperative; and a steam tent and close,

hot room are the worst possible things. A change to the seaside works wonders, and medicines which assist and regulate the bowels, such as extract of malt, rhubarb and soda, acids and pepsin, and cod-liver oil, when it can be digested, are indicated.

LARYNGITIS, ACUTE.—Acute catarrhal laryngitis; mucous laryngitis.

Acute inflammation of the mucous membrane lining the larynx.

Etiology.—(1) Sudden changes in the atmosphere; (2) exposure to the cold and wet; (3) immoderate use of voice; (4) inhalation of dust or chemicals; (5) traumatism; (6) certain diseases act as predisposing causes, such as tuberculosis, rheumatic diathesis.

Pathology.—The mucous membrane is red and highly congested, the swollen capillaries being of larger volume, and traverse the surface of the membrane in all directions. Large quantities of mucus are secreted, and form a coating over the vocal bands. In some cases the serous material is retained within the cellular tissue, causing occlusion of the glottis (edema of the larynx). The latter condition is more common in tuberculosis or syphilis.

Symptoms.—There are, commonly, hoarseness, cough, expectoration of a viscid secretion, dryness of throat, and pain on deglutition. In children the respiration is frequently embarrassed, and paroxysms of croup may occur. Physical examination reveals a reddened condition of the mucous membrane lining the organ, and also affecting the vocal bands, which lose their characteristic shining appearance.

Diagnosis is determined by the subjective and objective symptoms.

Prognosis is favorable.

General Treatment.—Calomel should be given in fractional doses (1/4 of a grain), followed by a saline purge. The room should be at an equable temperature, not lower than 65° F.

℞. Tincture of aconite, ♏ xxx
Tincture of belladonna, ♏ xxx
Glycerin, ʒ ij
Solution of potassium citrate, enough to make ʒ ij.
Two teaspoonfuls every 3 hours.

Hot foot-baths taken at bedtime are of great benefit. The water should be as hot as can be borne, and applied by means of a towel as high up as the knees. From 10 to 15 minutes may be well spent in this manner. If necessary, it may be repeated again during the night, and for several successive nights. Diaphoresis may be encouraged by the use of hot drinks, with 5-grain doses of quinin and a Dover's powder. The diet at all times should be light and nourishing. Under no circumstances should constipation be allowed to exist.

Diuretics are also advisable; the solution of potassium citrate is particularly serviceable. It may be combined with 2-drop or 4-drop doses of tincture of aconite.

Local Treatment.—Small pieces of ice may be allowed slowly to dissolve in the mouth; externally, cold cloths. Leiter's coil or rubber tubing, through which cold water is allowed to run, may be applied.

Sedative inhalations are valuable:

℞. Menthol, gr. ij
Chloroform, ʒ ss
Compound tincture of benzoin, enough to make ʒ ij.
Two teaspoonfuls to a pint of hot water, and inhale every two hours.

For the first 2 or 3 days the throat may be swabbed out once daily with glycerite of tannin or boroglycerid.

Acute laryngitis in children is best relieved by the administration of syrup of ipecac (1/2 of a dram) every 15 minutes until vomiting occurs. Externally, the throat may be thoroughly lubricated with benzoinated lard, containing a small amount of oil of mustard. The parts may be covered with hot flannel cloths, frequently repeated. If there is a tendency to recur, the throat may be swabbed with glycerite of tannin.

LARYNGITIS, CHRONIC. Varieties.—Simple chronic catarrhal laryngitis; (2) tubercular laryngitis; (3) syphilitic laryngitis.

Simple Chronic Catarrhal Laryngitis

Synonym.—Chronic laryngeal catarrh.

The etiology is the same as acute laryngitis. It may follow acute attacks.

Pathology.—Cellular infiltration and hypertrophy of the mucous membrane, with permanent dilatation of the blood-vessels, is the distinct lesion. The glandular structure becomes involved, forming slight elevations (granulations), giving rise to what is termed follicular laryngitis. Generally the surface is red and swollen, and covered with thick mucus. Superficial erosions may occur. The vocal bands may contain small nodules.

Symptoms.—Tickling in the throat, hoarseness, persistent cough, and expectoration of thick, tenacious, whitish mucus are the most common symptoms. Physical examination reveals congestion of the larynx, with small granulations in certain portions of the mucous membrane. The vocal bands are usually reddened, frequently unilateral, or the cartilaginous portion alone may be affected.

Prognosis is guardedly favorable under prolonged treatment.

General Treatment.—Correct the indigestion, constipation, and restrict the use of tobacco and alcoholic drinks. Tonics, such as the syrup of hypophosphites with iron and strychnin, are valuable. Turkish baths are of benefit.

Local Treatment.—Erosions or enlarged follicles, after being cocainized, should be removed by means of molded silver nitrate or the galvanocautery. Stimulating inhalations are of service.

℞. Eucalyptol, gr. iij
Spirit of camphor, ʒ iv
Compound tincture of benzoin, enough to make ʒ ij.
Two teaspoonfuls to a pint of hot water. Inhale on rising and at bedtime.

After the morning inhalation it is best for the patient to remain indoors for an hour or two. Local applications of a solution of silver nitrate (10 to 20 grains to the ounce) may be applied twice a week. Glycerite of tannin, or boroglycerid (50 percent), may be substituted for the silver nitrate. Cleanse the throat at intervals by means of alkaline solutions, used in the form of a spray. Solutions made from any of the antiseptic nasal-douche tablets may be employed for this purpose. See RHINITIS (Chronic). Guaiac has been recommended. It is best administered in the form of a lozenge.

℞. Guaiac, ʒ ij
Oil of cloves, ♏ ij
Oil of lemon, ♏ v
Powdered acacia, ʒ ss
Powdered sugar, ʒ j
Confection of rose, enough to make 30 lozenges.
Allow one to dissolve in the mouth every 4 hours.

Tuberculous Laryngitis

This is usually secondary to pulmonary tuberculosis.

Symptoms.—Hoarseness, pain on deglutition, distressing cough, hemoptysis, and frequent attacks of aphonia.

Physical examination reveals a marked paleness of the mucous membrane of the larynx and vocal cords, ulceration, and distinct hypertrophy (excrescences) of the glandular structure in localized areas. Caries and necrosis may be present.

The ulcers are multiple in character and have a tendency to coalesce without much tendency to penetrate deeply.

Tuberculous laryngitis and syphilitic laryngitis may be differentiated as follows:

TUBERCULOUS LARYNGITIS.	SYPHILITIC LARYNGITIS.
Pain severe on deglutition.	Usually slight.
Ulcerates slowly.	Rapidly.
Usually first appears as small spots or nodules which are rapidly followed by great edema.	Is rarely seen in stage of induration, the first evidence being a clear-cut, deep ulcer.
Ulcers extend laterally, but not deeply.	Extend deeply, often involving cartilage.
Mucous membrane is usually pale.	Hyperemic, injected.
Health impaired previous to laryngeal involvement.	Unimpaired.
Previous or coincident pulmonary trouble common.	Frequently evidence of syphilitic disease in other tissues.
Iodids have no influence.	Readily improves under iodids.

Complication.—Edema of the larynx is very common.

Prognosis.—See TUBERCULOSIS.

General Treatment.—See TUBERCULOSIS.

Local Treatment.—Cleanse the parts once or twice a week with an alkaline spray, and subsequently dust over with aristol or iodoform. If the pain is intense, touch the ulcers with a solution of cocain (10 percent). Menthol may also be used for the same purpose.

To be inhaled:

℞. Menthol, gr. iij
Creosote (beechwood), ♏ xvj
Compound tincture of benzoin, ʒ ij.
Two teaspoonfuls to a pint of hot water. Inhale at bedtime.

Weak solutions of menthol in albolene used in a nebulizer give good results.

More profound and prolonged anesthesia may, however, be produced by the application of a 20 percent solution of quinin and urea hydrochlorid (*q. v.*); which has recently been highly praised.

Electric cataphoresis with guaiacol or oxychlorid of copper has proved of value. Submucous and intratracheal injections of guaiacol, 20 percent, are sometimes efficacious.

Edema of the larynx frequently occurs, and tracheotomy is occasionally advisable.

Syphilitic Laryngitis

Symptoms.—There is persistent huskiness of voice. The cough is less troublesome than in the tuberculous form, and pain is not great or may be entirely absent.

Physical Examination.—The larynx is ulcerated, the vocal cords congested, and mucous patches may appear on the tip of the epiglottis or on the ventricular bands. The latter are described by Gottstein as being "round or elongated grayish-white spots of thickened epithelium, slightly raised upon the congested tissue which surrounds them, and are either sharply circumscribed or shade gradually off into it." The secretion is scanty and very tenacious.

Complication.—Edema of the larynx is very common.

General Treatment.—See SYPHILIS.

Locally, the ulcers may be touched with the galvanocautery, a solution of zinc chlorid (30 grains to 1 ounce), or with a crystal of copper sulphate or silver nitrate. Stimulating inhalations may be used.

Should edema of larynx occur, tracheotomy may be necessary

LARYNGITIS, EDEMATOUS (Edema of the Glottis).—An acute inflammation of the mucous membrane of the larynx and that about the glottis, with an infiltration of the areolar tissues by a serous, seropurulent, or purulent fluid; it is characterized by obstructed or stridulous breathing and dysphonia or aphonia.

Etiology.—It may be the result of acute laryngitis; abscess in or about the throat or tonsils; erysipelas of the face; scarlatina; small-pox; Bright's

disease; syphilis of the larynx. It is rare in children, except when due to scalds.

Pathologic Anatomy.—There is infiltration of the loose connective tissue of the aryepiglottic folds, the glossoepiglottic ligament, the base of the epiglottis, and the interarytenoid space. If the true vocal bands are inflamed, their color changes, and instead of appearing white, glistening, and brilliant, they are dull, grayish-red, or violet-red in patches. If the swelling is the result of purulent infiltration, the parts affected present a deeply congested color, with here and there spots of a yellowish hue. Serous infiltration, sufficient to cause fatal edema, disappears with death, leaving but slight traces to account for the formidable symptoms.

Symptoms.—The onset is much the same as a simple catarrhal laryngitis with a gradually increasing impediment to the respiration. The patient experiences the sensation of a foreign body in the throat, and, after a short time, a difficulty of breathing, which ultimately threatens suffocation. The deglutition is rendered difficult owing to the swelling of the epiglottis. The voice, at first muffled, gradually becomes weaker and weaker, until finally it is almost extinct. The cough at first is dry and harsh, but as the infiltration increases it becomes stridulous and suppressed; there is no expectoration except that, after great effort to clear the throat, a little frothy mucus is raised. The difficulty of respiration, as the disease progresses, becomes greater and greater, and the paroxysms of impending suffocation more frequent. The inspiration is accompanied by a whistling sound characteristic of the narrow condition of the glottis; the patient sits up in bed, his mouth open, gasping for breath, his eyes protruding, the whole body trembling with intense convulsive movements; after a time a general cyanosis commences, the face assuming a bluish hue, all these symptoms continuing for a few moments, when slight relief occurs, to be again followed by another paroxysm, in one of which, if nature or art does not afford prompt relief, death occurs from asphyxia. A physical examination of the parts may be made by gently passing the finger into the throat, when the epiglottis may be felt very much thickened, and the aryepiglottic folds may have attained such tumefaction as to convey to the finger an impression similar to that which is given by touching the tonsils.

Laryngoscopic Appearance.—The mucous membrane has a bright-red appearance. The epiglottis has the appearance of a semitransparent, roll-like body, or it is often merely erect and tense. It is this condition of the epiglottis which explains the pain and difficulty in deglutition. Rarely the vocal bands are infiltrated.

Diagnosis.—Any disease which gives rise to dyspnea may simulate edematous laryngitis, but the history of the case, together with a laryngoscopic examination, will generally furnish conclusive evidence as to the real nature of the malady.

Prognosis is, as a rule, unfavorable. If early and vigorous treatment is instituted, recovery is possible; but without it death is the inevitable result, the patient dying asphyxiated. Even when local measures have removed the obstruction to free respiration, the patient is very likely to perish subsequently from exhaustion or blood-poisoning, or from pneumonia or other lung complication. The duration of infiltration of the larynx varies from a few hours to several days.

Treatment.—Prompt local treatment must be adopted in order to remove the laryngeal obstruction. A blister or leeches placed over the sides of the larynx in mild cases may effect so much reduction in the edema as to free the patient from danger.

If the infiltration has already occurred, and is slight in amount, scarification, guiding the instrument by the index-finger of the opposite hand, may afford relief, or the hypodermic injection of pilocarpin, 1/3 of a grain, repeated, may lessen the swelling.

The persistent use of small pellets of ice, swallowed or held far back in the mouth until dissolved, early in the attack and the application of ice to the neck; the administration of saline laxatives; the inhalation or spray of alum, adrenalin, or a strong solution of tannic acid; and the application, as near the seat of the disease as possible, of Monsel's solution, full or half strength, may be effective. Mackenzie says the patient should be kept constantly under the influence of potassium bromid.

If these means fail, tracheotomy or intubation is indicated; in those cases of sudden and rapid infiltration of the glottis or larynx occurring in Bright's disease, erysipelas, scarlatina, or syphilis of the larynx, and especially the former and the latter, tracheotomy or intubation should be performed at once.

In cases of infiltration of the larynx stimulants should be boldly administered by the rectum, if stomachic administration is impossible. If the infiltration is composed of pus, quinin sulphate, 5 grains every 4 hours, and stimulants are indicated. See Laryngitis, Tracheotomy, Intubation.

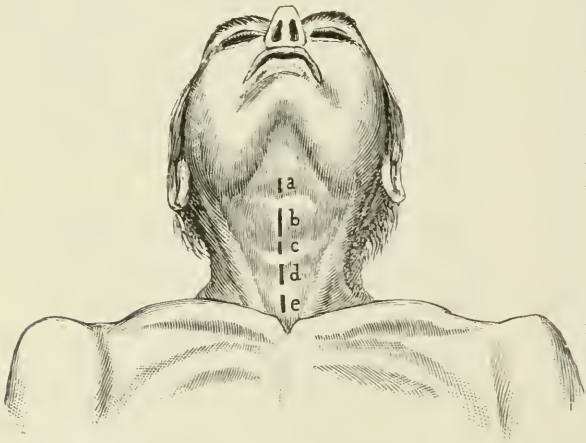
LARYNGOSCOPE.—See Larynx (Examination).

LARYNGOTOMY. Indications.—The operation of laryngotomy is now rarely performed by laryngologists, because of their skill in operating within the larynx through the mouth; yet with surgeons less skilled in laryngology, and, perhaps, more efficient in general operating, laryngotomy continues in favor. It must be remembered, however, that it is a serious operation, and especially dangerous in young children and the aged. It is indicated for the removal of neoplasms and foreign bodies in the larynx, provided there is danger to life from suffocation or dysphagia, and when they cannot be removed through the mouth; also, in some instances, for the relief of stenosis resulting from diphtheria, when other measures fail. In cases in which laryngeal tumors are very large or very numerous, or, when single, are attached in places difficult to reach, laryngotomy is probably easier than intralaryngeal operation, and sometimes it may be safer and more complete.

Impacted jagged foreign bodies often demand laryngotomy, and others usually require tracheotomy. In any case the operation to be preferred, provided the operator is competent, should only be decided upon after an accurate diagnosis, unless suffocation is imminent, and then tracheotomy should be done.

The history and symptoms can seldom be relied upon in making an accurate diagnosis of surgical affection of the larynx. In supposed cases of foreign bodies in the larynx due attention must be given to the statements and sensations of the patient; yet they are often very misleading, so that inspection is necessary in most cases. Laryngoscopy is difficult, and sometimes impossible, in nervous children and in some adults. When the throat is very irritable, the sensitiveness may generally be relieved by the use of a cocain spray. But in young children in order to inspect the larynx one will often be obliged to give an anesthetic and then employ Kerstein's autoscope. Even this will fail to reveal the parts in some cases, and then we must rely upon the symptoms and history for our diagnosis.

The symptoms of foreign bodies in the larynx vary greatly with the position, size, and shape of the object, ranging from a slight irritation, and including paroxysmal cough, dyspnea, dysphagia, and hemorrhage, to clonic spasms of the glottis and speedy death. The usual symptoms of a tumor in the larynx—varying, of course, with its size and shape—are cough, dyspnea, dysphonia or aphonia, and dysphagia. There is also slight pain in some cases.

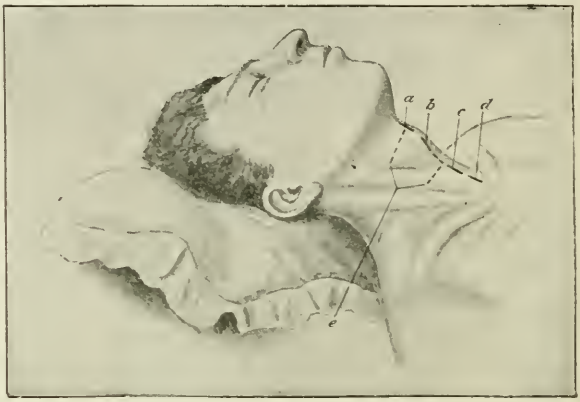


Situation for Incision in the Middle Line of the Neck.
a. Subhyoid pharyngotomy. b. Thyrotomy. c. Laryngotomy. d. Tracheotomy above isthmus. e. Tracheotomy below isthmus. The lines only show the relative situation of the incisions, not their correct length.—(*Spencer and Gask.*)

Operation.—Laryngotomy includes suprathyroid laryngotomy, thyrotomy, and infrathyroid laryngotomy.

Suprathyroid laryngotomy is performed by making a transverse incision through the superficial structures and the thyroid membrane. This incision gives but a limited exposure of the cavity of the larynx, and the operation is seldom employed, as by it no more can be accomplished than through the mouth.

The infrathyroid method is seldom resorted to unless combined with division of some of the upper rings of the trachea.



Laryngeal Incision.
a. Median subhyoid pharyngotomy. b. Thyrotomy, and, point below laryngotomy. c. High tracheotomy. d. Low tracheotomy e. The interrupted lines mark the incisions in laryngectomy.—(*Spencer and Gask.*)

Thyrotomy consists of the division of the thyroid cartilage in the median line, and is the operation commonly referred to as laryngotomy.

If there is great embarrassment of respiration or if much bleeding is feared from the operation within the larynx, a preliminary tracheotomy should be performed and a proper tube inserted and left in place. This insures free respiration and allows the upper part of the trachea or lower part of the larynx to be packed with gauze in case troublesome hemorrhage is encountered within the larynx. Several days, or, better, one or more weeks, should generally elapse before the more serious operation of thyrotomy is undertaken, though sometimes it is best to do both operations at the same time. In the interim the surgeon may endeavor from time to time to remove the growth or foreign bodies by endolaryngeal means or through the tracheal opening; or success may possibly be attained by the aid of Kerstein's autoscope.

For thyrotomy the patient should be anesthetized, and if tracheotomy has been previously performed, a rubber tube may be attached to the cannula within the trachea and the anesthetic administered through the tube, out of the operator's way. The patient should be in the dorsal recumbent position, with the head hanging over the end of the table, supported by an assistant or by the knees of the operator.

An incision is made exactly in the median line

from the hyoid bone to just below the cricoid cartilage, dividing everything down to the thyroid cartilage. The soft parts should be retracted and all hemorrhage arrested. The thyroid cartilage now remains to be divided. In children this can easily be done with a strong knife or scissors. In adults if ossification has taken place, a small circular saw revolved by a motor, a convex saw, or bone-forceps will be found satisfactory. Care must be taken to cut exactly in the median line, and thus avoid the vocal bands, which are attached on either side. It is advantageous to leave a little of the upper part of the thyroid cartilage intact, in order to avoid displacement of the vocal cords in suturing the edges of the wound. The greatest difficulties of the operation begin when the larynx is opened. Violent reflex action is set up from the introduction of the knife or blood into the larynx, which rises and falls rapidly and spasmodically. A sharp-pointed knife is therefore dangerous at this stage of the operation. When this reflex action interferes greatly with the progress of the operation, it may be checked, in a measure, at least, by spraying a 10 percent solution of cocain on the laryngeal mucous membrane. Hemorrhage is seldom marked, save in cancerous growths. Compression is usually sufficient to arrest what bleeding there is.

If operating for a tumor, the larynx may now be tamponed below the growth, as suggested for the prevention of the entrance of blood into the trachea.

The divided cartilages having been retracted, the growth or foreign body is removed. To remove neoplasms several differently shaped slender forceps, cutting forceps, sharp spoons, a snare, porte-caustique, and pointed cautery electrodes should be at hand. These must be used with great care, so as to preserve as much of the mucous membrane of the part as is compatible with thorough removal of the tumor. The base of the tumor should be cauterized with the galvanocautery or with solid nitrate of silver. Mackenzie prefers the latter, believing this practice less likely to be followed by laryngitis. The foreign body or tumor having been removed, the larynx should be gently sponged, to remove all foreign substance, and the divided cartilages carefully approximated and sutured, preferably with silver wire.

If tracheotomy has been performed, the tube should be left in the trachea until all danger of edematous laryngitis is past.

Removal of a papilloma is not infrequently followed by recurrence, but the operation may be repeated with a good hope of permanent cure. Malignant growths are, of course, liable to return, and the operation for their removal is useless, except when the growth is very small and distinctly circumscribed. See Neck (Injuries).

LARYNX, EXAMINATION.—The larynx is the organ of voice placed at the upper part of the air-passage. It is situated between the trachea and base of the tongue, at the upper and anterior region of the neck. On each side of it lie the great vessels of the neck; behind it forms part of the boundary of the pharynx, and is covered by the mucous membrane lining that cavity (Gray).

Physical Examination of the Larynx (Laryngoscopy).—For this is needed (1) sunlight or light from a student-lamp or an Argand or Welsbach gas-burner; (2) a head-mirror with an aperture in center; (3) two sizes of laryngeal mirrors; (4) a tongue-depressor; (5) a throat applicator; (6) a solution of cocain (5 percent or 10 percent).

The patient is seated facing the examiner, with the light behind or on either side of the head and on a level with the eye of the operator. After anesthetizing the posterior vault of the pharynx and soft palate with a solution of cocain (5 percent), the tongue is then grasped firmly between the folds of a napkin and withdrawn a sufficient distance so as to expose the vault of the pharynx, and the light is then reflected by means of the head-mirror. It is essential that the operator should always look through the central opening of the mirror, instead of from above or below.

The laryngoscopic mirror is then slightly heated (to prevent the image from becoming cloudy from the moisture given off during respiration), and slowly introduced until the posterior vault of the pharynx is reached. Care should be exercised not to touch any portion of the vault of the pharynx, tongue, or of soft palate not anesthetized, as it would cause retching, and often vomiting. The patient is then directed to slightly tilt the head backward and to phonate "ā" or "ee."

The first examination is often unsatisfactory, from the fact that the fear of the patient is aroused.

LARYNX, FOREIGN BODIES.—It not infrequently happens that children place various articles in their mouth, and then by aspiration draw them into the trachea, instead of swallowing them, as was purposed. Such accidents are not infrequent with beans, peas, cherry-pits, almonds, candies, pennies, tacks, corks, etc.

The symptoms are violent coughing and suffocation, with cyanosis, attending the entrance of a foreign body into the larynx, and if it remains, an irritating cough persists with subsequent inflammation and ulceration of the trachea. Should the substance be carried deeper, we may be able to perceive its irritating motion as an audible gurgling sound, to and fro with each respiration. Or if it is lodged fast, as might happen with a sharp bit of bone, it produces localized ulceration, indicated by a cough attended with bloody or purulent sputum. Should the body be drawn still lower down into the smaller bronchioles, it may lead either to atelecetasis of that portion of the lung or to pneumonia.

Some of these foreign bodies, as needles, may migrate to other parts of the body, or they may result in abscesses, or may, more rarely, become encapsulated. Small, soft bodies, like bits of meat, may be thrown out by violent coughing or, if soluble, like candy, may be dissolved.

The prognosis is generally unfavorable if the foreign body has passed within the local bands or if the body is too large to be coughed out or dissolved. An insoluble foreign body inspired into one of the lesser bronchioles leads almost inevit-

ably to death, as there is no operative or medicinal measure that can be safely used for its removal.

Treatment.—If the foreign body lies above the vocal bands, its extraction should be attempted as speedily as possible, with the aid of the appropriate instruments, or, if these are not at hand, by holding the child by its heels, head downward, and encouraging coughing by slapping its back or tickling its fauces. When the offending substance has gone deeper, we must resort, first, to forcible expiration following long-drawn inspirations (forced coughing) and emetics, the promptest of which is apomorphin (1/12 of a grain) or turpeth mineral (1 grain). Tracheotomy is called for when the object can be localized, and this operation is usually successful. Foreign bodies in the trachea or the bronchi should, whenever possible, be removed through a bronchoscope. The best bronchoscope is probably that devised by Jackson. It is a long, straight, slender speculum, with an electric lamp at the distal end. Under local anesthesia the glottis is exposed with Jackson's direct laryngoscope, the patient being in the dorsal position with the head fully extended, *i. e.*, the occiput is forced down toward the shoulders, thus elevating the anterior part of the neck. The bronchoscope is passed through the laryngoscope into the larynx, the laryngoscope is withdrawn, and a "bite-block inserted to prevent the patient biting the thin-walled bronchoscope. The bronchial tree is exceedingly elastic and flexible, and may be explored by following the lumen by sight." During the exploration the head and neck should be out in the air beyond the table and supported by an assistant, so that the head may be freely movable as needed. For instance it must be moved to the right for the bronchoscope to enter the left bronchus, and *vice versa* to enter the right bronchus; and it must be slightly lowered to enter the middle lobe bronchus of the right side, raised to enter the posterior branch bronchi" (Jackson). Secretions are removed by aspiration or by sponging. Foreign bodies are removed with suitable forceps. The sooner the bronchoscopic examination is made the greater the chances of success, as after 12 hours the foreign body may be concealed by swollen mucous membranes. Successful removal has been effected, however, even after years (Stewart). See Laryngotomy, Tracheotomy.

LARYNX, TUMORS.—The most frequent benign tumors observed are first, papillomata, second, fibromata. They should be removed under local anesthesia by the intralaryngeal method if possible, the laryngeal forceps, the cutting forceps, the cold wire or galvanocautery snare being used. In children, and for large growths tracheotomy may be demanded.

Malignant growths are usually epitheliomata. Rarely sarcoma occurs. In the case of a sarcoma the preliminary tracheotomy, which is desirable in every instance, generally reveals the necessity of a complete laryngectomy. Epithelioma usually originates in a vocal cord, in old and middle aged men and is of slow development. There may be a history of chronic inflammation or of overuse of the voice. The first symptom is hoarseness. Microscopic examination of a piece of the growth may not be feasible. In some cases, indeed, there is danger of metastasis and stimulation of the growth resulting from removal of a piece of tissue, and a negative report is often misleading. Tuberculosis and syphilis may be eliminated by the tuberculin test and large doses of potassium iodid. One or the other of these diseases, however, may coexist with the epithelioma.

Palliative treatment consists in relieving the pain with local anesthetics and, as a last resort, morphin. The frequent application of adrenalin and the ligature of the laryngeal arteries possibly may control the growth. Radical treatment includes thyrotomy, with a primary tracheotomy, followed by free excision of all the diseased tissue.

LATERAL SCLEROSIS, PRIMARY (Spastic Spinal Paralysis of the Adult, Primary Spastic Paraplegia, Spasmodic Tabes Dorsalis).—A chronic disease of the spinal cord characterized by paraplegia, contractures of the muscles, with exaggerated reflexes, but without sensory or vesical disturbances or atrophy. A disease of early adult life, generally between 20 and 40, occurring very rarely in children. The etiology is obscure. It has been traced to syphilis, trauma, lead-poisoning, acute infectious fevers, and the puerperium. The lesion is essentially in the pyramidal tracts. The onset is marked by a sense of heaviness and weakness in the legs.

Symptoms.—There is gradual loss of power in the muscles combined with rigidity. The spasms of the legs gradually increase in extent as the power lessens, until at last the legs, whenever extended, pass into a condition of strong extensor spasm, rigidly fixing them to the pelvis, so that the patient lies rigid; if one leg is lifted from the couch by the observer, the other leg is moved also. The spasm may be such that the knee cannot be passively flexed by any force that can be applied to it until the spasm has become less. When flexed, the limb is comparatively supple; but if it is then extended, the spasm instantly returns, making the limb rigid, and often completing the extension, just as the blade of a knife opens out under the influence of its spring—"clasp-knife rigidity." Occasionally there occur brief flexor spasms, drawing the legs up. The tendon and superficial reflexes are markedly exaggerated (Babinski's sign and ankle clonus are easily elicited). The spastic gait is characteristic, termed by Hammond "the waddle"; the legs drag behind and are moved forward as a rigid whole, the toes catching against the ground, the patient showing a tendency to fall forward. Sensation is unaffected. As the morbid process extends upward, the superior extremities suffer in the same manner as those of the lower. The reaction of degeneration is absent.

The disease may be long protracted, but is incurable. Treatment consists in rest, massage, warm baths. Treatment should be directed to the improvement of the general health. If syphilis is present, mercury and the iodids are indicated. Electricity may be tried.

Hysterical spastic paraplegia simulates the true

form, but some hysterical stigmata may appear on careful examination. Recovery may take place under proper treatment.

LATHYRISM.—See LUPINOSIS.

LATIN, MEDICAL.—**The verbs** used in prescription-writing are nearly all in the imperative mood; giving directions to the compounder, and having their object in the accusative case. Such are:

Adde, add.	*Fac*, make.	*Recipe*, take.
Cola, strain.	*Filtra*, filter.	*Signa*, write.
Divide, divide.	*Macera*, macerate	*Solve*, dissolve.
Extende, spread.	*Misce*, mix.	*Tere*, rub.

A few verbs are found in the subjunctive mood, taking their subject in the nominative case. The most usual are:

Fiat, let be made.	*Detur*, let be given.
Coletur, let be strained.	*Dividatur*, let be divided.
Coloretur, let be colored.	*Sit*, let it be.
Bulliat, let boil.	*Sumatur*, let be taken.
	Capiat, let take.

Participles or verbal adjectives are occasionally used, and should agree with their respective nouns in gender, number, and case. Such are:

Adhibendus, a, um, to be administered.
Dividendus, a, um, to be divided.
Sumendus, a, um, to be taken.

Prepositions.—The accusative case follows those in the first column, the ablative those in the second column:

Ad, to, up to.	*Cum*, with.
In, into.	*Pro*, for.
Supra, upon.	*Sine*, without.

Ana, of each, governs the genitive case.

Sundry Words and Phrases in Most Frequent Use.

Bis, twice.	*Numero*, to the number of.
Bene, well.	*Numerus*, number.
Dein, thereupon.	*Octarius*, a pint.
Et, and.	*Semel*, once.
Gradatim, gradually.	*Simul*, together.
Guttatim, by drops.	*Statim*, at once.
In dies, daily.	*Ter*, thrice.
Da, give.	*Quater*, four times.
Non, not.	*Ad saturandum*, to saturation.

Quantum sufficiat, as much as necessary.
Pro re nata, according to need.
In partes æquales, into equal parts.
Redactus in pulverem, let be pulverized.
Secundum artem, according to art.
Non repetatur, let it not be repeated.
See PRESCRIPTION-WRITING.

Genitive Case-Endings.—(*Potter.*)

NOM.	GEN.	EXCEPTIONS.
a	æ	Cataplasma, Enema, Physostigma, Aspidosperma, and Gargarysma all have the genitive in *-atis*. Folia is plural; gen., Foliorum.
us um os on	i	Rhus, Rhois; Flos, Floris; Bos, Bovis; Limon, Limonis; Erigeron, Erigerontis. Fructus, Cornus, Quercus, Spiritus, Haustus, Potus, do not change, being of fourth declension.
as	atis	Asclepias, Asclepiadis; Mas, Maris.
is	idis	Pulvis, Pulveris; Arsenis, Arsenitis; Phosphis, Phosphitis; Sulphis, Sulphitis; and all salts ending in *-is* have genitive in *-itis*.
o	onis	Mucilago, -inis; Ustilago, -inis; Solidago, -inis.
l	-lis	Fel, Fellis; Mel, Mellis; Sumbul, Sumbuli.

Words which do not change in the Genitive.

e	es	Azedarach	Ethyl[1]	Potus
en	inis	Buchu	Fructus	Quercus
ps	pis	Cannabis	Gambir	Sabal
rs	rtis	Caoutchouc	Haustus	Sago
r	ris	Catechu	Hydrastis	Sassafras
x	cis	Chloral[1]	Jaborandi	Sinapis
		Cundurango	Kino	Spiritus
		Curare	Matico	Sumbul
		Digitalis	Menthol[1]	Thymol[1]

LAUDANUM.—The tincture of opium, containing about 48 grains of opium to the ounce. The dose is from 5 to 30 minims, according to the effect desired. It is the form of opium mostly used in liniments, and for external applications, as with lead-water. See OPIUM.

LAUGHING GAS.—See NITROUS OXID, ANESTHETICS.

LAVAGE.—Irrigation or washing out of the stomach.

Uses.—Lavage is more valuable for diagnosis than for treatment. In cases of chronic indigestion and often in neurasthenia, constipation, insomnia, and especially in stubborn headaches, it is of value to make an analysis of the stomach-contents under varying conditions, to determine exactly what sort of work the organ is doing as to its secretory, absorptive, and motor functions. When such tests show a large amount of mucus, gastric catarrh may be suspected; and in most cases of chronic catarrhal inflammation of the stomach lavage will do good; in many of them it is almost indispensable. More often the mucus comes from the parts above, having been swallowed; and the diagnosis of chronic gastric catarrh, which many physicians attempt to make offhand, frequently presents difficulties, even with the help of chemic and microscopic examinations of the stomach-contents. See STOMACH.

The most imperative indication for lavage is gastrectasis, or aggravated dilatation of the stomach, whether resulting from narrowing of the pyloric orifice (cancer or other tumors, or the cicatrix of an ulcer), from a kink of the small intestines (which may follow displacement of the stomach, colon, or right kidney), or from atony of the muscular walls of the organ. Whatever the cause, dilatation, when neglected, tends to become a serious condition, and lavage judiciously done is an aid to the cure in the atonic cases, while it is a most

[1] In the B. P. Chloral, Ethyl, Menthol, and Thymol are Latin nominatives, and do not change in the genitive, (*e. g.*, Syrupus Chloral, Liquor Ethyl Nitritis, Emplastrum Menthol). In the U. S. P. the corresponding nominatives are Chloralum, Æthyl, Menthol, and Thymol; but the genitive of Æthyl is Æthylis, and that of Thymol is Thymolis, (*e. g.* Æthylis Carbamas, Thymolis Iodidum).

valuable palliative in the desperate ones until operative relief can be obtained. In bad cases of gastric catarrh and in patients not too reduced in strength, provided all the results are encouraging, it will be proper to wash out the stomach every day at first, until the amount of mucus is markedly lessened. This will be the more advisable if the microscope shows the presence of numerous yeast fungi or sarcinæ in the wash-water. As the conditions improve, or sooner if the patient should fall off in flesh, cardiac tone, or appetite, the intervals should be prolonged, until by the end of a month or two, once or twice a week may often be enough. When the treatment has been begun early and is properly carried out, one will often succeed in removing all the symptoms and signs of disease within 2 months; but in very advanced or debilitated cases, one will need to be guided by the effects, and sometimes, in such cases, a radical cure is scarcely practicable outside of a special institution. The best that can be accomplished then, under ordinary conditions, is palliation, and for this it is useful to cleanse away the accumulated mucus and bacteria at least once a week for long periods (Reed).

Time.—In nearly all cases the best time for lavage is before breakfast. Many good authorities advise that lavage should be done at bedtime when fermenting food in the stomach prevents sleep. Exceptionally this may be useful, especially in cases of gastralgia, but diseased stomachs are rarely empty at bedtime, and experience teaches that, as a continuous practice, washing away half-digested food is disastrous. When severe fermentation cannot be otherwise controlled, it would be better to feed less by the stomach and supplement by nutritive enemata.

Method.—The best and the simplest apparatus is a medium-sized tube, though the larger the better, provided the patient tolerates it well. It should be long enough to extend 3 feet from the mouth. A bulb in the course of it will be helpful in case of blocking; and a separate large glass funnel holding a pint is much better than the small soft-rubber ones that are found attached to many of the tubes in the shops. Warm water, sterilized by boiling, with or without bicarbonate of sodium dissolved in it to the extent of 1 or 2 teaspoonfuls to the quart, is used. If there is doubt as to the diagnosis, simple boiled water may be used.

When there is a marked deficiency of hydrochloric acid, the water may be hotter, and table salt, from a teaspoonful to a tablespoonful, may be added to each quart. Exceptionally, stronger antiseptics or astringents may be used—alum, one-half to a teaspoonful, and silver nitrate, 1 or 2 grains to the quart, but this should be followed with a salt solution after the silver nitrate. The patient's garments should be protected with towels or oilcloth. If the throat is very sensitive, it should be sprayed with a solution of cocain (3 or 4 percent) in liquid vaselin, to which has been added 1 grain of menthol.

It is not necessary to lubricate the tube with glycerin or vaselin, but it may be dipped in water. The process of introduction must be an educative one, and the first trial may fail.

The patient should sit in a low chair with his head thrown back; the mouth should be opened about two-thirds its full width, and the patient is instructed to breathe naturally. The index-finger of the operator is then inserted well back into the pharynx, and the tube is pushed along the side of the finger to the posterior wall of the pharynx and down into the entrance of the esophagus; the patient is then instructed to swallow, at the same time gradually pushing the tube onward until it has entered the stomach. The average distance from the incisor teeth to the lower border of the stomach is 22 inches. In gastric dilatation it is more than this.

The tube, with the funnel inserted in it, having been introduced, the solution, previously prepared and placed in a pitcher at hand, is poured in, a pint or quart at a time. Just before the last of the water has disappeared from the funnel the latter should be carried quickly down toward the floor and held in the inverted position over a pail. By siphonage the liquid now flows back into the inverted funnel, where it may be inspected before emptying. A piece of glass tubing inserted at some point of the tube outside the mouth, or between two sections of the tube, will enable one to see when the liquid is flowing through properly. One quart of water is quite as much as most patients will care to have used in the first washings, but later the quantity may be gradually increased, until finally several quarts, or enough to cleanse away all the mucus, may be introduced; but not more than 1 quart at a time, and in some very weak stomachs a pint at a time, will be more advisable. It has been found that to lessen considerably the time required to loosen and detach all the mucus in old gastric catarrhs it is advisable to have the patient drink a cup or two of warm water before taking the tube, and then, lying down on the back, make voluntary contractions of the abdominal muscles so as to splash the water around in the stomach for 3 to 5 minutes. When this is done, scarcely one-half the usual quantity of water is required in the washing out, which follows directly afterward. Delicate patients should be allowed to rest in the recumbent position half an hour at least after lavage, and in no case should a meal be eaten within that time after the procedure.

The tube should be withdrawn gradually while the patient is in a sitting posture.

Lavage in Infants.—Lavage is a very valuable therapeutic measure in infants. In children over 18 months or 2 years of age it is more difficult of application and not, as a rule, useful. The indications for stomach-washing are acute indigestion, either with or without persistent vomiting, when a single washing may be sufficient; and certain cases of chronic indigestion when daily washing is necessary, and in poisoning.

Apparatus and Method.—A soft-rubber catheter connected by a short glass tube to a piece of rubber tubing and a glass funnel, as described under GAVAGE (*q. v.*), are all the apparatus necessary.

The catheter should be as large as can be easily passed (about No. 24 French), and should have one or more large eyes. The child should be held in the sitting position and its body protected by a rubber sheet. The tongue is depressed with the forefinger of the left hand, and the catheter moistened and passed rapidly back into the pharynx and down the esophagus. About 10 inches of the catheter should be passed beyond the lips.

When the stomach is reached, the funnel is momentarily raised to allow the gas to escape, then lowered in order to siphon out any fluid which may be in the stomach. If nothing escapes, the funnel is raised and from 4 to 6 ounces of water poured into it, when the funnel is again lowered and the water siphoned out. This procedure is repeated from 4 to 10 times or until the water returns perfectly clear. Boiled water should be used at 100° to 110° F.—the higher temperature when there is great gastric irritation.

It is not often advisable to add anything to the water, but in some cases a weak solution of boric acid or a salt solution, a teaspoonful to the pint, may be used.

LAVENDER (Lavandula).—The fresh flowers of *Lavandula officinalis*. They have a fragrant odor, and an aromatic, camphoraceous taste; and contain resin and tannin, also a *volatile oil*.

Lavender is aromatic, stimulant and carminative, but is rarely used alone as a medicine. It is an agreeable flavoring and perfume, in the form of the official spirit, which is sold under the name of *lavender-water*, after the addition of oil of bergamot and essence of ambergris. The compound tincture is a very agreeable combination of spices, and is much used as a remedy for gastralgia, nausea, and flatulence, and as an adjuvant or corrigent of other medicines.

Preparations.—Oleum lavandulæ florum, a volatile oil distilled from fresh lavender, and having the fragrant odor of the flowers. It is soluble in alcohol in all proportions, in 3 times its volume of a mixture of alcohol 3 and water 1, and in glacial acetic acid. Dose, 1 to 5 minims. **Spiritus L.** has of the oil 5, in alcohol 95. A perfume and flavoring agent. Dose, 10 to 45 minims. **Tinctura L. Composita,** an aromatic stimulant, composed of the oil 8, oil of rosemary 2, saigon cinnamon 20, cloves 5, nutmeg 10, red saunders 10, alcohol 750, water to 1000. Is a constituent of Fowler's solution. Dose, 10 to 45 minims.

LAXATIVES.—See Cathartics.

LEAD (Plumbum).—Symbol, Pb. Atomic weight, 207; quantivalence, ii or iv. A bluish-white, soft, malleable metal, obtained from a native sulphid called galena, by roasting. Soluble salts of lead combine with albumin, forming albuminates. In large doses by the stomach they are irritant to the mucous membrane. Upon the intestines they act as powerful astringents. If absorbed into the circulation in small quantities for a considerable period of time, lead causes a very interesting and varied group of symptoms, which are described below. Lead is eliminated through the kidneys and the intestinal mucosa. It appears to check the elimination of uric acid, and is, especially in England, a factor in the causation of gout in lead-workers. In medicine lead is used locally as a sedative to inflamed parts, as an astringent to mucous surfaces, as in gonorrhea and leukorrhea.

Therapeutics.—Lead salts are chiefly used as astringents and hemostatics. The solution of the subacetate, diluted with 4 parts of glycerin and water, is locally employed in many skin-diseases, especially in eczema, lichen, impetigo, and erythema; also in catarrhal discharges of mucopurulent character from the ear, vagina, and urethra, particularly in gonorrhea and leukorrhea. Inflammations of external parts are constantly treated by the lotion of "lead-water and laudanum" (liquor plumbi subacetatis dilutus, 7 parts to 1 of tinctura opii).

Internally the acetate, in 2-grain doses every 3 hours, is used in various internal hemorrhages, particularly hemoptysis, hematemesis, and gastric ulcer. The same salt is used in smaller doses in bronchorrhea, and with powdered opium if there are choleraic symptoms, and still smaller doses for the summer complaint of children. In caseous pneumonia and in cardiac hypertrophy, and in whooping-cough with excessive bronchial secretion, and in humid asthma, the acetate is also useful.

The carbonate is useful in erythema, erysipelas, intertrigo, and as white paint, mixed with linseed oil, applied to burns or scalds only when the cuticle is unbroken.

The iodid is useful as an ointment for enlarged lymphatic glands and enlarged spleen, and in chronic eczema and psoriasis. The nitrate is serviceable when applied to fissured nipples, 10 grains to 1 ounce of glycerin. In solution it is deodorant to the fetor of gangrenous sores, ozena, and other offensive discharges.

Acute poisoning is rare, as the salts of lead are not often chosen by the intending suicide. It is treated by encouraging emesis and washing out the stomach. Dilute sulphuric acid, 30 minims in water, or the sulphate of magnesia or soda, 1/2 of an ounce, should at once be administered, all well diluted with water. Milk or the white of egg is to be freely given. Morphin given hypodermically and poultices may be employed. A subsequent course of potassium iodid is advisable.

Chronic poisoning is called **saturnism** or **plumbism.** It is most common in those whose occupation exposes them to contact with salts of the metal, such as painters, glaziers, workers in white-lead works, etc. Drinking-water and foods may also convey the poison to the system; so may cosmetics impregnated with lead; indeed, the sources of poisoning are manifold and often very curious.

The forms of chronic lead-poisoning may be grouped as follows: (1) *Lead colic*, the most frequent. The pain is centered about the umbilicus, the abdomen is retracted, constipation obstinate, the pulse corded. See Colic. (2) *Lead palsy*, wrist-drop or drop-wrist. This is a paralysis of the extensor muscles of both forearms; it may be associated with sensory disturbances. Paralysis

of the ocular and the laryngeal muscles has also been observed. (3) *Saturnine encephalopathy.* (4) *Saturnine arthralgia,* a painful affection of the joints, especially the knee, rarely the others. Objective signs are usually absent. The disease may resemble chronic gout. (5) *Chronic contracted kidney.* (5) *Amblyopia* due to atrophy of the optic nerve. The general symptoms of lead-poisoning are a marked anemia and cachexia, and a blue line at the edge of the gums.

Treatment.—Prophylaxis is of the first importance, and among workers absolute personal cleanliness, extending to the finger-nails, the use of a working suit, a daily warm bath after work, eating outside the works, and the use of respirators are the chief preventive measures. "Treacle beer" and sulphuric acid lemonade are beverages of service in preventing the effects of the metal. Constipation is to be relieved by occasional doses of magnesium sulphate.

Dry, hot fomentations to the abdomen are the best applications for the lead colic. Magnesium sulphate is an excellent purgative, and may be administered after the more acute symptoms have subsided, in combination with potassium iodid. Castor oil, with 5 to 10 minims of the tincture of opium added to each dose, is useful to clear the bowel.

Massage is the best treatment for the paralysis of lead poisoning, and the electric current may be applied daily for about 10 minutes. A long period of treatment is necessary.

Incompatible with *lead salts* are: Alkalies, mineral acids and their salts, albuminous solutions, opium, potassium iodid, vegetable acids, vegetable astringents, waters containing lime, sulphates, carbonates, and carbonic acid gas. With *lead acetate* are: Acids, acetamid, alkalies, bromids, carbonates, chloral hydrate, chlorids, chromates, cyanids, glucosids, gums, hydrochloric acid, iodids, opium, phenol, pyrocatechin, pyrogallol, resorcinol, salicylic acid, sodium phosphate, sodium salicylate, sulphates, sulphids, sulphites, tannic acid, urea, urethane, vegetable decoctions, infusions and tinctures. With *solution of lead subacetate* are: Acacia, acids (organic), albumin, alkaloids, antipyrin, glucosids, and otherwise like lead acetate.

Preparations.—**P. Acetas** (*sugar of lead*), colorless, shining, prismatic crystals or scales, efflorescent, of faintly acetous odor and acid reaction, and a sweetish, astringent and metallic taste. Soluble in 2.3 of water and in 21 of alcohol at 59° F., in 0.5 of boiling water and in 1 of boiling alcohol. Dose, 1/2 to 2 grains. **P. Iodidum,** a heavy, bright, citron-yellow powder, odorless and tasteless, fusible and volatilizable by heat; soluble in about 2000 of water at 59° F., and in about 200 of boiling water. Used externally as an ointment. May be given internally in doses of 1/5 grain twice daily. **P. Nitras,** colorless, opaque, octahedral crystals, odorless, of sweetish, astringent and metallic taste and acid reaction; soluble in 2 of water at 59° F., almost insoluble in alcohol. Used locally as an astringent and deodorizer in solutions up to 1 percent, also as an escharotic and a disinfectant. **P. Oxidum** (*litharge*), a heavy, yellowish, or reddish-yellow powder, odorless and tasteless; insoluble in water or alcohol, but almost wholly soluble with slight effervescence in dilute nitric acid. When heated in contact with charcoal it is reduced to metallic lead. Used as plaster and sometimes with oil as an external application. **Liquor P. Subacetatis** (*Goulard's extract*), an aqueous solution containing about 25 percent of the salt, prepared from acetate of lead 18, oxid of lead 11, and distilled water to 100. It is a clear, colorless liquid, of sweetish, astringent taste and alkaline reaction, and when added to a solution of acacia it produces a dense, white precipitate. Used locally as an astringent and cooling lotion, diluted usually with an equal quantity of water. **Liquor P. Subacetatis Dilutus** (*lead water*), has of the preceding 4, in distilled water to 100. Used locally as a mildly astringent and cooling lotion. **Ceratum P. Subacetatis** (*Goulard's cerate*) has of the solution of lead subacetate 20 percent, with camphor 2, wool fat 20, paraffin 20, white petrolatum 38. An astringent application. **Emplastrum P.,** has of lead acetate 60, soap 100, each dissolved in hot water, mixed, and the liquid decanted. It is pliable and tenacious, and forms the basis of other plasters. **Emplastrum Adhesivum,** has of rubber 2, petrolatum 2, lead plaster 96. **Unguentum Diachylon,** has of lead plaster 50, olive oil 49, oil of lavender flowers 1. Used locally in eczema and other cutaneous disorders.

LECITHIN.—A phosphorized fat found combined with proteids in nervous tissue, yolk of eggs and in almost all animal and vegetable cells. The lecithins are esters of the fatty acids and glycerophosphoric acid in combination with cholin. Lecithin stimulates nutrition, causing an increase in the number of erythrocytes and in the percentage of hemoglobin and in the amount of reserve proteids. It is believed to be efficient in malnutrition and is said to be especially valuable for bottle-fed infants. Dose, 1 1/2 to 8 grains before meals in pill form; for infants one-third as much.

LEECHING.—The use of leeches is indicated when it is desired to abstract blood from localities which, from their position or from excessive tenderness, are with difficulty operated upon by the knife. They are particularly valuable in inflammations of the eye and ear. In order to imitate as near as practicable the conditions under which these animals secure their food, the skin over the selected locality should be carefully cleansed, especially should all traces of soap be removed, and of such pungent medicaments as turpentine, liniments, etc., otherwise the animals will refuse to bite. A little blood or milk smeared upon the skin will often induce leeches to take hold. Medicinal leeches are of two kinds, the Swedish and American. The former are much the more powerful, and, at least in the treatment of adults, are, as a rule, preferred. Each abstracts from 1/2 an ounce to 1 ounce of blood. The American leech is one-sixth the strength of the European. When a number of leeches are to be applied, as over the abdomen in nervous persons, and each bite causes alarm, the leeches may be placed in a half glass of

cold water, and by an adroit movement the glass may be inverted on the part; the leeches will attach themselves rapidly; the water may be drained away and caught in a pledget of absorbent cotton. Leech-bites are likely to continue bleeding. The bleeding may be controlled by pressure, Monsel's solution on cotton, styptic cotton, or, if these fail, by the application of the actual cautery. Leeches should not be applied where the skin is delicate or loose, as on the eyelids or scrotum. To remove a leech easily, apply a small quantity of table salt to it.

The **Heurteloup's apparatus,** or **artificial leech,** is of great value when leeches cannot be obtained.

LEG, AMPUTATION.—Improvements in artificial limbs have rendered obsolete the rule that made the point of election for amputation of the leg three inches below the tubercle of the tibia. Amputations just above the ankle, are unsatisfactory but unfortunately the teaching of a past era still prevails in certain localities.

The operation is applicable to any portion of the leg below the knee-joint to a point within 3 inches of the ankle.

The Anteroposterior-flap Operation.—The 2 flaps are of the same length: that of the anterior being cut from without inward, and the posterior being procured by transfixion. The patient is brought well to the edge of the table; the limb to be removed is laid upon a pillow, supported at the heel by an assistant. The operator places the thumb of the left hand on a point just below the fibula, and the index-finger a little below the line of the internal border of the fibula; with these points as guides, a semilunar flap is cut, somewhat longer than half the diameter of the limb, through the skin and fascia; this is dissected back to the points where the index-finger and thumb of the left hand rest; a transfixion knife is then entered just below the fibula, and being carried through the tissues, is made to protrude on the other side, opposite the point of entrance, when a posterior flap is cut of the same length as that for the anterior. Any muscles which have not been divided are to be severed by a circular sweep of the knife; the interosseous space is divided, the periosteum pushed back, and the bones sawed through. After the limb has been removed, saw off the sharp edge of the tibia and cut off 1/2 of an inch of the fibula, which insures a better stump. Secure the vessels, apply necessary drainage, and close the wound in the usual manner.

Double-flap method, at the upper fourth of the leg. A stout bistoury, with blade 4 or 5 inches long, and a broad saw are the cutting instruments required. The flaps are made of integument only, by cutting from the surface without transfixion. The point of the knife is entered at the side, about 2 inches below the tibial tubercle, and carried across the front of the leg, describing an anterior curved flap, somewhat longer than, and of the exact width of, the half diameter of the limb. This is dissected up close to the bones and deep fascia. A similar flap is made on the posterior aspect, and the integument and fascia composing it are raised from the muscles. The latter, with the large vessels and nerves, are then divided transversely, direct to the bone. The point of the knife must be used to divide the intervening structures. The bones are then divided straight across.

The anterior tibial artery is often divided as it passes between the bones to the front of the leg, and it may be difficult to get it separated from the surrounding ligamentous structures.

Single-flap Operation.—The operator places the heel of the knife on the side of the limb furthest from him, then draws it across the front of the limb, cutting a semilunar flap of skin; when its point arrives at the opposite side, it is made to transfix the limb, and then the posterior flap is cut. Care must be taken not to get the knife between the bones when making the flap by transfixion. The muscles and ligamentous structures which are between the bones are then divided by the point of the knife. The fleshy mass of the gastrocnemius may require to be cut out to make the posterior flap thinner.

The circular operation is especially adapted to removal of the leg at the lower third of its length. One assistant supporting the foot and another holding the knee, and at the same time drawing up the skin, the surgeon makes a circular incision through the skin, 4 inches below the point where the bones are to be divided. The integument is then dissected up for 2 inches and turned back, and the muscles divided down to the bone by a second or third circular incision. A catling is then passed between the bones to divide the interosseous ligament and muscles, and both bones sawed through together, the flesh being protected by a three-tailed retractor, the middle tail passing between the bones; to prevent splintering, the division of the fibula should be completed before that of the tibia. The anterior and posterior tibial are the principal arteries requiring ligatures. The modified circular operation may also be satisfactorily performed at this part of the leg. See AMPUTATIONS.

LEG, BOW-. See GENU VARUM.

LEG, FRACTURES.—**Fracture of the tibia at its upper end** usually results from compression by the opposite condyle of the femur, as in falling from a height and landing on the feet. The symptoms are those of a severe contusion; joint-movements are painful, lateral movements usually possible, with distinct painful points at the upper end of the tibia. Generally the fracture is of only one-half of the articular surface, so varus and valgus positions are liable to result.

Treatment is by fixation by splint or weight with early massage and movements as in all articular fractures.

Traumatic separation of the upper epiphysis of the tibia is rare. It is to be suspected in cases of severe contusion at the upper end of the tibia. Abnormal mobility and cartilaginous crepitation can alone make the diagnosis positive.

Treatment is on general principles.

Separation of the tuberosity of the tibia rarely occurs. The traction of the quadriceps sometimes tears off the tuberosity instead of fracturing the

patella. The fragment is drawn upward, active extension at the knee is impossible, the fragment is felt under the skin movable in all directions, while the patella is found intact.

Treatment is very similar to that described for fractured patella. See KNEE. The joint need not be implicated; hence the best treatment is to secure the replaced fragment in place by open suture.

Fracture of the shaft of the tibia may occur isolated as a result of torsion or bending, being transverse, as a rule, in the upper part of the bone, and oblique in the lower.

The symptoms are clear and easily recognized. If the fibula remains unbroken and there is much longitudinal displacement, the head of the fibula must be dislocated upward. This is most likely to occur in fracture of the upper half of the shaft. If the fibula remains intact and is not luxated, marked displacement of the fragments cannot well occur.

Treatment.—If marked swelling has already occurred, it is best for a few days to elevate the limb in a fracture-box and make local sedative applications. The swelling having in a large degree subsided, a close-fitting plaster-of-Paris dressing is applied, fixing the knee and taking in the foot. This dressing should extend to the upper part of the thigh and be well padded under the tuberosity of the ischium, which is designed to rest upon it, a perineal crutch in this way being provided. A 2-inch cotton pad is placed on the sole of the foot before the plaster is applied. When the patient is on his feet, the splint catches the body weight on the tuberosity of the ischium, while the foot descends into the thick cotton pad mentioned. This constitutes the so-called **ambulatory splint.** If there is not great tendency to displacement, the patient may be placed on his feet by the end of the first week, or even at once, using crutches at first and then getting about by the aid of a stick alone. It will usually be found necessary to put a high sole on the shoe of the sound side. In 4 weeks the dressing can be removed and a lighter one supplied, which is worn for 2 or 3 weeks longer, when dressings can be discarded.

Isolated fracture of the fibula is somewhat rare, especially in its middle and upper portions, and it is due to direct violence. Fracture at the lower end may be due to violent eversion or inversion of the foot. There is little tendency to displacement.

Treatment.—Plaster-of-Paris is the best dressing. The knee need not be fixed. The foot should be placed in slight inversion, at a right angle to the leg, and fixed in the dressing.

Fracture of both bones of the leg in the region of the diaphysis is a frequent injury, the result of direct violence, both bones usually being fractured at the same level. Sometimes, the foot being fixed and the body twisted, a torsion fracture of the tibia results; the weight of the body then falls on the tibia, which is broken secondarily and frequently higher up on the shaft. Oblique fractures are, of course, more liable to considerable displacement, and are relatively less favorable than transverse. The lower fragment of the tibia is usually displaced upward behind the upper fragment, and rotated a little outward. This ascent is largely due to the action of the calf-muscles.

This fracture is easy of diagnosis, abnormal mobility, crepitation, and displacement being readily demonstrated. Palpation of the crest of the tibia in the two directions discloses the point of fracture, and also any rotation of the lower fragment. The exact point of fracture of the fibula is sometimes difficult of determination.

Treatment.—In fracture near the ankle-joint the pull of the calf-muscles tends sometimes to maintain deformity, and may even demand tenotomy of the Achilles tendon. For the first 3 weeks 1 posterior and 2 side splints should be used, or a fracture-box may be employed. The dressings should be removed and the fracture inspected and controlled at the end of each week. After this time plaster-of-Paris can be employed, and the treatment be made ambulatory, as already indicated for isolated fracture of the tibia. After healing, a painful bony prominence may persist on the crest of the tibia, which may require removal by the chisel. See KNEE, ANKLE (Fractures).

LEGITIMACY, LAWS.—The law assumes that every child born in wedlock is legitimate unless it can be shown that the man and wife had been separated for a longer time than that accepted as the average period of gestation, or unless it can be proved that the husband was impotent. The accepted period of gestation is from 268 to 313 days. A child is regarded as legitimate though not conceived in wedlock, if the mother afterward marries and her condition is recognized by the husband at the time of the marriage.

LEMON (Limon).—The fruit of *Citrus limonum*, official in two forms: (1) Orange, *Citrus vulgaris* and *C. aurantium*, and (2) Lime, *C. acris*. The rind contains an official volatile oil, and a glucosid. The pulp yields about 7 percent of citric acid, $C_6H_8O_7$, which has about the same properties as acetic acid, but has much value as a refrigerant and antiscorbutic. The expressed juice is largely employed as a refrigerant drink in fevers. **L., Ol.**, the volatile oil. Dose, 1 to 5 minims. **Tinct. Limonis Corticis**, a 50 percent tincture, made with alcohol. Dose, according to the amount of alcohol desired to be given, 1/2 to 4 drams. **Acidi Citrici, Syr.**, citric acid, water, tincture of lemon peel, each 1; syrup to 100.

LENIGALLOL.—Pyrogallol triacetate. A substitute for pyrogallol in psoriasis, lupus, etc. It is applied in 5 to 10 percent ointment with zinc oxid.

LENSES.—A lens is a transparent refracting medium, usually of glass or crystal, which is bounded by two curved surfaces or a curved surface and a plane surface.

Lenses may be considered as a juxtaposition of prisms with different refracting angles. Convex lenses are equivalent to prisms with their bases placed together; and concave lenses, to prisms with their apices placed together. Therefore, rays of light always being deflected toward the base of a prism, will be rendered convergent by convex lenses, in which the prismatic bases are central;

and will be rendered divergent by concave lenses, in which the prismatic bases are peripheral.

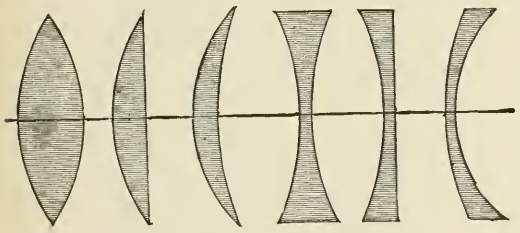
Spheric lenses are used in ophthalmology in 6 different forms:

1. Biconvex, segments of two spheres having two convex surfaces.
2. Planoconvex, the segment of one sphere, having a plane surface on one side and a convex surface on the reverse side.
3. Concavoconvex, or converging meniscus.
4. Biconcave, having two concave surfaces.
5. Planoconcave, having on one side a plane surface and on the reverse side a concave surface.
6. Convexoconcave, or diverging meniscus.

Numbers 3 and 6, having opposite sides at different surfaces, are called periscopic or meniscus lenses, and are used to avoid spheric aberration and to gain a greater field of clear vision.

The principal axis of a lens is a line passing through the optic center at right angles to the surfaces of the lens. Rays passing through this axis are not refracted. Rays passing through the optic center of a lens, but not passing through the principal axis, are slightly deviated, although in practical optics they may be considered as straight lines. The focal length of a lens is the distance from the lens to the point at which parallel rays, refracted by the lens, focus.

A cylindric lens is a lens with a plane surface in one axis, and a convex or a concave surface in the axis at right angles. This form of lens is really a segment of a cylinder. Examination of any cylinder—as, for instance, a bottle—will show there is curvature only in one direction, from side to side, and not in the axis. As the axis of a cylinder has a plane surface, the rays are only refracted at right angles to the axis, and the strength of the cylinder depends on the curvature possessed by the surface



DIFFERENT FORMS OF SPHERIC LENSES.

1. Biconvex lens. 2. Planoconvex lens. 3. Concavoconvex or convergent meniscus. 4. Biconcave. 5. Planoconcave. 6. Convexoconcave, or divergent meniscus.

at right angles to the axis. The axes of the cylinders in a test case are usually shown by grinding and making partially opaque portions of each side of the lens in the direction of the axis.

It must be remembered that a cylinder refracts rays of light only in the meridian at right angles to its axis, while a spheric lens refracts rays of light in every meridian.

Classification and Numbering of Lenses.—Lenses are numbered according to their focal distance, and the strength of the lens varies inversely as its focal distance. Formerly, lenses were numbered according to the **inch system,** the unit of which was a lens whose focal distance equaled 1 inch—a very strong lens. This system necessitated the use of large numbers or fractions; and, moreover, the denomination inch had different significations in different countries, the French inch, for example, varying from the English inch. The **metric or dioptric system** of numbering lenses is now in use, and the unit is a lens having a focal distance of 1 meter and is called a lens of 1 diopter strength—a comparatively weak lens; a 2-diopter lens is one having half the focal length of the 1-diopter lens, or 1/2 of a meter. Decimals, of course, are used instead of fractions; a lens of a focal length of 4 meters is called a 0.25-diopter lens.

Convex lenses form real images, and are called positive or plus lenses, and are designated by the sign +.

Concave lenses produce only virtual images, and are called negative or minus lenses, and are designated by the sign −.

To convert a prescription written in the old system of numbering lenses into the modern metric system of diopters, we can roughly consider the meter as equivalent to 40 inches. A 10-inch lens would be equivalent to a lens having a focal length of 1/4 of a meter, or 4 diopters.

The following table from Landolt gives the equivalents in both the old and new systems:

OLD SYSTEM.				NEW SYSTEM.			
No. of the Lens, Old System.	Focal Distance in English Inches.	Focal Distance in Millimeters.	Equivalent in Diopters.	No. of the Lens, New System.	Focal Distance in Millimeters.	Focal Distance in English inches.	No. Corresponding of the Old System.
72	67.9	1724	0.58	0.25	4000	157.48	166.94
60	56.6	1437	0.695	0.5	2000	78.74	83.46
48	45.3	1150	0.87	0.75	1333	52.5	55.63
42	39.6	1005	0.99	1	1000	39.37	41.73
36	34	863	1.16	1.25	800	31.5	33.39
30	28.3	718	1.39	1.5	666	26.22	27.79
24	22.6	574	1.74	1.75	571	22.48	23.83
20	18.8	477	2.09	2	500	19.69	20.87
18	17	431	2.31	2.25	444	17.48	18.53
16	15	381	2.6	2.5	400	15.75	16.69
15	14.1	358	2.79	3	333	13.17	13.9
14	13.2	335	2.98	3.5	286	11.26	11.94
13	12.2	312	3.20	4	250	9.84	10.43
12	11.2	287	3.48	4.5	222	8.74	9.26
11	10.3	261	3.82	5	200	7.87	8.35
10	9.4	239	4.18	5.5	182	7.16	7.6
9	8.5	216	4.63	6	166	6.54	6.93
8	7.5	190	5.25	7	143	5.63	5.97
7	6.6	167	5.96	8	125	4.92	5.22
6½	6.13	155	6.42	9	111	4.37	4.63
6	5.6	142	7.0	10	100	3.94	4.17
5½	5.2	132	7.57	11	91	3.58	3.8
5	4.7	119	8.4	12	83	3.27	3.46
4½	4.2	106	9.4	13	77	3.03	3.21
4	3.8	96	10.4	14	71	2.8	2.96
3½	3.3	84	11.9	15	67	2.64	2.8
3¼	3.1	79	12.7	16	62	2.44	2.59
3	2.8	71	14.0	17	59	2.32	2.46
2¾	2.6	66	15.1	18	55	2.17	2.29
2½	2.36	60	17.7	20	50	1.97	2.09
2¼	2.1	53	18.7				
2	1.88	48	20.94				

Varieties of Lenses Used to Correct Refractive Errors.—1. The simple sphere may be either convex or concave, and is used to correct the uncomplicated forms of refractive errors.

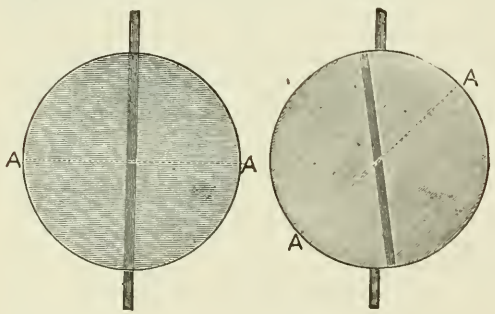
2. The simple cylinder is limited in refractive power to the direction of its curvature, and is used in cases of simple astigmatism in which there is an error of refraction in only one meridian of the eye.

3. The spherocylinder is a combination of a sphere with a cylinder, and is used in cases of compound or mixed astigmatism in which there is a different refractive error in the two principal meridians of the eye.

4. The cross-cylinder is a form of lens made up of two cylinders with their axes at right angles to each other. It is seldom prescribed, but is occasionally used in making tests.

For a further description of test-lenses, see REFRACTION.

Neutralization of Lenses.—The lens is held a few inches in front of the eye, and some object, such as the vertical and horizontal lines of a window-frame or the test-letters, is viewed through it. The lens is then moved to the right, and if it is convex, the object will move to the left; if it is concave, the object will move with the lens to the right. Having determined what sort of a spheric lens we have under examination, we proceed to neutralize it by holding successively a concave lens if convex, or a convex lens if concave, until no movement of the object is perceived through the lens; therefore, **to find the strength of spheric lens,** it is only necessary to combine it with successive lenses of the opposite sign, until one is found which neutralizes the apparent movement of objects seen through the lens under examination. The more rapid the apparent movement, the higher the power of the lens required to neutralize.



NEUTRALIZATION OF CYLINDRIC LENSES.

Cylindric lenses only show movement in the direction opposite to their axes; the movement is against in convex cylinders and with in concave cylinders. To find the axis, an object presenting a straight line, such as the vertical line of the window-sash or the edge of a frame, is viewed through the lens. As the lens is rotated about the visual axis the portion of the vertical line seen through the lens will appear to be oblique, as compared to that seen above and below the lens. This oblique displacement takes place in a direction contrary to the rotatory motion given a convex lens, and in the same direction as the rotatory motion giving a concave lens. To ascertain the position of the axis of a cylinder it is slowly rotated unt the line seen through it appears continuous abov and below. If motion from side to side produces apparent motion of the object, this line is the axis of the cylinder, and if no motion results, the line is at right angles to the axis of the cylinder. The axis being determined, the cylinder is neutralized by successive cylinders of opposite curvature applied in the same axis.

Spherocylindric lenses are neutralized the same way as two cylinders with their axes perpendicular to each other. Having neutralized the movement in one meridian, we note the result and neutralize the movement in the other meridian.

The phacometer is an instrument designed rapidly to discover the strength of lens under examination. It is operated by pressing the surface of a spheric lens squarely against three steel pins, the central one of which is movable. When the central one is depressed until all three points touch the glass, the curvature of the lens is indicated on the dial.

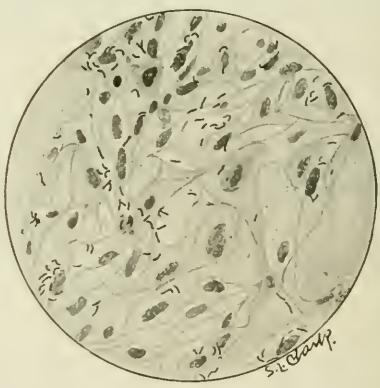
LENTIGO.—See FRECKLES.

LEONTIASIS OSSEA.—See BONE, (Diseases).

LEOPARD'S-BANE.—See ARNICA.

LEPROSY.—Lepra vera; elephantiasis Græcorum; black leprosy.

An endemic, chronic, constitutional disease, analogous to syphilis, and varying in its morbid manifestations according as the brunt of the disease falls on the skin, the nerves, or other tissues. It occurs in 3 forms: the tuberculous, the nontuberculous or anesthetic, and the mixed tuberculous.



BACILLUS LEPRÆ (EXTRACELLULAR).—(*Coplin.*)

The tuberculous or **nodular leprosy** is attended at the onset by debility, depression, dyspepsia, diarrhea, drowsiness, chilliness, and profuse perspiration, marked vertigo, recurrent epistaxis, fever up to 104° F.; after a variable period of days, or even months, coming first with edema of the eyelids, the leprous spots appear on the face and ears, and then on the anterior and external surfaces of the limbs. The exanthem is an erythema, varying from a bright-red to a purplish-red or mahogany-red tint, associated with the leprous deposit of well-defined, shiny, slightly raised patches of from one to several inches in diameter. Papules then form in crops, gradually reaching

the size of a hen's egg and of a yellowish to a dark-brown color. Tuberculation does not develop until from 3 to 6 months after the commencement of the disease. Nodules are most common on the face, limbs, breast, scrotum, and penis. There is also an involvement of the mucous membranes. When the disease is fully developed, the face assumes the characteristic leonine appearance, from thickening of the skin. Ulceration eventually sets in, and the patient dies of exhaustion or complications.

Nontuberculous leprosy is the most common tropical form. The prodromal symptoms are marked, and are associated at first with hyperesthesia of the skin. At the end of a year the special eruption breaks out, usually on the back, shoulders, posterior aspect of the arms, nails, thighs, and sometimes in the course of nerves. The spots are 1 or 2 inches in diameter, well defined, not raised, and of a pale yellow color. They spread peripherally, clearing in the center, which becomes dry, scaly, and anesthetic. Paralysis is usually a late symptom, and ulceration is common. Death results from ulceration, gangrene, marasmus, or general debility.

Mixed tuberculous leprosy is the least common form, and its symptoms are a combination of those of the other two varieties. Destruction of the cartilages of the nose and of the soft palate is common.

Etiology.—Leprosy is caused by the invasion of the organism by the bacillus lepræ. Heredity, climate, soil, and mode of living may act as predisposing causes.

The contagion is probably chiefly effected through direct or mediate inoculation.

Pathology.—The disease consists of a deposit of cells in the corium and subcutaneous tissue, similar to those seen in lupus and syphilis. The specific bacillus is found in the tubercles, infiltrations, lymphatic glands, nerves, etc.

Diagnosis.—Advanced cases of leprosy are easily recognized. The disease may be confounded with syphilis, morphea, vitiligo, and lupus. The occurrence of anesthesia and the history and course of the disease will usually enable one to make the diagnosis. In doubtful cases the microscope should be resorted to, with the view discovering the bacilli in the affected tissues. The Wassermann reaction seems as successful in leprosy as in syphilis.

Prognosis.—Always unfavorable. The disease progresses, with rare exceptions, to a fatal termination. The course is more rapid in the tubercular than in the anesthetic form.

Treatment.—Nutritious food, good hygiene, and removal to a healthful climate are important therapeutic measures.

The remedies which have proved most valuable in the treatment of leprosy are chaulmoogra oil (best in the form of antileprol, it is claimed) and gurjun oil, used both internally and externally in the tubercular variety, and strychnin in large doses in the anesthetic form. Nastin and eucalyptus are advised. X-ray treatment has apparently resulted in cures.

LEPTANDRA (Culver's-root).—The rhizome and rootlets of *Leptandra virginica*, now called *Veronica virginica*. Its properties are thought to be due to a glucosid, *leptandrin* (dose, 2 to 4 grains). It is a tonic, laxative, and cholagog, and is indicated in indigestion and chronic constipation. Dose of the extract, 1 to 6 grains; of the fluidextract, 10 to 20 minims.

LEPTOMENINGITIS.—Inflammation of the pia and arachnoid of the brain and the spinal cord, in contradistinction to pachymeningitis, though meningitis alone usually signifies the same as leptomeningitis. See MENINGITIS.

LEUKANEMIA.—A term applied by von Leube to an acute condition of leukemia combined with severe anemia. It is usually fatal in from a few days to three months. The onset may be sudden with fever and severe tonsillitis, prostration, hemorrhage, extreme pallor and rapid decline. There is often general glandular enlargement including the liver and spleen. The reduction of hemoglobin and erythrocytes with increase of plymhocytes (usually the large form) is conspicuous. The red cells may be as low as 1,500,000. The color index is high.

LEUKEMIA (Leukocythemia).—A chronic disease of the blood-making organs, characterized by great and persistent increase of the white blood-corpuscles; by a diminished number of red cells, which are altered in shape and size, and display nucleated and degenerate forms; by a lessened amount of hemoglobin; and by enlargement of the spleen, lymphatic glands, or medulla of bone (Musser).

Etiology.—The disease may occur at any period of life, but is seen mostly in adult males. Syphilis, splenic traumatism, pregnancy, heredity, malaria, bad hygiene, and repeated hemorrhages may act as predisposing causes. It has been held to be due to the absorption of toxic substances from the digestive tract. It seems probable that it is of infectious origin.

Pathology.—There may be great emaciation. The spleen is usually enlarged. The cervical, inguinal, and axillary glands may be the first to enlarge. The liver may be enormously enlarged.

There is extensive hyperplasia of the lymphatic tissues and reversion of the bone-marrow to the embryonal type.

Symptoms and Course.—By examining the blood we detect 2 varieties of leukemia: (1) Splenic myelogenous leukemia; (2) lymphatic leukemia. Mixed splenic and medullary leukemias are the most common—called splenomedullary (lienomedullary) or lienomyelogenic.

Splenic Myelogenous Leukemia.—The colorless corpuscles are greatly increased, but there may be only a small diminution in the number of the red cells, averaging slightly above 3,000,000, with a small decrease of the hemoglobin. Nucleated red cells are present in abundance. Eosinophiles and basophilic leukocytes are markedly increased.

Characteristic of this form of leukemia is the large corpuscle—the *myclocyte*, a large cell with a large, pale blue nucleus, and not ameboid. The great number of these myelocytes present is diag-

nostic of this form of leukemia. With the decided increase in the number of these myelocytes there is a corresponding diminution in the lymphocytes (youngest leukocytes).

Lymphatic Leukemia.—This is characterized by enlargement of the lymphatic glands and an absolute lymphocytosis. In this form (about 15 percent of all cases)there is a greater reduction in the number of red cells than in the splenic myelogenous form, but there is almost an absence of the nucleated red cells, in contrast with the splenic variety of leukemia. With this reduction of the red cells there is a greatly increased number of the leukocytes (though less so than in the splenomyelogenous form) especially the lymphocytes, which may constitute 90 percent of the white corpuscles. These lymphocytes are of all sizes.

The leading characteristics of leukemic blood are:

Splenomedullary leukemia	1. Red cells reduced to greator or less degree (at times below 1,000,000), numerous nucleated forms. 2. White cells about 400,000, of which— 3. Myelocytes form about 35 percent.
Lymphatic leukemia.	1. Red cells about 3,000,000 or lower, nucleated forms rare. 2. White cells 100,000 or lower, of which— 3. Lymphocytes form 90 percent, either large or small predominating. 4. Myelocytes and eosinophiles very scanty.

Symptoms.—At first the symptoms are those of the other anemias: Insidious onset, pallor, faintness, vertigo, dyspnea, weakness, anorexia, indigestion, headache, palpitation. Hemorrhages are common. Enlargement of the spleen or lymphatic glands or both are found. There may be moderate fever. The enlarged glands are free from active inflammation and give rise to pressure symptoms. There is a tendency to serous effusions in the later stages and emaciation appears. The pulse is rapid and easily compressible. Nausea and vomiting are common. The urine usually contains an increased amount of uric acid.

Diagnosis can only be made by the blood examination. See BLOOD, Diagnosis of Leukemia.

Prognosis is usually unfavorable. The lymphatic form may be fatal in from 6 weeks to 2 months.

Treatment.—The best hygienic surroundings possible should be given the patient, and good, nutritious food supplied. The patient should never exhaust himself by too active exercise. If there is a history of malaria, quinin in 3- or 4-grain doses should be given 3 times daily. Arsenic is highly recommended, and any prescription recommended for pernicious anemia may be given. Benefit has been derived, it is claimed, from X-ray treatment by the Pancoast method (exposure consecutively of the various bone-marrow regions of the body). In the splenomyelogenous type remarkable results have been obtained from the use of the X-rays. Some improvement is reported in cases of the myeloid type from the use of mixed toxins of streptococcus and B. prodigiosus. See ANEMIA (Pernicious); BLOOD (Examination).

LEUKOCYTE EXTRACT.—According to Hiss, an aqueous extract of washed leukocytes, obtained from healthy rabbits after an injection of aleuronat into the pleural cavity, has a curative action when injected in infectious diseases. Satisfactory results have been obtained in pneumonia, furunculosis, erysipelas and cerebrospinal meningitis.

LEUKOCYTOSIS.—See BLOOD (Examination).

LEUKODERMA.—Leukasmus; achroma cutis; leukopathy. A congenital pigment anomaly of the skin, in which, at the time of birth or soon after, whitish patches or bands, irregularly outlined and usually isolated, appear upon the skin of the child. See VITILIGO.

LEUKOMA.—An opacity of the cornea the result of an ulcer, wound, or inflammation, and presenting an appearance of ground glass. See CORNEA.

LEUKOMAIN.—The name applied by Gautier to the nitrogenous bases or alkaloids necessarily and normally developed by the vital functions or metabolic activity of living organisms, as distinguished from the alkaloids developed in dead bodies, and called by Selmi ptomains. See PTOMAIN, AUTOINTOXICATION. From their chemic affinities leukomains may be divided into two groups: The *xanthin group*, comprising xanthin, adenin, carnin, gerontin, guanin, heteroxanthin, hypoxanthin, paraxanthin, pseudoxanthin, spermin, and the *creatinin group*, in which are classed creatin, creatinin, amphicreatinin, crusocreatinin, xanthocreatinin, and some unnamed bases.

LEUKOPENIA (Hypoleukocytosis).—See BLOOD.

LEUKOPLAKIA.—See TONGUE.

LEUKORRHEA.—A whitish mucopurulent discharge from the female genital canal, popularly called "the whites." See CERVIX (Diseases), GONORRHEA, VAGINITIS, VULVA.

LICE.—See PEDICULOSIS.

LICHEN RUBER.—An inflammatory disease characterized by the appearance of small, flat, angular, and shining or discrete, acuminated and scaly, reddish papules, running a chronic course and attended by more or less itching.

Symptoms.—There are 2 varieties: Lichen ruber acuminatus and lichen ruber planus. Some authors regard these forms as distinct diseases.

Lichen Ruber Acuminatus (Lichen Ruber).—This is a very rare disease, particularly in America. It is characterized by discrete, millet-seed sized, acuminated, scaly, reddish papules, which are disseminated over the trunk with no disposition to grouping. After a duration of years the skin may become diffusely infiltrated, reddened, and scaly. There is mild or severe itching present. The disease is extremely chronic, usually compromising the general health, and tending ultimately to a fatal termination.

Lichen Ruber Planus (Lichen Planus).—Lichen planus is not an uncommon disease. It may develop gradually or rapidly, appearing as pinhead-sized to pea-sized flat, quadrangular, or polygonal, shining, slightly umbilicated papules of a violaceous or reddish color. The lesions may be disseminated, but are more commonly closely aggregated in patches, which assume frequently a linear form. The surface of the papule is at first glazed or shining, later covered with fine whitish scales. The favorite regions are the flexor surfaces of the forearm and wrist and the dorsal surfaces of the feet. When occurring upon the legs, the

papules are apt to become confluent, with the formation of elevated plaques of a purplish color. A brownish pigmentation often persists after the disappearance of the lesions.

Itching is, in the majority of cases, a prominent symptom. The general health remains unaffected.

Etiology.—The disease is of neurotic origin. The most common cause is nervous exhaustion resulting from worry, overwork, etc. It is most frequently observed in middle-aged individuals.

Pathology.—The pathologic process in the plane variety consists of a dilatation of the papillary blood-vessels, a dense, sharply circumscribed round-cell infiltration in the upper part of the corium, proliferation of the cells of the rete mucosum, with either flattening or elongation of the papillæ. The papules are claimed by some to develop at the sites of hair follicles; by others, around the sweatducts.

Diagnosis.—The characteristic features of the papules of lichen planus are their angularity, flatness, shining surface, violaceous color, and umbilication. These points will differentiate the disease from papular eczema, psoriasis, and the papular syphilid. The papules of eczema are rounded, somewhat acuminate, brighter red in color, and have a different history.

Prognosis.—The prognosis of the acuminate variety is extremely guarded; of the plane variety, favorable.

Treatment.—The treatment is both general and local. Attention to diet and hygiene should not be neglected. Cod-liver oil, iron, strychnin, etc., are often indicated. Arsenic is by far the most valuable remedy, exerting almost a specific influence upon the disease. In some cases, particularly when arsenic fails, mercury acts most favorably.

Locally, applications containing tar, phenol, menthol, salicylic acid, mercury, etc., are to be employed. The following formula, suggested by Unna, has been successfully used:

℞.	Carbolic acid,	gr. x to xx
	Mercuric chlorid,	gr. ij to iv
	Zinc oxid ointment,	℥ j.

Apply twice a day.

LICORICE.—See Glycyrrhiza.

LIFE ASSURANCE EXAMINATION. **General Remarks.**—Life assurance is a contract by which a corporation agrees to pay a stipulated sum, such as may be agreed upon between the parties, either on the death of the life assured or within a limited number of years, as the case may be, provided the applicant fulfils his part of the contract. The latter consists in the regular payment of fixed sums, known as premiums. Before a company will enter into such a contract it usually requires the recommendation of at least two medical officers of the company—the one the local examiner, to whom the applicant submits for medical examination as to his present state of health, and to whom also he must furnish a truthful report of his past ailments, as well as data with regard to his family history: the other, the medical director, or chief medical officer, whose duty it is to examine carefully this report and advise the company as to the desirability of accepting the risk.

Of late years the amount of money involved in these contracts has reached enormous dimensions. The financial standing and the success of all companies depend to so large an extent on the judicious report as to the past and present state of health of the applicant, as well also as the moral hazard of the risk, that it is necessary that the medical inspection and supervision of each individual risk should be made with great care.

The first important point it is desirable for the medical examiner to remember is that all assurance companies base their premiums on the assumption that their assured lives shall be healthy individuals of healthy families: *i. e.*, not only must the applicant for assurance be himself free from disease and of good habits, but he must also belong to a family of healthy brothers and sisters (if he has any), children of healthy parents.

With such a history, the average duration of life at all ages has been estimated by actuaries of several companies, who have varied but a few months as to its duration at the different ages; that is to say, as to the number of years longer which a healthy person, as above stated, of a certain age, is expected to live. This is what they call their "expectation." The rates of assurance for first-class lives are fixed accordingly. See Life (Expectation).

The "selection" of the risk is the duty of the medical board, which may consist of one or more "medical directors," so called because they direct the medical affairs of the company. Most English companies have but one such officer, whom they call the "medical referee" or "chief medical officer."

It is the duty of these officers to examine the medical reports of all examinations and to eliminate the objectionable risks. Many cases are rejected by medical directors because of features which their greater experience leads them to believe are hazardous, although recommended as first class by medical examiners.

In other cases, although they may consider the risk not a safe one on a cheap plan, they may think it assurable on some plan with large annual payments, and offer a policy on an endowment plan or some plan more favorable to the company than the one applied for. If the applicant will not accept this policy, the risk will be completely declined and placed on the black-list.

The medical examiner who has examined the applicant may consider him an unobjectionable risk because at the time of examination he is perfectly healthy, but the medical director, in reviewing the whole history of the case and acting upon the statistics furnished by the actuarial department, as well as his own observation in examining death claims, may, and very frequently does, feel compelled, acting in the interest of the company, to reject the risk, notwithstanding the favorable recommendation of the examiner. The objectionable features in the case may have been only an incomplete family history and light weight compared with height.

The decision of the medical board may or may not be referred to the executive, or board of directors (not medical). They nearly always follow the recommendation of the medical board, but, of course, may do otherwise, if they so decide. To be binding, the policy must have the signature of the executive.

All appointments of medical examiners are made by the medical board or medical director. Some companies have a "medical referee," to whom all applications for appointment as examiner are sent. With some companies the medical referee acts as medical inspector, whose duty it is to visit the various agencies and acquire information as to the standing of the various medical examiners. He also occasionally is called upon to investigate the circumstances connected with death claims in the previous history of which there may be some unsatisfactory points to be explained.

No applicant who at the time of examination is suffering from disease in any form should be accepted at that time. Many, also, who are quite free from present disease must be considered bad or impaired risks. These, however, are usually insurable, but at rates and on plans varying with the nature of the impairment. With some this impairment is likely to diminish as they grow older, while with others the contrary is the case; hence we have those who may be classed as lives with "diminishing risks," and also lives with "increasing risks."

Gout, arteriosclerosis, and consequences—diseases more frequently found after middle life—are examples of the latter class. In the former a tendency to tuberculosis, especially of the lungs, may be included, inasmuch as the liability lessens as the individual grows older. Assurance companies take different measures to meet these various risks. Some, more especially the British, impose in nearly all cases an addition of a certain number of years to the age of the applicant, thus increasing the amount of premium required. Others, particularly American officers, offer the applicant an "endowment" policy, on the theory that the extra risk is overcome by shortening the term of the policy and exacting a correspondingly heavier premium. Either of these plans may be comparatively safe for cases of "increasing risks," but they can hardly be considered as based on sound actuarial principles when applied to the case of "diminishing risks."

It is the practice of some companies to place a "gradually reducing lien" or "contingent debt" on the policy issued on such a life. Both the amount of the lien and the duration of its existence vary according to the nature of the risk, and many authorities consider that this is a more correct method of dealing with such cases.

Duties of Medical Examiner.—The medical examiner must always remember that he is the official representative of the company, and that he acts purely in its interests. Whenever there is any doubt as to the advisability of accepting the risk as a first-class one, it is his duty to give the company the benefit of that doubt. Under no circumstances should he allow himself to be influenced, either by agent or applicant, in suppressing any information in regard to family or personal history. Illness of any kind for which the applicant may have consulted a physician, especially if within the last few years, should be fully reported on, both as to its nature, the length of the confinement to bed and to the house, and any other information of importance in connection with it. Before a policy will be issued the medical board must have full particulars of the past medical history of the applicant, to enable them to form an opinion of the value of the risk, quite independent of the medical examiner's views. It may not always be advisable for the medical examiner to put in writing on a printed form his opinion, especially as to habits, if they are objectionable. They will be sure to be read over by the agent, and probably related to applicant. This difficulty can be readily overcome by the medical examiner writing a confidential letter to the medical director giving more complete information as to any unfavorable point in either personal or family history.

In proceeding to examine the applicant the medical examiner should remember that he must do so with as much care as he would were it an ordinary office connection on the applicant's behalf, according to the printed form of the company. There are a number of questions he is expected to ask, both with regard to the family and also the personal history. The replies to these questions he must write down. Now, for this purpose it is advisable to have the applicant so placed in front of the light that, while getting the replies to the various questions, he may study his appearance, and thus form a general idea as to his age, general health, and prospects of longevity. A good rule is to commence these questions by asking the applicant if he has ever been refused by any company, and also if every company to whom he has applied has issued a policy on the plan applied for. The reason of this is that it is almost of daily occurrence in companies doing a large business to find that as soon as the agent who has canvassed the risk has the slightest hint that the applicant is not a first-class life, and probably because of conscientiously believing the examiner to have been unnecessarily strict, he will at once take the man to another company in the hope that its medical representative may not be so particular. Unfortunately, it often happens that through a hasty and incomplete examination the second doctor may overlook a slight heart murmur or some other feature recognized by the first examiner, and advise issuing a policy, with the consequence that his own services may, quite possibly, be dispensed with. This happens in this way: So soon as a risk is declined, notice of this refusal is sent to a central bureau, and from there a printed card is posted to all the companies who are members of the "exchange." The cards thus received are kept on file in cabinets. Before a policy can issue from the office every name that has been recommended for assurance is searched for in these cabinets, and if found in this black-list, information is obtained as to the reason why the previous

company did not issue its policy. In this way many a fraud on the part of the applicant (who has denied previous refusal) and many an error on the part of the physician have been discovered.

At the same time it must be remembered that the denial by the applicant of his refusal by another assurance company does not always mean fraud. He may be, and very often is, in ignorance of the reasons of the policy not having been issued.

In making this examination there are four distinct points which should carefully be inquired into by the medical examiner and reported upon:

1. Family history.
2. Past medical history.
3. Past and present habits.
4. Present state of health as indicated by medical examination.

In reporting upon all the above the medical examiner must not lose sight of the fact, already referred to, that he is examining in the interest of the company he represents. With that in view, he should be on his guard as to the possibility of the applicant concealing information connected with family or personal history which might influence the decision of the company as to issuing a policy. That concealment may be intentional or otherwise. Should a death claim arise within 3 or 4 years, notwithstanding the false statements made, the company is barred by the laws of many states from making this a point in the defense, unless it can be proved that this statement was fraudulently made and had a direct bearing on the cause of death. Nowadays most companies voluntarily adopt a limited period (generally 2 or 3 years) after which time the policy is absolutely indisputable, notwithstanding any misstatements.

Family History.—Taking up, now, the first of the headings above referred to—the family history—the replies to the questions as written down by the medical examiner are very frequently the cause of much inconvenience and delay in issuing a policy. In the case of death of either parent or other member of the family, the terms "general debility," "anemia," "la grippe," "burst a blood-vessel," "hemorrhage," or, in the case of sisters or mother, the terms "change of life" or "childbirth," are often used without any explanatory notes as to the duration of illness or presence or absence of cough. The experience of all medical directors shows that these terms are frequently made use of when the actual cause of death has been **tuberculosis** of the lungs. Many an applicant quite conscientiously gives "childbirth" as cause of death of mother or sister, believing it to have been the direct existing cause of the diseased condition, which may have terminated in death a few months after delivery. In view of this tendency on the part of the public in the absence of such definite information as will satisfy the medical director that tubercular disease may be completely eliminated, he will not be justified in treating the case as an unimpaired life, unless, indeed, there are other features of a personal character, which in his opinion may offset these unfavorable points.

The mortality from tuberculosis is so great that when indefinite statements are made regarding family history, suspicion is naturally directed that way. Hence the absolute necessity arises of the medical examiner furnishing such complete and detailed information as will enable the medical director to form an accurate opinion as to the facts of each case.

Other indefinite terms are occasionally made use of by inexperienced medical examiners, such as "dropsy" (a mere symptom of a diseased condition of some organ, such as heart, kidney, or liver), "heart failure," "dissipation," "congestive chill." All such cases require full inquiry and explanation.

When either parent has died of consumption, it is particularly desirable that inquiries should be made as to the cause of death (if any deaths) of other members of deceased's family, so as to be able to eliminate any chronic lung trouble, for, indeed, in an insurance point of view, the company should take the benefit of any doubt that may exist, and assume that every suspicious case is one of tuberculosis.

Seeing that consumption accounts for the largest number of death claims in the mortuary list of all assurance companies, it is one which, naturally, the medical department tries most to guard against. There is little doubt that some of these claims are avoidable. With our more modern views of the nature of the disease, and its manner of transmission, the question of heredity loses some importance. Although an important factor, the environment, occupation, and physique of the applicant are of even greater importance. As a rule, however, the progeny of strong and healthy parents possess more endurance, and are less susceptible to contagious diseases, other things being equal, than those of feeble parents. Therefore, when exposed to the contagion, the latter are less liable to resist the attack of the bacilli.

It is a debatable question in the case of either parent dying of consumption at an age when the children are very young, whether such a risk should be considered more or less hazardous on the part of the children subsequently seeking assurance. In favor of the latter view may be stated that they are exposed to the contagion at a time—early childhood—when the individual has great resisting powers to that disease. Later on, when developing into men and women, the danger of contracting the disease is greater should they be exposed to the contagion. On the other hand, it should not be lost sight of that if either parent died within a very short period of the birth of the child seeking assurance, there is a probability of that child inheriting, to some extent at least, the impaired vitality of the parent.

Living in the same house, especially sleeping in one, in which an individual has recently died from consumption, or is suffering from it, neutralizes to a certain extent the favorable importance of a first-class personal physique, and even of over average weight. This is especially the case in regard to man and wife, so that with young married men the fact of the wife suffering from the disease or from any chronic lung trouble which would give reason for suspecting consumption,

seriously impairs the life of the husband, so far as assurance is concerned.

Arteriosclerosis and its resultant affections of the system, such as some forms of **kidney-disease, apoplexy,** and the like, if the cause of 2 or more deaths in a family, should be considered as placing an applicant in the under average class, especially if associated with even a moderately free use of alcohol. Many of these causes are really the result of a "gouty" condition, and if death of either parent can be assigned to that cause, the risk is rendered more hazardous, as we have unfortunately many evidences of its hereditary nature.

When such a family history is present, it is the duty of the medical examiner to inquire minutely into the personal history of the applicant for any evidences of a similar condition, such as frequently occurring attacks of tonsillitis, bronchitis, and eczema. These remarks apply more to individuals over 45 years of age, and with almost equal emphasis in a family and personal history of rheumatism.

Past Medical History of the Applicant.—Naturally, this has an important bearing on the desirability of the company assuming the risk. Again, we think of the dreaded disease **consumption,** and cannot help observing in private and hospital practice that the frequent occurrence of catarrhal conditions in an individual who is the offspring of tubercular parents makes him a particularly hazardous risk, although at time of examination he may appear to be perfectly sound.

No less important is the history of the occurrence of **pleurisy** within recent years. The examiner should be most careful in making the examination. He may be able to locate where the pleuritic condition existed, but if the history of the case pointed to the probability of its being toward the apex of the lung and of recent date, the risk should be considered an impaired life. If a history of tuberculosis is present in the family, and the applicant is below the average weight, the risk should not be accepted at ordinary rates. A death in the family from pleurisy should be looked upon with suspicion as possibly being associated with tuberculosis.

The view too often entertained that a history of pleurisy in an applicant is of very little consequence is a grievous error. In recorded cases in which death has occurred from this disease and postmortem examinations have been made, nearly 50 percent have been tuberculous. Of those who have recovered from the attack almost one-fourth subsequently developed tuberculous disease of the lungs. In cases in which the disease has lasted any length of time fully 50 percent die of tuberculosis.

Hemoptysis, if within recent years, should certainly be considered sufficient grounds for refusing a risk. There are good reasons for believing that it may occur without tuberculous disease, but the cases of that kind are so very rare that for assurance views it is safe to look upon all such as tubercular. If an applicant has been in perfect health since the attack, and has increased in weight so that he is above the average weight for his height, and an interval of 8 or 10 years has elapsed since the hemoptysis, the risk may be considered fairly safe, but he cannot be a first-class life. He is safely assurable on some plan, such as an endowment, or with a small lien placed on the policy.

Cancer is a disease about which there appears to be but little unanimity in practice among companies with regard to the acceptance of those risks. There can be little doubt that the relative number of deaths from cancer is greater now than it was many years ago. This can, however, be readily accounted for by the fact that the mortality of the younger ages is very much less than formerly—that is to say, that more individuals survive to the ages at which cancer makes its appearance. The practice of some companies in disregarding a single death from cancer in the family history seems to be justified by mortality lists. Two or more deaths in the family from any cancerous affections are, however, sufficient to cause a life to be treated as impaired.

Diseases of the Genitourinary Tract.—An applicant suffering from an attack of gonorrhea should be put off until some time after the disease has been fully cured. It may result in a stricture which in late years (through secondary diseased conditions) may endanger life. Stricture, if obstinate and not readily and quickly yielding to treatment, may cause secondary diseased conditions, such as pyelitis or disease of the bladder or kidneys of a more chronic form. Such troubles may arise from an apparently insignificant stricture. Such an applicant should not be considered first class. Some years should be taken off his "expectation" and the premium increased accordingly, or a policy on a short term endowment only granted.

Syphilis.—That individuals may die of syphilis can be easily proved by referring to the pathologic museum of any hospital or school of medicine, and that many of them may die at periods remote from the primary inoculation, clinical history will attest. For these reasons a man who has had syphilis, although reported cured, cannot be considered a "selected" life. The practice of assurance companies varies with regard to such lives. Many companies will issue any form of policy provided a certain time, say 3 years, has elapsed since final disappearance of symptoms, more especially if they have had several months' treatment. Others again will issue only a limited policy, say 20-year endowment, without any extra premium. When an applicant has had syphilis and has undergone a regular course of medical treatment for say 3 years, and the individual has a healthy appearance and leads a regular life, and if at all uses alcohol only very moderately, the risk is considered by many companies as presenting no objections to being first class. Other companies again will demand an extra premium corresponding to that caused by the addition of 6 or 7 years to the age of the applicant. Still others again impose a lien running off in 15 to 20 years.

It must not be overlooked that many, even of the so-called cured, patients, may die 15 or 20 years after the infection from some such disease or locomotor ataxia or some affection of the brain, while others succumb at earlier periods from syphilitic affection of the lungs, kidneys, liver, etc.

Albuminuria is a condition regarding which there appears to be an utter absence of unanimity of action on the part of the medical boards of the various companies. All medical authorities are fully agreed that the presence of albuminuria in a young person is not incompatible with perfect health.

Many individuals in whom albuminuria is present, and who were declined for assurance—some as far back as 27 years ago—have during that time enjoyed the best of health. On the other hand, cases are so numerous in which the detection of albuminuria has been followed by so limited a term of existence, even in the young, that its presence at the time of examination should be sufficient to postpone the acceptance of the risk until such time as it can be reported that frequent examinations within some definite time have proved the absence of albumin.

Should an examiner meet with such cases, he should make a most careful examination of the **heart-sounds**, especially in the aortic region, so as to be able to conclude that very important indication of arterial changes, the accentuated second sound, and report in full all the facts.

Otorrhea is a condition which should be inquired into if present. It may be of little consequence, but as many of those in whom this condition is present die from the extension of the disease, as a result of septic infection or of inflammatory affection of the brain or its membranes, the life cannot be considered otherwise than as impaired. By the term otorrhea we understand a chronic suppurative inflammation of the middle ear. It is frequently a sequence of either measles or scarlet fever, but it may follow an acute inflammatory affection, as a result of cold in a person with scrofulous tendency. The mastoid cells may become involved and place the life of the individual in jeopardy. Even in cases in which the discharge has ceased for a time a slight existing cause may give rise to inflammatory processes which, by extension, may cause alarming cerebral symptoms.

In cases of this kind the examiner should elicit from the applicant the duration of the discharge, and, if it has now ceased, the time of its disappearance. He should also endeavor to find out whether or not it followed any of the eruptive diseases. All these facts should be fully explained in the medical report.

The actual presence of a discharge is not enough to cause rejection of the risk. Some companies may accept on a short term endowment, while others may place a small lien on the policy, running off in say 15 years; while others may meet the extra risk by charging a higher premium, resulting from adding an extra 7 years to the age.

Inflammation of the bowels, in the past history of an applicant, is a term about which examiners are very often not sufficiently accurate in their reports. When given as one of the ailments for which he has had medical care, the date of the occurrence and duration of illness should be fully reported. The medical examiner should get from the applicant a description of symptoms from which he suffered, and report accordingly. Without a detailed or satisfactory report the medical director will be in duty bound to accept the views of most physicians and surgeons, who look upon the great majority of such inflammatory cases as attacks of appendicitis, which, if recent, are so liable to recur. There can be no doubt that often when the applicant reports that he has had inflammation of the bowels it may have been only some catarrhal trouble, or an attack of enteritis, or a mild attack of dysentery. Should there be no satisfactory evidence, so far as the report goes, that the attack was not appendicitis, and if it occurred recently, say within from 3 to 5 years, the medical director will probably take the benefit of the doubt, and postpone the acceptance of the risk for a limited time after its occurrence (3 to 5 years generally), or advise issuing a policy only on some heavier payment plan, or its equivalent.

A perfect cure after removal of the appendix renders the risk unobjectionable on the ground of a previous appendicitis.

Habits.—The abuse of alcohol in its various forms is a source of great trouble to assurance companies. In the first place, a very large proportion of death claims are either directly or indirectly due to it. Most physicians agree that its very moderate use may cause no injurious effect on the health of the individual. All men know that its excessive use is decidedly injurious. It is an extremely difficult matter to decide as to the dividing line between the two conditions. It can be safely assumed that the man who uses over, say, 2 or 3 ounces of spirit or its equivalent a day, is producing injurious structural changes in his vascular system. But few individuals admit the full quantity taken daily. The facts tend to prove that the offspring of neurotic parents, when users of alcohol, are more prone to its excessive use. In estimating, on this ground, the value of a life seeking assurance, heredity should be considered. One who uses alcohol freely in any form, either of whose parents were addicted to its use, must be considered a very hazardous risk.

When any doubt exists, the company should unquestionably take the benefit of that doubt either by not assuming the risk or by issuing a policy on some short term plan, with heavy payments, such as a 10-year or 15-year endowment, or, again, by adding 7 to 10 years to the age with correspondingly increased premium.

Medical Examination of the Applicant.—By the time the medical examiner has completed his questions and noted down the replies thereto, he will have formed a fair idea of the nature of the risk his company is asked to assume. He will have observed the man's **general appearance**—whether anemic or plethoric—by the general appearance of face and ears, as well as the character of his breathing, whether or not there is a probable tendency to tubercular disease. At the same time he will have given the applicant a chance to overcome that nervousness so often met with in applicants for assurance, when knowing they have to undergo medical inspection. When possible, in fact in all cases, the **chest** should be uncovered so that an inspection, as well as a

LIGATURE.—A cord or thread of any material for tying arteries, etc.

Arterial hemorrhage is best arrested by simple ligation, and a ligature is occasionally required in venous bleeding. It is best to include as little of the surrounding tissues as possible in employing a ligature, except when arterial coats are diseased. In ovariotomy the pedicle is included in the ligature with the vessels *en masse*. Hemorrhoids and nævi may be treated by ligature. Silk linen thread, silkworm-gut, kangaroo tendon, hemp, catgut, ox aorta, fine wire, horsehair, and other materials have been used for ligature. Silk, silkworm-gut, and catgut are the materials most used. Dentists' floss has been recommended when large vessels are to be tied, since it does not easily slip. For sutures, silk or silkworm-gut is best. Silver and other wire sutures are not much employed. For cut ends of arteries catgut, properly prepared, is likely the best ligature material. Chromicized catgut is harder than ordinary catgut, and requires soaking in carbolic lotion for an hour before use. It then ceases to be slippery or brittle, and its knot will not yield. Animal ligatures disappear in course of time, while silk ligatures remain and may set up irritation. A single thread should always be used for ligation of arteries.

Preparation of Catgut.—Dry sterilization of catgut seemed to become the general procedure a few years ago, but extensive trial has shown that it cannot be relied upon in rendering the material absolutely safe for practical use. The many failures of catgut as an aseptic suture and ligature, as heretofore prepared, are responsible for the substitution of silk for catgut in the practice of many surgeons. Instances of even tetanus infection have been traced to the use of catgut. Silk can be readily sterilized by boiling, the simplest and quickest method of effecting absolute sterilization.

The ideal sterilization of catgut consists in rendering the material not only absolutely sterile, but also mildly antiseptic, without impairing its tensile strength. Every surgeon has been anxiously looking for a method by which catgut could be prepared so that it could be sterilized by boiling without impairing its strength. Experiments have shown that catgut and leather immersed for 48 hours in a 2 to 4 percent solution of formalin undergo an unknown chemic change, which alters their texture in such a way that its tensile strength is not impaired, but rather increased, by boiling. The commercial catgut is subjected to the action of the formalin without any previous preparatory treatment of the raw material. Hofmeister, who has done such excellent service in perfecting the formalin preparation of catgut, gives the following most recent method: (1) The catgut is wound on a glass plate with slightly projecting edges, so that the gut is free from the sides of the plate and exposed to the circulation of the boiling and flowing water. The ends of the gut are fastened through holes in the plate. (2) Immersion 12 to 48 hours in aqueous solution of formalin 2 to 4 percent. (3) Immersion in flowing water at least 12 hours to free the gut from the formalin. (4) Boiling in water from 10 to 30 minutes. Ten to 12 minutes are amply sufficient, as all microbes and spores are killed by exposure to boiling heat for that length of time. (5) Hardening and preservation in absolute alcohol containing 5 percent of glycerin and 0.1 percent of corrosive sublimate.

One of the essential conditions of success in this method of catgut sterilization is to wind the gut quite tightly around the glass plate or hollow glass cylinder during the process of sterilization.

The result of Senn's experience has led him to modify the procedure in several ways. Instead of glass plates, ordinary glass abdominal drainage-tubes have been employed, upon which the gut is wound quite tightly. These glass drains have been found an excellent substitute for the plates. An ordinary large test-tube would answer the same purpose. The remaining directions given by Hofmeister were followed to the letter. Numerous inoculations with fragments of catgut prepared by this method in sterile gelatin invariably gave negative results. The catgut is as strong as the raw material, hard, and the knot is less liable to slip than when the ordinary material is used.

In the preparation of catgut Senn has modified Hofmeister's method by substituting iodoform for the corrosive sublimate. After boiling the deformalinized catgut for 12 to 15 minutes, it is cut into pieces of desirable length, tied into small bundles containing from 6 to 12 threads, when it is immersed and kept ready for use in the following mixture: Absolute alcohol 950, glycerin 50, iodoform (finely pulverized) 100. The alcohol dissolves part of the iodoform. The bottle containing the catgut should be closed with a well-fitting glass cork and should be shaken well every few days to bring the dissolved iodoform in contact with the threads. The catgut can be kept in this mixture for any length of time without losing its strength. One of the valuable properties of iodoform applied to a recent wound is to diminish the amount of primary wound secretion. It does not destroy pus microbes, but inhibits their growth.

Silk may be prepared by boiling, after having been wound on glass spools, and kept in an ordinary test-tube, the mouth of which has been stoppered by sterile absorbent cotton. Before use it should be resterilized. It may be put in a carbolic solution, 1:20, to which two-thirds of its quantity of alcohol has been added. This is better than corrosive sublimate solution, since the needles may be threaded and placed in the liquid together with the ligature.

Kangaroo tendon has the advantage over catgut in being uncontaminated by germs when obtained from a healthy freshly-killed animal. It is very carefully prepared and dried and may be kept indefinitely in carbolic acid (1 to 20). The strands are especially valuable for large blood-vessels and varicoceles and deep-buried sutures of the abdomi-

nal wall, hernia and muscular union. They are absorbed in about 6 weeks.

Horsehair washed with ether and sterilized by heat is excellent for skin sutures when there is not much tension.

Silkworm-gut is commonly used by anglers. It may be purchased in bundles, and from them suitable pieces should be picked for surgical use. As a rule, pharmacists keep selected material for surgical use. It may be sterilized by heat or it may be soaked in a carbolic solution for 15 minutes before use. The first knot should be a double one, and the second knot tied very lightly or not at all, to obviate breakage. It is an excellent interrupted skin suture, but not adapted for vessels and deep tissues by reason of its remaining rigid and unabsorbed.

Silver wire is used for skin sutures when there is much tension, and combined with lead for bone suture. Its polished surface has the advantage of not attracting germs.

The method of tying a ligature is as follows: Usually a reef knot is used. See KNOT. The fingertips should be pressed down on the ligature surrounding the vessel, to obviate the danger of lifting up the artery from its bed. The ends should be cut short. Absolute cessation of pulsation of the artery below the ligature denotes sufficient ligation, but if the vessel is diseased, the knot should be made most deliberately. The preparation of ligatures is also discussed in the article on ABDOMINAL SECTION (*q. v.*). See also ARTERIES (Ligation).

LIGHTNING, INJURIES.—In nonfatal injuries sudden collapse, with unconsciousness, is followed by drowsiness, fever, much prostration, and occasionally by delirium and convulsions. Paralysis of one or more limbs, severe neuralgic pains, impairment of vision, and even blindness are results. A long list of sequels, due to progressive inflammatory changes and shock, has been recorded. Superficial injuries show spots of ecchymosis, burns greatly varying in extent and severity, and dusky patches due to fused buttons, chains, studs, etc. Arrest of the growth of the hair is another result of injury from lightning. The mortality of injuries from lightning is about 25 percent. When a person is killed suddenly, the body either falls at once to the ground or becomes rigid and remains fixed in a more or less erect attitude. Such a person may not present a visible mark of injury or the body may be mutilated and the bones of limbs or cranium widely comminuted and exposed. The clothes may be untouched or be reduced to shreds and torn away. Rigor mortis comes on rapidly in fatal cases. Instances of rupture of the heart and of the stomach have been recorded.

The treatment of the resultant shock consists in the application of warmth to the surface of the body; the administration of stimulants by mouth, rectum, or hypodermically, and, when necessary, the use of artificial respiration. Local lesions require their proper treatment, for which see BURNS, ELECTRICITY (Injuries). Burns caused by lightning heal very slowly. Paralyses ensuing often yield to the influence of galvanism when properly and regularly given.

LIGHT THERAPY.—See PHOTOTHERAPY.

LIME.—The popular name for calcium oxid, CaO (quicklime), and calcium hydroxid, $Ca(HO)_2$. Calcium oxid (quicklime) has a great affinity for water and for CO_2. On contact with the former, slaked lime is formed, with the evolution of heat. On living tissues it acts as a caustic. **L., Burnt, L., Caustic,** calcium oxid, quicklime. **L., Chlorid of, L., Chlorinated,** the chlorid of lime of commerce, is not a distinct chemic compound; its chief constituent. and the one on which its disinfectant properties depend, is calcium hypochlorite, which liberates chlorin. **L., Milk of,** a milky fluid consisting of calcium hydroxid suspended in water. **L., Quick-, L., Slaked,** common terms for lime. **L. Ointment,** an ointment consisting of slaked lime, 4; lard, 1; and olive oil, 3. **L.- water,** a solution of calcium hydroxid in water. It is astringent and alkaline and prevents the formation of dense coagula if added to milk. Dose, 4 to 8 drams. **L., Syrup of** (*syrup of calcium hydroxid*)—contains 6 1/2 percent of lime, and 40 of sugar, the latter aiding the solvent power. Dose, 10 to 60 minims. It is an antidote to poisoning by oxalic acid and phenol. **L., Liniment** (*Carron oil*)—contains equal volumes of lime-water and linseed oil, mixed by agitation. For local use.

Lime-water is a useful antacid. In diabetes, in uric acid diathesis, and in excessive nausea and vomiting, teaspoonful doses of milk and lime-water will be retained when nothing else will remain on the stomach. Lime-water is given in the dose of 1 dram to 2 ounces. Externally, lime-water is used in tinea capitis, and in burns when mixed with equal parts of linseed oil or olive oil, forming *carron oil*. In membranous croup and in diphtheria lime-water is useful as a spray or on a swab. Lime-water is made by pouring 2 quarts of boiled and filtered water upon a piece of unslaked lime about the size of a walnut. After stirring and allowing to settle in an earthen jar, the clear liquid is poured off for use. See CALCIUM.

LINIMENTS (Linimenta).—Very thin ointments for external application, intended to be applied with friction to the skin. They are solutions of various substances in oily liquids or in alcoholic liquids containing fatty oils. There are 8 official liniments.

Official Liniments.—

TITLE.	BASE.	CONSTITUENTS.
LINIMENTUM:		
Ammoniæ (ammonia), (*Volatile Liniment*),	Cottonseed oil.	Ammonia water, 350 c.c.; alcohol, 50 c.c.; cottonseed oil, 570 c.c.; oleic acid, 30 c.c.
Belladonnæ (belladonna),	Alcohol.....	Camphor, 50 gm.; fldext. belladonna, to make 1000 c.c.
Calcis (carron oil),	Linseed oil.....	Lime water, linseed oil, equal parts.
Camphoræ (camphor),	Cottonseed oil..	Camphor, 200 gm.; cottonseed oil, 800 gm.
Chloroformi (chloroform)	Alcohol.....	Chloroform, 300 c.c soap liniment, 700 c.c.

Title.	Base.	Constituents.
Linimentum: Saponis (soap),...	Alcohol.....	Soap (gran.), 60 gm.; camphor, 45 gm.; oil rosemary, 10 c.c.; alcohol, 725 c.c.; water to make 1000 c.c.
Saponis mollis (soft soap).	Alcohol	Soft soap, 650 gm.; oil lavender flowers, 20 c.c.; alcohol, to make 1000 c.c.
Terebinthinæ (turpentine).	Oil of turpentine.	Rosin cerate, 650 gm.; oil turpentine, 350 gm.

LINSEED (Flaxseed).—The seed of *Linum usitatissimum* (flax), a cultivated annual plant. It contains 15 percent of mucilage in the epithelium, also 30 to 40 percent of fixed oil in the embryo. Ground linseed should yield not less than 25 percent of the fixed oil.

Therapeutics.—Linseed is demulcent, emollient, expectorant, and diuretic. The oil is laxative in a dose of 1 ounce, and in smaller doses is oxidized in the system. The infusion contains the mucilaginous principle and a small portion of the oil, and is advantageously used in inflammations of the mucous membrane of the throat, the gastrointestinal tract, and the urinary passages. It is an excellent demulcent in coughs of various kinds, and will be found very serviceable in cystitis, irritable bladder, renal colic, strangury, etc. The oil may be administered internally as a laxative, and has considerable reputation as a remedy for hemorrhoids in doses of 2 ounces twice daily. For laxative purposes (especially in children) it is usually administered as an enema. Externally it is a favorite application to burns, when made into an emulsion with lime-water. The ground seed (linseed or flaxseed meal) is one of the best agents for making poultices, and is universally employed for that purpose, though it is objectionable from an aseptic point of view.

To make a **linseed poultice,** the following materials must be collected: (1) A sheet of tow, a folded flannel or cloth—in an emergency a sheet of brown paper or large cabbage-leaf—spread out on a table or board, and a little larger than the part to be poulticed; (2) a bowl and spoon; (3) the crushed linseed; (4) a kettle and boiling water. Warm the basin and spoon by pouring into the former some boiling water, and empty it out. Put in some meal and add a very little hot water. Stir into a paste with the heated spoon. Continue doing this until enough paste to cover the tow has been made. It should now be spread 1/4 inch thick evenly and flatly to within 1 inch of the edges of the tow or cloth, which edges are folded up to form a margin. Too much or too little water is harmful, making the poultice soft and sloppy or sticky. The poultice should be made at the bedside, and the linseed placed next to the skin, and removed after 2 hours. See Flaxseed; Poultice.

Preparations.—L., Ol., the fixed oil of linseed expressed cold; a glycerid of linoleic acid. Dose, 1/2 to 2 ounces. **Carron Oil,** linseed oil emulsified in lime-water, used for burns.

LINT.—A loosely woven or partly felted mass of broken linen-fibers, made by scraping and "picking" old linen cloth. It is used as a dressing for wounds and raw surfaces. Common lint is twilled on one side and "woolly" on the other. In the spreading of an ointment the twilled side is used.

LIPEMIA.—See Blood.

LIPOMA.—A fatty tumor. See Tumors.

LIPS, DISEASES. Herpes.—A crop of herpetic vesicles which burst in a few days, leaving a scab, is common upon the lips, especially in gastric and febrile disturbances. The vesicles may be moistened with alcohol, cologne water, camphor water, or smeared with alum, zinc ointment, boric ointment, etc.

Cracks and fissures of the lip following exposure to cold, etc., in dyspeptics, are very common, and if neglected, may form deep and painful fissures, prone to bleed and obstinate to heal. A simple ointment, and, if persistent, touching them with silver nitrate, will generally suffice to cure them. They must not be mistaken for the fissures about the corners of the mouth so common in congenital and acquired syphilis.

Papillomata or **warty growths** of the lips are of interest in that they are liable, as age advances, to become epitheliomatous. They may sometimes grow out in the form of horns. Extirpation with the knife is the proper treatment.

Superficial ulcers on the inner surface of the lip are common accompaniments of errors in digestion and of secondary syphilis. There are usually similar ulcers on the side of the tongue and cheeks. Silver nitrate or chromic acid lotions are the best local applications.

Nevus of the lip, when small, may be touched with nitric acid or sodium ethylate; and when pendulous and projecting from the free margin, ligated. When involving the whole substance of the lip, it may be treated by electrolysis, or, better, excised by means of a V-shaped incision.

Hypertrophy of the lip, generally the upper, is often met with in connection with cracks and fissures in strumous children, and is known as the *strumous lip.* A similar condition is sometimes met in congenital syphilis and in chronic nasal catarrh. The thickening, as a rule, disappears under constitutional treatment and as the patient grows older. The removal of a wedge-shaped piece, as advised by some, is seldom necessary.

Carbuncle of the lip is a most dangerous disease, as it is very likely to lead to infective phlebitis of the facial vein, which may spread thence through the ophthalmic vein to the cavernous and other cranial sinuses, and terminate in infective meningitis or in general blood-poisoning. Free incisions should be made, the sloughs scraped away, antiseptics applied, and the strength supported by fluid nourishment and stimulants.

Adenoma or **labial glandular tumor** (Paget) occasionally occurs in the lip as small, smooth, elastic growths projecting under the mucous membrane. It sometimes contains nodules of cartilage, and is then of harder consistency. It should be removed from the mucous surface to avoid scarring.

Cysts due to obstruction of the mucous follicles are frequent in the lip. They contain a glairy

fluid, and appear as small, tense, semitranslucent, globular, bluish-pink swellings on the mucous surface. A free incision through the mucous membrane, and removal of the cyst-wall with forceps, is perhaps the best treatment.

Mucous patches are sometimes observed on the mucous surfaces of the lips, most frequently at the angle of the mouth or in the groove between the gums and lips. They are usually superficial, not elevated, and present the appearance as if a silver nitrate stick had been drawn across the surface; the latter circumstance has given rise to the term "opaline patches." When situated at the angle of the mouth, they may become fissured, painful, and bleeding. Their surrounding area lacks the semblance of acute inflammation, being somewhat dull and congested; this fact proves important in differentiating them from the patches of aphthous stomatitis. The previous history, the adenopathy, the presence, perhaps, of a cutaneous lesion, and the resistance to ordinary local treatment would serve to render the diagnosis clear. See SYPHILIS.

Epithelioma nearly always occurs in men, and on the lower lip; and although it may affect non-smokers, it generally appears to be due to the irritation and heat of a short clay pipe. It begins as a crack, small ulcer, or indurated tubercle, and may either spread superficially along the free margin of the lip or extend deeply into its substance. Sooner or later it involves the whole lip and adjoining parts, becomes adherent to the jaw, and invades the bone. The lymphatic glands in the neck become involved, but dissemination through internal organs is rare. If removed early, it may not recur until after a long period of immunity or, perhaps, not at all. It seldom returns in the scar, but in the lymphatic glands, the patient dying of exhaustion induced by ulcerating and bleeding masses in the neck.

Diagnosis.—The affection is likely to be mistaken for hard chancre, and the latter has been cut away under the impression that it was an epithelioma. The following points should serve in diagnosis: (1) Epithelioma generally occurs in the old, and in men, and on the lower lip; chancre in the young, in women, and on the upper lip. (2) The epitheliomatous ulcer has hard, sinuous, and everted edges, and an indurated and warty base; the chancrous is raised, excoriated, smoother, and the induration is more circumscribed. (3) In the malignant affection the glands are not affected until late in the disease—perhaps 6 months; in the syphilitic, early—say 6 weeks. Moreover, in chancre secondary symptoms will be present or soon appear, and the disease readily yields to antisyphilitic remedies. See EPITHELIOMA.

Treatment.—Free and early excision is imperative. The growth may be either included in a V-shaped incision, the wound being afterward united by harelip pins, or, if superficial, freely shaved off. The glands in the neck, if enlarged and not too extensively diseased, should be extirpated at the same time. When the bone is involved, a portion of the jaw may be removed if the whole disease can be exterminated.

Harelip.—See HARELIP.

LIQUID AIR (Carbon Dioxid Snow).—See AIR, LIQUID.

LIQUOR.—In pharmacy any solution in water of nonvolatile substances, except infusions, decoctions, syrups. There are 25 official solutions: **Liquor Acidi Arsenosi.** Should contain arsenous acid, corresponding in amount to 1 percent of arsenic trioxid. Medical properties same as Fowler's solution. Average dose, 3 minims. **Liquor Ammonii Acetatis** (spirit of Mindererus). An aqueous solution which should contain not less than 7 percent of ammonium acetate, together with small amounts of acetic and carbonic acids. Diaphoretic in fevers. Average dose, 4 drams. **Liquor Antisepticus.** (Similar to listerine, etc.) Boric acid, 20 gm.; benzoic acid, 1 gm.; thymol, 1 gm.; eucalyptol, 0.25 c.c.; oil of peppermint, 0.50 c.c.; oil of gaultheria, 0.25 c.c.; oil of thyme, 0.10 c.c.; alcohol, 250 c.c.; purified talc, 20 gm.; water, to make 1000 c.c. Average dose, 1 dram. **Liquor Arseni et Hydrargyri Iodidi** (solution of arsenic and mercuric iodid) (Donovan's solution). Contains 1 percent of each of the active ingredients. Alterative. Average dose, 1 1/2 minims. **Liquor Calcis** (solution of calcium hydrate; lime water). A saturated solution. Antacid, tonic and astringent. Average dose, 4 drams. **Liquor Chlori Compositus.** Compound solution of chlorin. Chlorin water. (To replace Aqua Chlori, U. S. P., 1890.) An aqueous solution containing, when freshly prepared, about 0.4 percent of chlorin with some oxid of chlorin and potassium chlorid. Average dose, 1 dram. **Liquor Cresolis Compositus.** (Similar to lysol.) Cresol, 500 gm.; linseed oil, 350 gm.; potassium hydroxid, 8 gm.; water to 1000 gm. **Liquor Ferri Chloridi.** An aqueous solution of ferric chlorid which should contain not less than 29 percent of the anhydrous salt, corresponding to 10 percent of metallic iron. Average dose, 1 1/2 minims. Used in preparing tincture of ferric chlorid; also externally as a styptic to arrest hemorrhage. **Liquor Ferri et Ammonii Acetatis** (Basham's mixture). Contains in each thousand c.c. Tr. Ferri. Chlor. 40 c.c., Acid Acetic Dil. 60 c.c., Sol. Ammon. Acet. 500 c.c., Aromat. Elix. 120 c.c., glycerin 120 c.c., water to 100 c.c. Actively chalybeate, also astringent, and very largely used in Bright's disease. Average dose, 4 drams. **Liquor Ferri Subsulphatis** (solution of basic ferric sulphate, Monsel's solution). An aqueous solution of variable chemical composition, containing an amount of basic ferric sulphate corresponding to not less than 13.57 percent of metallic iron. Styptic to bleeding surfaces; used internally in hemorrhage of stomach and bowels. Average dose, 3 minims. **Liquor Ferri Tersulphatis.** An aqueous solution which should contain about 35 percent of normal ferric sulphate, corresponding to not less than 10 percent of metallic iron. Used for preparing other iron preparations, as in the preparation of the antidote for arsenic. **Liquor Formaldehydi** (formalin). An aqueous solution, containing not less than 37 percent by weight of absolute formaldehyd. **Liquor Hydrargyri Nitratis.** A liquid which should contain about 60

percent of mercuric nitrate, and about 11 percent of free HNO_3. Caustic application to chancre, etc. **Liquor Iodi Compositus** (Lugol's solution). Should contain not less than 5 percent iodin, 10 percent potassium iodid. Average dose, 3 minims. **Liquor Magnesii Citratis.** Made by dissolving 33 gm. citric acid in 120 c.c. of water and adding 15 gm. magnesium carbonate; dissolving; filtering into a bottle holding 360 c.c. (containing 120 c.c. syrup of citric acid), adding enough water to nearly fill the bottle, dropping in 2.5 gm. potassium bicarbonate; shaking until dissolved; corking, and securing the cork with twine. Average dose, 12 drams. **Liquor Plumbi Subacetatis.** (Sometimes called Goulard's extract.) An aqueous liquid, containing not less than 25 percent of lead subacetate. Used externally as a sedative in sprains, etc., when dilute, from 1/2 or 1 part to 16 parts distilled water. **Liquor Plumbi Subacetatis Dilutus** (lead water). Contains 4 percent of the stronger lead water. Astringent and sedative externally. **Liquor Potassii Arsenitis** (Fowler's solution). An aqueous solution which should contain potassium arsenite corresponding in amount to 1 percent of arsenic trioxid, formed by the combination of arsenous acid with potassium of the potassium bicarbonate (carbon dioxid being evolved). Compound spirit of lavender is added to give it taste, and prevent its being mistaken for water; 100 minims equal about 1 grain arsenic. Average dose, 3 minims. **Liquor Potassii Citratis** (Mistura Potassii Citratis). An aqueous liquid, containing in solution not less than 8 percent of anhydrous potassium citrate, together with small amounts of citric and carbonic acids. Made by dissolving separately potassium bicarbonate and citric acid, and afterward mixing the solution, under the names *neutral mixture, saline mixture,* or *effervescing draught;* long used as a refrigerant diaphoretic. Average dose, 4 drams. **Liquor Potassii Hydroxidi.** (Liquor Potassæ, U. S. P., 1880.) An aqueous solution containing about 5 percent of potassium hydroxid. Average dose, 15 minims. **Liquor Sodæ Chlorinatæ** (Labarraque's solution). An aqueous solution of several chlorin compounds of sodium, containing at least 2.4 percent by weight of available chlorin. Stimulant, antiseptic, and resolvent. Average dose, 15 minims. Also, use locally for fetor, etc. A powerful disinfectant. **Liquor Sodii Arsenatis.** Should contain sodium arsenate corresponding in amount to not less than 1 percent of exsiccated sodium arsenate. Average dose, 3 minims. **Liquor Sodii Hydroxidi.** (Liquor Sodæ, U. S. P, 1890.) An aqueous solution containing about 5 percent of sodium hydroxid. Average dose, 15 minims. **Liquor Sodii Phosphatis Compositus.** Sodium phosphate, 1000 gm.; sodium nitrate, 40 gm.; citric acid, 130 gm.; distilled water, to 1000 c.c. Average dose, 2 drams. **Liquor Zinci Chloridi.** An aqueous solution containing about 50 percent by weight of zinc chlorid. A substitute for Burnett's disinfecting fluid. Used locally to disinfect fetid discharges; also employed for preserving anatomical specimens.

LIQUOR AMNII.—See Amnii (Liquor).

LIQUORICE.—See Glycyrrhiza.

LITHEMIA.—Modified gout. A condition in which, owing to defective metabolism of the nitrogenous elements, the blood becomes charged with deleterious substances, principally, perhaps, of the uric acid group, although their exact chemic nature is not determined. See Uric Acid, Gout, Rheumatism.

LITHIA.—Li_2O. Oxid of lithium, an alkaline caustic. **L. Water,** mineral water containing lithium salts in solution. Among the best known in the United States are the Buffalo lithia water, water from Buffalo Lithia Springs, Mecklenburg County, Va.; Farmville lithia water, from Farmville, Va.; Londonderry lithia water, from Londonderry, N. H. The proportion of bicarbonate of lithium contained in the 3 waters mentioned is as follows: Londonderry, 8.620; Buffalo, 1.484 to 2.25; Farmville, 1.99.

LITHIUM.—Li = 7; quantivalence, 1. One of the rarer alkaline metals, a few of the salts only being used in medicine. Because of its low atomic weight, its high saturating power makes its salts more highly alkaline than those of sodium and potassium. The carbonate and citrate are used largely in rheumatism and gout. **L. Benzoas.** Dose, 5 to 20 grains. **L. Bromidum.** See Bromin. Dose, 5 to 20 grains. **L. Carbonas,** not deliquescent. Dose, 2 to 15 grains. **L. Citras,** deliquescent. Dose, 5 to 20 grains. **L. Citras Effervescens,** effervescent lithium citrate, prepared from citrate 5, with sodium bicarbonate 57, tartaric acid 30, citric acid 19 1/2. Dose, 1 to 3 drams in water, as an effervescent drink. **L. Salicylas.** See Salicylic Acid. Dose, 5 to 20 grains.

LITHOLAPAXY.—See Bladder (Stone).

LITHONTRIPTICS.—See Antilithics.

LITHOTOMY.—See Bladder (Stone).

LITMUS.—A blue pigment obtained from *Rocella tinctoria,* a lichen. It is employed in chemic determinations to detect the presence of acids and alkalies. **Blue litmus paper** is unsized paper steeped in a solution of litmus; it turns red on contact with acid solutions. **Red litmus paper** is unsized paper steeped in litmus tincture, colored red with acid; it turns blue on contact with alkaline solutions. See Acidity, Alkalinity, Urine (Examination).

LITTER.—The following qualities are essential for a litter or stretcher: 1. Firm and comfortable support for the patient, and capability of being readily cleansed. 2. Lightness. 3. Strength. 4. Simplicity of construction. 5. Capability of being folded up, if possible. 6. Such connection of component parts as to prevent risk of loss. 7. Provision for keeping patient a certain distance above ground when the litter is laid down. 8. Economy.

A two-handed seat or litter may be devised by 2 bearers facing each other, locking the fingers of the left hand of one with the fingers of the right hand of the other. The support is placed beneath the patient's thighs in front of the buttock for a seat, the disengaged hands resting upon and grasping each other's shoulders behind the patient, and thus forming a back support. The arms of the

patient may be passed around the neck of each bearer.

A three-handed seat may be made by 2 persons facing each other, the thick part of the forearm just below the elbow of one being grasped by his right hand and with the left hand the left forearm of the other being grasped. This left forearm now grasps the right forearm of the other bearer at about its middle. The right hand of the second bearer grasps the left shoulder of the other bearer to form a back support. The seat formed is a triangular one, and is formed by the 3 forearms.

A four-handed seat is made by 2 bearers grasping their own left forearms with their own right hands at or about their wrists. The left hand of each grasps the right forearm of the other.

Swords in their scabbards may be passed through the sleeves of a coat turned inside out and the coat skirts buttoned from below upward, for 2 or 3 buttons over the sleeves incasing the swords.

Improvised stretchers or litters may be made out of hurdles, shutters, or planks. In the 2 latter cases straps, ropes, or wooden traverses must be passed beneath, between 2 bearers at the head and 2 at the feet.

A rifle litter may be made with a blanket or rug, 2 rifles being laid on the ground at each side and the blanket folded over them.

LIVE BIRTH, TESTS.—See Viability.

LIVER, ABSCESS (Suppurative Hepatitis).—

Etiology.—Abscess of the liver is probably always of microbic origin. The infection may reach the liver by way of the hepatic artery, from ulcerative endocarditis, general septicemia, etc.; or the hepatic vein; or the common duct. Secondary to a suppurative cholangitis set up by biliary calculi or parasites, but generally it enters *viâ* the portal vein in the form of an infectious thrombus or embolus or the ameba coli. Thus septic emboli from suppurative appendicitis, gastric ulcer or dysentery may enter the liver. In most instances, however, abscess of the liver is due to the ameba coli and is preceded by amebic dysentery, though in some amebic abscesses there are no intestinal symptoms. Occasionally it results from infective traumatism. It may be secondary to an infected hydatid cyst. See Colon Bacillus Infection.

Pathology.—In two-thirds of the cases of abscess of the liver the middle portion of the right lobe is affected. The abscess varies in size and may be either single or multiple. Amebic abscess is usually single and large, while pyemic metastatic abscesses are small and multiple. Frequently both lobes are involved and the liver may be greatly increased in size. The pus may be reddish in color or creamy, and frequently it is sterile. The abscess may rupture into the bowel, abdominal cavity, or bronchi.

Symptoms and Clinical Course.—There are probably many cases of abscess of liver which are never diagnosed, owing to the latency of many of the symptoms in the early stages. The first subjective symptoms probably are: Pain in the right hypochondriac region, or region of the right scapula, of a deep-seated character; gradual decline of health with loss of flesh; intermittent, irregular high fever 105° F.; rapid and feeble pulse and frequent chills, followed by profuse perspiration. Hectic symptoms may be present. These are the classic symptoms of infection, yet they do not lead us to the correct diagnosis, and frequently the physical signs are distinctly misleading.

Physical Signs.—**Inspection** frequently detects bulging in the right hypochondrium, and slight jaundice.

Abscess of Liver.	Hepatic Intermittent Fever.	Cancer.	Malarial Fever.	Hydatid Cyst.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*
1. History of traumatism, dysentery.	1. History of hepatic colic and transient jaundice.	1. Often inherited tendency.	1. History of malarial exposure.	1. History negative.
2. Pain in region of right hypochondriac region or right scapula.	2. Same as abscess.....	2. Same as abscess....	2. Pain slight or absent.	2. Pain absent.
3. Intermittent, irregular, high fever, with sweat and chills not controlled by quinin.	3. Same as abscess.....	3. Same as abscess....	3. Temperature controlled by quinin.	3. Temperature normal.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*
1. Jaundice slight.....	1. Jaundice intense....	1. Jaundice.....	1. No jaundice.....	1. Jaundice usually absent.
2. Bulging in right hypochondrium.	2. Negative.....	2. Negative.....	2. Negative.....	2. Bulging in epigastric or hypogastric region.
3. Liver enlarged and smooth; occasionally edema and fluctuation in right hypochondrium.	3. Liver slightly decreased in size.	3. Liver enlarged and nodular.	3. Liver may be slightly enlarged and smooth. Spleen enlarged.	3. Liver dulness increased in area.
4. Percussion confirms palpation.	4. Same.....	4. Increased area of dulness.	4. Percussion confirms palpation.	4. Percussion often detects a vibratory sensation.
5. Aspiration detects pus.	5. Negative.....	5. Negative.....	5. Negative; palsmodium in blood confirms diagnosis.	5. Aspiration detects clear fluid containing glucose.

Palpation detects enlargement and a deep-seated pain. Frequently there is an edematous condition over the affected part, and fluctuation may be present if the abscess is superficial. If the lower portion of the right lobe is affected, the enlargement extends downward. In the early stages the area is hard, but later, as the disease advances, it softens and may give rise to fluctuation.

Percussion detects an increased area of dulness in the direction of the portion involved. Osler states that the enlargement is most frequently upward, and that at the nipple-line the curve of liver dulness begins to rise and in the midaxillary line it may reach the fifth rib, while behind, near the spine, the area of dulness may be so high as to be on a level with the angle of the scapula.

Diagnosis depends upon the subjective and objective symptoms.

Prognosis is unfavorable.

Treatment.—If the pain is severe, opium, 1 grain, is advisable every 4 hours. Locally, a hot-water bag, mustard plaster, or hot turpentine stupes may afford some relief. The bowels should be kept open by means of salines.

Stimulants, such as whiskey, 4 drams, are allowable every 4 hours, if necessary. Quinin, 4 grains, with dilute nitrohydrochloric acid, 6 minims, may be of benefit.

Medicines, as a rule, are only palliative, and surgical measures give a better chance for recovery.

Surgical Treatment.—(1) If the skin over the swelling is red and pits on pressure, there can be little doubt either as to the existence of an abscess or to the presence of adhesions. In such circumstances an aspirating needle may be used as a preliminary, to act as a guide, but as soon as it has entered the cavity and the diagnosis is confirmed, the opening should be enlarged, so that the pus can escape as freely as possible, and a full-sized drainage-tube inserted. The following day, when the adhesions are firmer, the abscess cavity may be explored with the finger to make sure there are no other sacs in the immediate neighborhood, and, if necessary, washed out with iodin or some other antiseptic. (2) When there is no certainty as to the presence of adhesions the choice lies between aspiration, drainage with a trocar and cannula, and incision (Tyson).

Aspiration is chiefly of use for exploration; it rarely happens that an abscess cavity is completely emptied, and nearly always the swelling appears again within a few days. In a few instances, however, a cure has followed after 2 or 3 repetitions. Puncture with a trocar and cannula is also open to grave objections. If adhesions are present already, it is more satisfactory to make a free incision and allow of thorough exploration and drainage; if they are not, the peritoneal cavity is opened without any safeguard to prevent the pus entering it. Further, the constant movement of the liver in the abdominal cavity frequently renders the retention of a tight-fitting cannula or of a stiff drainage-tube a matter of very considerable difficulty.

Incision directly into the abscess sac can only be practised when the skin over it is reddened and it is certain that the walls are adherent. If this is not definite, either the operation must be carried out in separate stages, or an incision made into the abdomen over the swelling, the surface of the liver exposed, and the abscess opened with the usual precautions to prevent its contents entering the peritoneal cavity. The preliminary steps are the same in both, but while in one the incision is only carried down to the parietal peritoneum, and is then plugged, so that adhesions may form beneath, in the other the abdominal cavity is opened at once and the surface of the liver examined. In a few cases omentum has been interposed, or it has been found that the abscesses are multiple and that there is no hope of thorough evacuation; but if no difficulty of this kind is apparent, the wound is carefully packed around with sponges, and an aspirating needle thrust into the swelling. As soon as the pus is found, the opening is enlarged freely with the knife, and the contents of the abscess allowed to escape completely; the assistant, meanwhile, carefully supporting the liver in either side, so that it shall not fall away from the surface of the abdomen. When the sac is emptied, the cavity may be explored with the finger and the walls stitched to the skin margins of the wound all around. An aspirating needle may be thrust through the two layers of the pleura and diaphragm for the sake of exploring the posterior surface of the liver without risk; but if a permanent drain is required, a free incision should be made down to the parietal pleura, a portion of one of the ribs being resected if necessary, the two layers of the pleura accurately sutured together with catgut (there is no difficulty in this in the lower intercostal spaces), and then the trocar and cannula thrust through, so as to avoid the risk of air or pus entering into the pleural space.

LIVER, ACUTE YELLOW ATROPHY.—A fatal form of disease of the liver, characterized anatomically by a rapid destruction of the liver cells, diminution in size of the organ, and associated with deep jaundice and grave nervous symptoms.

Synonyms.—Malignant jaundice, acute parenchymatous hepatitis, icterus gravis.

Etiology.—(1) Female sex; (2) pregnancy; (3) infectious fevers; (4) alcoholism; (5) mental excitement. An acute toxemia may be the main exciting cause.

Pathology.—The liver is greatly reduced in size, often not more than one-third the usual volume during health. This rapid destruction may take place within the course of a few days, or from 1 to 2 weeks. The organ is soft, yellowish in color in the early stages, but later may be reddish (red atrophy). The capsule may be wrinkled. Microscopically, fatty degeneration of the liver cells occurs, taking place first in the periphery and later extending toward the center of the lobule. There is also fatty degeneration of the epithelial cells of the biliary ducts. The destroyed liver cells and epithelial cells subsequently undergo liquefaction necrosis and are rapidly absorbed, causing shrinkage of the organ. If the disease persists, there is a hyperplasia of the connective tissue, and the color becomes mottled.

Symptoms and Clinical Course.—The initial symptoms occupy a period of 2 or 3 days, and are marked by headache, loss of appetite, nausea and vomiting, gastric distress, jaundice, and, later, delirium or convulsions. Hemorrhages from the mucous membranes may occur, and hematemesis is common. The liver is rapidly reduced in size, while the spleen is considerably enlarged. The urine is deeply bile-stained, of high specific gravity (1030), slightly albuminous, containing fatty casts, leucin, and tyrosin.

Diagnosis.—See LIVER (Cirrhosis).

Prognosis.—The disease is always fatal.

Treatment is supportive and palliative.

LIVER, AMYLOID.—An enlargement of the liver due to infiltration of the tissues by an amyloid substance.

Synonyms.—Lardaceous liver; waxy liver; albuminoid liver.

Etiology.—(1) Prolonged suppuration as in tubercular bone-disease; (2) syphilis; (3) leukemia; (4) rickets.

Pathology.—The liver is enlarged and smooth; the cut surface is semitranslucent (waxy), and resembles in appearance boiled bacon. The amyloid deposit is found mainly in the central portion of the lobules. The initial process seems to be in the capillary blood-vessels, which are often coated with a hyaline material.

The amyloid substance is not deposited to so great an extent in the liver cells, but they may undergo fatty degeneration from want of a free blood supply.

Symptoms and Clinical Course.—The liver is smooth in contour and greatly enlarged, and may reach the umbilicus. There is no pain or jaundice. Ascites is absent except in the last stages. The spleen shares in the process and is greatly enlarged. Often the kidney becomes affected by the albuminoid infiltration, giving rise to albumin in the urine.

Diagnosis rests upon the history of the case; great enlargement of the liver and spleen; absence of jaundice, ascites, hectic symptoms, and the presence of albumin in the urine. From leukemia it must be differentiated by a blood examination.

Prognosis is unfavorable.

Treatment must be directed to the underlying cause.

LIVER, CARCINOMA. Etiology.—(1) Male sex after the fortieth year; (2) usually secondary from neighboring organs.

Pathology.—The organ is enlarged in size, the liver tissue being brownish or yellowish in color. Instead of the surface being smooth, it is generally irregular or nodular.

Varieties.—(1) Nodular form; (2) radiating form; (3) massive form.

In the **nodular form** there are small whitish areas or elevations which project from the external surface.

The **radiating form** produces multiple nodules that are pigmented. It is usually secondary.

In the **massive form** the disease is diffused throughout the whole organ, causing great enlargement. The color is usually grayish-white. The nodules may be hard or soft, the larger ones often showing a degree of fatty degeneration, and may give rise to extravasation of blood into the parenchyma.

Both the large and small nodules project slightly above the serous surface, and in the former variety a degree of umbilication may be seen.

Symptoms and Clinical Course.—There are severe pain over the region of the liver, persistent vomiting, cachexia with rapid loss of flesh and strength, and great anemia (red cells moderately reduced, 4,000,000; hemoglobin may be only 50 percent; moderate leukocytosis). Jaundice is nearly always present. Ascites is usually absent. There is moderate fever—101° to 103° F.

Physical Signs.—**Palpation** detects tenderness, and frequently nodular growths on the free border of the liver.

Percussion confirms palpation, and shows an increased area of dulness in all directions. It also shows the presence of cancer in neighboring organs (stomach, pancreas, etc.).

Diagnosis.—See LIVER (Abscess).

Prognosis.—The duration is from 3 to 15 months.

Treatment is symptomatic and palliative.

LIVER, CIRRHOSIS. Synonyms.—Chronic interstitial hepatitis, hob-nail liver, gin liver, granular liver.

A disease characterized by hyperplasia of the connective tissue, with a destruction to a greater or less extent of the parenchymatous cells, the liver being firmer in consistency.

Etiology.—(1) Male sex; (2) middle life; (3) alcoholism; (4) chronic malarial poisoning; (5) congenital syphilis; (6) passive hyperemia resulting from heart or lung disease; (7) gall stones; (8) rich diet; (9) cause unknown. The causes may act through the portal vein, the hepatic arteries, hepatic vein, or the biliary ducts. It seems probable, as Weigert has shown, that the cells irritated undergo degeneration and die, their place being taken by connective tissue overgrowth, the subsequent contraction of which causes still more destruction of the secreting cells.

Varieties.—(1) Atrophic; (2) hypertrophic.

Atrophic Cirrhosis. Synonyms.—Portal cirrhosis; Lænnec's cirrhosis.

Pathology.—The liver is much smaller and harder than normal and its surface is usually roughened with small granulations or nodules, though sometimes it is smooth, owing to a uniform distribution of the connective tissue. The elevations, when present, are due to the contraction of bands of connective tisue which have taken the place of parenchyma, and which surround normal areas of secreting cells. The entire surface is yellowish or mottled if the cells are fatty. Associated with the cirrhosis is frequently found fatty infiltration. The increase in size of the liver due to the latter condition may predominate over the reduction resulting from the cirrhosis. As the disease advances retrograde changes involve also the branches of the portal vein, and even the biliary ducts, causing obstruction in the portal circulation and ascites.

Hypertrophic Cirrhosis. Synonym.—Hanot's cirrhosis.

Pathology.—In this form the hyperplastic connective tissue has not the tendency to contract that it exhibits in the atrophic. Therefore, the liver is enlarged but smooth. Its color is generally yellowish-green. It is believed that the connective tissue overgrowth takes place especially within the lobules. The branches of the portal vein are not encroached upon, but there is obstruction of the biliary channels resulting in jaundice.

Biliary Cirrhosis.—A distinct form according to French clinicians, is believed by some observers to be identical with the hypertrophic variety. It is secondary to obstruction in the gall ducts. The retention of bile in the ducts leading to destruction of the parenchymatous cells, their place is taken by a proliferation of the interstitial connective tissue. There is a deposit of pigment. The organ becomes larger and harder.

Symptoms of Atrophic Cirrhosis.—In the early stages of cirrhosis of the liver symptoms may be absent. The onset is gradual, the initial symptoms being due to obstructed portal circulation which produces chronic gastrointestinal catarrh, with its run of symptoms—coated tongue, anorexia, nausea, flatulence, constipation. Deficiency in the amount of bile secreted is evidenced by the pale stools. As the compression of vessels increases there is a compensatory dilatation of the collateral vessels, as manifested by hemorrhoids, the overdistended superficial abdominal veins, which may be especially pronounced around the umbilicus, forming the **caput medusæ**. Similarly, there result gastric, intestinal, or esophageal hemorrhages; enlargement of spleen, ascites, and even edema of the lungs. Slight jaundice from obstruction of the bile ducts is present in about one-fourth of the cases, but its absence may be due to the paucity of the biliary secretions. There is progressive loss of flesh and strength. Uterine or nasal hemorrhages, or even hematuria may appear. Nervous signs, such as stupor, delirium, coma, sometimes supervene late in the disease.

Physical examination reveals a smaller area of hepatic dulness with increased splenic dulness. The urine is usually scanty, highly colored, of high specific gravity, with abundance of urates, reduction in amount of urea and only infrequently contains biliary pigment.

Symptoms of Hypertrophic Cirrhosis.—Jaundice is generally present, because of some obstruction in the biliary vessels. The liver is not only enlarged and smooth, but tender. There is usually little or no enlargement of the spleen, nor gastrointestinal congestion, nor ascites, nor hemorrhoids. The stools are sometimes pale, at others normal in color. The urine, although scanty and highly colored, frequently contains biliary pigment, while the quantity of urine is normal. There is a marked reduction in the number of red blood cells and increase in the number of leukocytes.

Complications.—Concomitant increase in the connective tissue of heart, lungs, blood-vessels, autointoxication from suppression of biliary secretion.

Diagnosis.—(1) **Of Atrophic Cirrhosis.**

In the early stages diagnosis is uncertain; but it is clear when reduction in size of the organ is found, associated with ascites. The emaciation and effusion of tuberculous peritonitis may be confusing, but, in the latter disease, the effusion is not so abundant and is of higher specific gravity, and there is abdominal tenderness and fever, and no reduction in the size of the liver. If doubt exists, the tuberculin test should be resorted to.

(2) **Of Hypertrophic Cirrhosis.**

Hypertrophic cirrhosis must be differentiated from chronic biliary obstruction, cancer of liver, amyloid liver, multilocular echinococcus cyst. In the secondary cirrhosis of chronic biliary obstruction the liver is not so enlarged, the course is more rapid and is attended with attacks of hepatic colic. In carcinoma the patient is older, with no alcoholic habit, or enlargement of the spleen, the liver is not so smooth, ascites is more general. In amyloid liver there is the characteristic etiology and no pain or jaundice. In hydatid disease the nodules on the surface become soft.

Prognosis.—The duration of hypertrophic cirrhosis is from 1 to 2 years. Atrophic cirrhosis has a longer coma. Fatal terminal symptoms, such as rapid pulse, fever, delirium, may appear rather suddenly. The disease, however, is not always fatal; if the process be not too far advanced and the cause, such as alcohol, removed, the patient may indeed recover tolerably good health. Usually, however, death ensues from exhaustion and toxemia.

Treatment.—The chief objects to be attained are the removal of the cause, the relief of the symptoms and restitution of the normal conditions in the liver. Alcohol must be interdicted. The gastrointestinal catarrh should receive careful attention. The diet should be nutritious, yet simple so as not to tax the more or less impaired digestion. Fats should be restricted and too much starchy food should not be allowed for fear of setting up additional fermentation. The free drinking of alkaline mineral waters, especially when hot, or of simple hot waters, before meals, particularly before breakfast, is valuable to remove the excessive mucus. The extensive fermentation may be alleviated by internal antiseptics, such as sodium phenolsulphonate or phenyl salicylate.

Depletion by salines or minerals is indicated. For instance 5 to 10 grains of blue mass at night followed in the morning by sodium phosphate or Hunyadi water one-half hour before breakfast, will relieve the congestion. Calomel in doses of 1/10 grain, frequently repeated, is excellent. Laxative mineral waters, such as Saratoga water, have a similar effect. Occasionally it is well to alternate with the salines cascara sagrada, or compound jalap powder. A diminution of the ascites effected by this treatment is further aided by diuretics. The potassium salt to be preferred is the acetate in doses of 20 grains t. i. d. citrated caffein may be given in doses of 2 to 5 grains. Theobromin has proved valuable in the hands of some observers.

Abdominal paracentesis, or tapping, must be employed when the effusion is sufficiently large to cause discomfort or additional symptoms of pressure. Frequently repeated treatment may be necessary, as the fluid may speedily reaccumulate.

Surgical Treatment of the Ascites.—Talma's operation—omentopexy—suture of the parietal peritoneum of the abdomen and omentum to the liver, to relieve the liver conditions by the establishment of a collateral circulation between the portal and systemic vessels has been found effective if not resorted to too late.

Attempts to check the progress of the degenerative changes and to effect repairs have been for the most part futile. Iodin in some form should be tried, especially if a specific origin is suspected. Potassium iodid is given for a long time in doses of 3 to 10 grains, well diluted, and on an empty stomach. Some observers prefer the syrup of hydriodic acid, 1 dram, well diluted, one-half hour before food. Other drugs, such as ammonium chlorid and nitrohydrochloric acid, have been used. Organotherapy is advocated by certain French clinicians.

LIVER, CONGESTION. Varieties.—(1) Active; (2) passive.

Etiology. Active Hyperemia.—(1) Overindulgence in food or drink; (2) warm climate; (3) infectious fevers. "Biliousness" is probably a form of active hyperemia.

Passive hyperemia usually results from valvular disease of the heart, disease of the lungs or pleura, or pressure on the vena cava.

Pathology.—The liver is enlarged in size from congestion of the blood-vessels. The organ is bluish-red or brownish-red in color. In certain areas the intralobular vein is filled with dark blood, while the adjacent capillaries are empty and opaque, giving rise to a mottled appearance—"nutmeg liver."

If of long standing, an overgrowth of the connective tissue occurs with a considerable amount of pigmentation and atrophy of the hepatic cells, giving rise to a condition called "cyanotic induration."

Symptoms and Clinical Course. Active Hyperemia.—There is anorexia, dull headache, mental hebetude, coated tongue, bitter, disagreeable taste in the mouth, feeling of nausea, often vomiting of material containing the biliary salts, fever, constipation or diarrhea in which the feces have a distinctly greenish color and cause great tenesmus. The urine is high-colored and scanty. Hemorrhoids are frequently produced.

Passive Hyperemia.—There is great enlargement of the organ, due to stagnation of the blood; and if the right heart is affected, there is often distinct pulsation in the liver.

Prognosis.—In active hyperemia the prognosis is good. In passive congestion, as there is disease in other organs, the prognosis is less favorable.

Treatment of Active Hyperemia.—Rest in bed and a liquid diet are demanded. Of many remedies recommended, calomel holds the first place. It is best given in small doses, 1/4 of a grain, every hour until 6 or 7 doses have been taken, and followed by a saline purge if the bowels do not move within 10 or 12 hours. If there is much pain in the right hypochondriac region, a series of small blisters, 1 by 2 inches, may be produced by means of cantharidal plaster, or the red iodid of mercury, 40 grains, with petrolatum, 1 ounce. In the more chronic forms the fats and foods containing sugar must be restricted. Frequent bathing and plenty of out-door exercise are invaluable.

Constipation may often be relieved by proper regimen, and the use of the fluidextract of cascara, 1/2 of a dram, at bedtime. Nitrohydrochloric acid, 6 minims, combined with pepsin, 5 grains, may afford relief.

The elixir of the phosphates of iron, quinin, and strychnin, 1 dram, is frequently beneficial.

Treatment of passive hyperemia must be directed mainly to the underlying cause. Depletion may be produced by rest in bed, a light diet, and a saline purge every day or two. A series of blisters may also afford some relief. See HEART-DISEASE, NEPHRITIS.

LIVER, EXAMINATION. Boundaries.—The liver is the largest gland in the body, weighing from 3 to 4 pounds. Its upper portion is convex and directed upward and forward; it is smooth and covered with peritoneum. The *upper* surface is in immediate relation with the under surface of the diaphragm. Its *under* surface is concave, directed downward and backward, and in relation with the stomach, duodenum, hepatic flexure of the colon, right kidney, and suprarenal capsule. The upper surface of the liver is divided into 2 unequal lobes—the right and the left.

The right lobe of the liver occupies the right hypochondrium, the upper border anteriorly extending from the base of the ensiform cartilage on the median line, in the fifth intercostal space on the right nipple-line, in the seventh intercostal space in the axillary line, and posteriorly below the base of the right lung, about the level of the tenth rib or dorsal spine. The lower border of the right lobe normally should not extend below the free margin of the ribs.

The left lobe of the liver occupies the epigastric region, extending 2 inches to the left of the median line, the lower margin usually being found immediately overlying the stomach and about 3 inches below the ensiform cartilage. The left lobe is in close relation with the heart, being separated from that organ through the medium of the diaphragm.

Inspection.—By this method of diagnosis we detect general jaundice and enlargement in the right hypochondrium. Bulging may be present in hydatid cyst and distended gall-bladder. Jaundice is present in catarrhal jaundice, biliary calculi, cancer, hypertrophic cirrhosis, acute yellow atrophy, and occasionally in acute hepatitis.

Palpation.—The patient should be in a dorsal position, with the shoulders elevated and the knees drawn up.

The liver is enlarged and smooth in amyloid disease, fatty liver, congestion of the liver, hypertrophic cirrhosis, and multiple abscesses. It is

enlarged but uneven in hydatid tumor, single abscess, and cancer.

Palpation detects pain which is present in acute congestion, catarrhal jaundice, biliary calculi, abscess, and cancer. Edema may be present in the right hypochondrium in hepatic abscess. Fluctuation may be detected in hydatid cyst and distended gall-bladder, and occasionally in abscess of liver.

The liver is diminished in size in atrophic cirrhosis and acute yellow atrophy.

Percussion.—The patient should be placed in a dorsal position. By percussion the size of the liver is obtained. The upper boundary of the organ is determined by first gently tapping over the right nipple to detect the lung resonance, then gradually going downward until the upper edge of the liver is found. In the axilla the same method is pursued. The upper boundary of the right lobe in the nipple-line will be found in the fifth intercostal space, in the axillary line in the seventh interspace, and posteriorly on a line with the tenth rib or tenth dorsal spine. The lower border of the liver extends to, but not beyond, the free margin of the ribs anteriorly. The left lobe of the liver may often be outlined by gentle percussion. The upper border is inseparable from the dulness of the heart. The lower border lies about 2 inches to the left of the median line, and extends downward midway between the ensiform cartilage and the umbilicus.

Examination in Children.—Douchez says: The exact determination of the borders of the liver in children is difficult, because of the involuntary contraction of the muscles, also on account of the resonance found over the thin lower edge and of the oblique position of the upper border.

The measure of dulness of the anterior face of the liver, in the living, is almost always less by 1 or 2 centimeters than the real measure on the cadaver, either before or after opening the abdomen; we should, therefore, estimate this dulness from its extreme limits, in order to reach as nearly as possible the truth.

The upper border of the liver corresponds in general to the interval between the fifth and sixth ribs.

In the healthy state, the vertical measurements increase almost regularly with each year's growth, excepting in certain individuals.

The liver was found somewhat large in cases of catarrhal jaundice and gastric disturbance; large in cardiac disease; very large with amyloid liver, syphilitic liver, fatty liver, and hydatid cysts.

The slightest disturbance of health may cause a variation of 2 to 4 centimeters, and a variation of 3 to 10 centimeters was found with certain grave lesions.

LIVER, HYDATID CYST. Etiology and Pathology.—Hydatid cysts are formed by the larvæ of the tænia echinococcus of the dog. This tape-worm is exceedingly small, provided with 4 sucking discs and a double row of hooklets (Osler). The eggs usually gain entrance through the mouth, and after the shell has become detached, the embryo is set free, and, becoming attached to the intestinal wall, may burrow its way to the external surface. It probably gains entrance to the liver through the medium of the portal vein. After a certain time the embryo develops into a cyst with two layers—the internal (breeding) or granular layer, and the external (dense) or laminated layer. Daughter cysts spring from the inner or granular layer; hence the process is a continuous one. The daughter cysts may be set free; hence there may be hundreds within the primary cyst. The investing membrane of the smaller growths is soft, thin, and gelatinous, containing a clear, nonalbuminous fluid of specific gravity 1005–1007, rich in chlorids and containing glucose.

Symptoms and Clinical Course.—In the early stages no symptoms are produced. Later, as the cysts multiply and the fluid accumulates, there is an irregular enlargement of the liver, producing a dragging sensation in the right hypochondrium, dyspnea, and palpitation of the heart. Fever and pain are only present if there is suppuration of the cyst.

Jaundice is generally absent, but may result if pressure is great enough to cause occlusion of the biliary ducts. Percussion over the area yields a vibratory or trembling movement. By aspiration the clear-colored fluid is obtained.

Complications.—Suppuration, metastasis to various organs, as lung, pleura, brain, spinal canal, and genitals.

Diagnosis.—See LIVER (Abscess).

Prognosis is unfavorable as to medicinal treatment. Surgical interference yields favorable results.

Treatment is purely surgica . See LIVER (Abscess).

LIVER, INJURIES.—See ABDOMEN (Wounds and Injuries), GUNSHOT WOUNDS.

LIVER, PERIHEPATITIS.—Inflammation of the peritoneal covering of the liver.

Etiology.—(1) Extension, by continuity, of hepatic inflammation; (2) extension of pleurisy, by contiguity; (3) secondary to ulcer of stomach, etc ; (4) as part of a general peritonitis.

Pathology.—In the acute type there is fibrinous or purulent exudation with formation of adhesions. Thus, between the liver and diaphragm a pocket filled with pus may be formed, *i. e.*, a subphrenic abscess.

In the chronic form the capsule of the liver is thickened, especially at the hilum, with stenosis of the blood-vessels and bile ducts, and shrinkage of the liver, while adhesions to neighboring organs may occur.

Symptoms.—None are characteristic; often it is unsuspected in life. Sometimes the symptoms resemble atrophic cirrhosis. Physical examination may disclose a friction-rub over the liver or epigastrium. If there is purulent exudation, symptoms, and signs of sepsis manifest themselves.

Diagnosis.—It is to be distinguished from an empyema by the early symptoms, which are abdominal rather than thoracic and accompanied by further downward displacement of the liver. Aspiration may be resorted to, and it is said that the spurting of the released fluid is synchronous in subphrenic abscess with inspiration, in empy-

ema with expiration. The nonpurulent form is rarely recognized until death.

Prognosis is grave in the suppurative form.

Treatment.—Before pus formation, bed, light diet, counterirritation by cupping or leeching, hot compresses, sinapisms are indicated. Surgery is necessary as soon as pus is manifest.

LIVER, SARCOMA.—Sarcoma of the liver is rare. In 1908, Knott was able to collect from the literature only fifty-nine cases in which it occurred as a primary lesion. It may occur at any time of life from infancy to old age. The tumor grows rapidly and constitutional symptoms soon develop. It is practically impossible to differentiate sarcoma from carcinoma when the disease affects a person in middle or advanced life. Unless the neoplasm is distinctly circumscribed no attempt should be made to remove it.

LIVER, SYPHILIS.—Syphilis of the liver is usually a tertiary lesion, although it may occur early in the secondary stage, as an acute diffuse low grade inflammation, causing considerable enlargement of the gland, and sometimes giving rise to jaundice. The prognosis of this form is usually good, active mercurial treatment bringing about complete resolution.

Tertiary syphilis may affect the liver either as an interstitial inflammation or in the form of single or multiple gummata. Interstitial hepatitis is similar to atrophic cirrhosis in many respects. The cellular infiltrate is changed into connective tissue which compresses the ducts and blood-vessels, with resulting atrophy of the hepatic cells.

Gummata are usually multiple and vary greatly in size.

For both tertiary forms of the disease large doses of potassium iodid together with mercurial inunctions or injections should be given. Gummata not relieved by such treatment have been excised or fixed to the abdominal wall, the interior scooped out and a strip of gauze inserted (Spencer and Gask).

LOBELIA.—The leaves and tops of *L. inflata*, an expectorant, diaphoretic, purgative, antispasmodic, and emetic; in larger doses a motor depressant and narcotic. It contains gum, resin, fixed oil, wax, lignin, salts of calcium, potassium, and iron, a liquid alkaloid, *lobelin*, also *lobelic acid*, and *lobelacrin*. Dose, 2 to 15 grains.

Lobelia has an acrid, nauseous taste, and heavy, unpleasant odor. It strongly resembles tobacco in its action. It is useful in paroxysmal spasmodic asthma, as well as in dry cough with constant tickling in the throat. As an enema in strangulated hernia, the infusion is safer than tobacco, and as efficient. In constipation from atony and deficient secretion, 10 minims of the tincture at bedtime will be found to act well.

Preparations.—**Fluidextractum L.** Dose, 1 to 15 minims. **Tinctura L.**, 10 percent. Dose, as expectorant 5 to 20 minims; as emetic 1/2 to 2 drams. **Infusum L.**, ℥j to a pint. Dose, 1 to 8 drams.

LOCHIA.—The bloody, serous discharge from the uterus after labor. For the first 4 or 5 days it is bright red in color (*lochia rubra*), and composed chiefly of blood. During the next few days it becomes lighter in color (*lochia serosa*), and is composed of some blood, pus, mucus, and serous discharge. Finally it becomes white or yellowish (*lochia alba*), and resembles an ordinary vaginal leukorrhea. The flow ceases entirely at the end of 3 to 6 weeks.

The amount of the flow varies considerably in different individuals and at different times. Ordinarily, 4 to 6 napkins are saturated in the 24 hours for the first 3 or 4 days; after that the number varies from 1 to 3 until the ninth or tenth day, when the discharge becomes so slight as not to require a protective.

The odor of the normal lochia is bloody or musty; should it become offensive, decomposition and, probably, sepsis have occurred.

LOCKJAW.—See TETANUS.

LOCOMOTOR ATAXIA (Tabes Dorsalis; Posterior Spinal Sclerosis).—Posterior spinal sclerosis is perhaps the preferable designation for the affection under consideration, because the most constant and the most conspicuous lesion is essentially that which this name describes. Although the disorder is the most common and the most important of the diseases of the spinal cord, it has been well recognized and differentiated only during the past sixty years.

Pathologic Anatomy.—The essential lesion is a more or less extensive degenerative process, of varying intensity, involving the paths for conducting sensory impressions, which is most pronounced and most conspicuous in the posterior nerve-roots and the posterior columns of the spinal cord. Macroscopically, the degenerated portions of the cord appear grayish or slightly pinkish and translucent, and somewhat depressed below the common level. The overlying pia mater may be turbid and slightly thickened. The differentiation between diseased and healthy structure is brought out more vividly by staining.

On microscopic examination the disease is found to begin on either side in the posterior nerve-roots, and to extend into the posteroexternal columns of Burdach, while at higher levels the posterointernal columns of Goll are also involved. A small area in the posterior columns, adjacent to the posterior commissure, invariably escapes, while an oval area, adjacent to the posterior median fissure, and a comma-shaped zone included between the columns of Burdach and those of Goll, remain long intact.

Histologic study shows the axis-cylinders to have disappeared from the degenerated areas partially or wholly, while the glia remains or has even undergone hyperplasia. The walls of the blood-vessels in the affected portions are thickened. The disease of the spinal cord is not confined to the white matter. In addition to the posterior roots the posterior vesicular columns of Clarke, the marginal zone of Lissauer, and the medullary bridge of Weigert also suffer sometimes. Further, the degenerative process may involve the ganglia of the posterior spinal nerves, whose medullated fibers and ganglion cells may be in part destroyed. Peripheral sensory nerves also have, in a number of instances, been found diseased. Sometimes, too, the cerebral nerves and the nuclei

situated in the medulla oblongata participate in the degenerative process. The morbid process usually begins, and is most common and most pronounced, in the dorsolumbar region of the cord, but a cervical and a cerebral type of the disease are also sometimes described.

Etiology.—Posterior spinal sclerosis is a disease of middle life, one-half of the cases occurring between 30 and 40 years, and almost all between 20 and 50 years. It is exceedingly uncommon in early life, and it rarely begins in late life. It is more common in men than in women, in the proportion of about 10 to 1; and in the larger cities than in the smaller towns. It is rare in negroes, if it occurs at all in the full black. Heredity, direct and indirect, exerts but little, if any, etiologic influence. The most potent, though scarcely the sole, cause is syphilis, albeit it must be borne in mind that even then the lesions themselves are not syphilitic. Among additional, though far less important, etiologic factors, are other infectious and toxic processes, exposure to wet and cold, traumatism, and excesses of various kinds. A long interval—from 5 to 20 years—often elapses between the incidence of the causative condition and the appearance of the first symptoms of the spinal disease, though cases have been reported in which the separation has been as short as 1 year and as long as 20 years respectively. Hereditary syphilis has been the antecedent condition in a small number of cases. The disease, further, is occasionally observed in the sequence of other affections of the spinal cord: *e. g.*, myelitis, gumma.

Duration and Course.—Posterior spinal sclerosis is essentially a chronic and progressive disease. It is often insidious in onset, and it may advance slowly. Not rarely there are remissions, sometimes with long stationary periods. Occasionally, the disease pursues a relatively acute course. Once established, however, recovery is out of the question. The duration is, as a rule, protracted, and may cover many years. The disease is not fatal of itself, death resulting from complications or intercurrent disease. Its course may be divided into three periods: (1) neuralgic; (2) ataxic; (3) paraplegic.

The prognosis is relatively favorable as to life, but distinctly unfavorable with regard to recovery, although arrest of the disease may take place at any stage.

Symptomatology.—The symptoms of posterior spinal sclerosis concern especially and almost exclusively the sensory functions of the nervous system, and they may represent any degree of disturbance, from mere diminution to absolute loss. Among the earliest are shooting pains in the thighs, the so-called **lightning** or **lancinating pains.** These usually occur in paroxysms of varying duration (from hours to days), at longer or shorter intervals (from days to months). The pains may be boring, tearing, cutting, or burning, and they are sometimes present in the upper extremities, and rarely in other portions of the body. Possibly allied to these, although commonly they occur at a later period of the disease, are the painful paroxysmal seizures known as crises; laryngeal, pharyngeal, cardiac, gastric, intestinal, rectal, anal, hepatic, renal, vesical, vaginal, etc.

Laryngeal crises are characterized by a sense of constriction of the throat, with great distress and choking; pharyngeal crises by dysphagia and regurgitation of food; cardiac crises by intense precordial pain and other symptoms of angina pectoris; intestinal crises by tormina and tenesmus and burning pain; gastric crises by intense epigastric pain, with vomiting, flatulence, eructation, hiccup, and consequent wasting; hepatic crises by symptoms of biliary colic; and renal and vesical crises by those of calculus or colic.

Sensibility is often deranged in other directions. Most commonly its acuity is diminished—hypesthesia; sometimes it is lost—anesthesia; occasionally it is heightened—hyperesthesia. Often sensory conductivity is retarded or delayed. Abnormal sensations are frequently present—paresthesias—as of numbness or tingling, formication, of crawling or creeping, of cold or of burning, of running water, etc. A not uncommon symptom is a feeling of constriction or a sensation as of a band, rope, or cord about the waist, the so-called girdle-sensation. Some patients cannot distinguish the density of the surface on which they walk. In addition to alterations of common sensibility, changes in other varieties of sensory perception may be present, as of the sense of weight or of pressure, of position, of pain, of temperature, of localization.

Another early symptom is want of muscular coordination—**ataxia.** This is most common and usually most pronounced in the lower extremities, and is responsible for the unsteadiness in walking and standing. When it affects the upper extremities, it renders difficult, if at all possible, the performance of fine, delicate movements with the hands. In standing the patient holds his feet far apart, or keeps his eyes fixed upon the ground. If the feet are brought in juxtaposition, or if the guidance of the eyes is removed, or both, the patient will sway, and he might fall if not supported. The gait is staggering, not unlike that of a drunken man, and walking in the dark or backward is difficult or impossible; the feet are raised high from the ground, thrown somewhat outward, and permitted to fall awkwardly. Fatigue is induced with undue readiness. Sometimes associated movements take place, a voluntary muscular act in one part of the body being accompanied by a like involuntary act in the corresponding members of the opposite side, or even by a movement in some unrelated and perhaps remote part.

While muscular coordination suffers in varying degree, muscular power and muscular nutrition, and the response of the muscles to electric stimulation, remain practically unaltered, except when, late in the disease, they are affected in consequence of disuse.

With the ataxia there is usually associated inequality or enfeeblement or **absence of the knee-jerks,** while the cutaneous reflexes are altered in accordance with the changes in cutaneous sensibility. When the cervical portion of the cord is affected, the deep reflexes inthe upper extremities

suffer, while the knee-jerks may be preserved. **The reaction of the pupils** to light stimulation is generally impaired early—reflex iridoplegia—although their contractility in accommodation and in convergence is, as a rule, preserved throughout (Argyll Robertson phenomenon). Reflex dilatability from stimulation of the skin of the neck may also be diminished or lost. The pupils are usually small, and may be unequal, though sometimes they are large.

Paralysis of one or more ocular muscles is a common symptom, from which not rarely recovery takes place; and at times there is more or less **ophthalmoplegia,** internal as well as external. In this way there will result strabismus, diplopia, ptosis, paralysis of accommodation, etc.

Optic atrophy, of varying degree and unilateral or bilateral, occurs in many cases and is responsible for the blindness present. Impairment or loss of hearing or of smell or of taste is occasionally observed. Symptoms of involvement of the medullary nerves or their nuclei are not rarely noted. Retention of urine may result from insensibility of the mucous membrane of the bladder, and incontinence from the same cause, or from overflow, or in consequence of weakness of the sphincter vesicæ. Cystitis may develop and lead in turn to ureteritis and pyelitis. The sphincter ani is generally competent, and constipation is the rule. Sexual desire and sexual potence are often diminished and sometimes entirely lost, perhaps in the train of satyriasis. Some cases are marked by drowsiness and lassitude.

Various vasomotor, secretory, and trophic disturbances have been observed in individual cases: *e. g.*, hyperemia, hyperhidrosis or anidrosis, epiphora, sialorrhea, polyuria, glycosuria, diarrhea, ecchymoses, purpura, urticaria, herpes, ichthyosis, loss of nails, painless loss of teeth, bed-sores, perforating ulcer of the foot, gangrene of the toes, spontaneous laceration of the fibers of tendons, and spontaneous fracture of bones. Sometimes morbid alterations take place in one or more joints—arthropathies—the synovial sac filling with fluid and the articular cartilage and adjacent bone undergoing atrophic or hyperplastic changes. The foot may become thickened and deformed from alterations in joints, tendons, and muscles. Atheroma or arteriosclerosis not rarely attends posterior spinal sclerosis, and it may engender obstruction at the aortic orifice and incompetency of the aortic valves, with systolic and diastolic murmurs at the base of the heart on the right side. Rarely there are symptoms of degeneration of cerebral or spinal motor nerves, resulting in facial or lingual hemiatrophy, paralysis of the diaphragm, and weakness and wasting of other muscles. In some cases, also, symptoms of progressive paralysis of the insane are superadded. Finally, apoplectiform and epileptiform seizures and hemiplegia have been observed.

Diagnosis.—The recognition of posterior spinal sclerosis is to be based on the lightning pains, the unsteadiness of gait and station, the want of coordination in the upper extremities, the diminution or loss of knee-jerks, the narrowing of the pupils and their immobility on exposure to light, the ocular palsies, the optic atrophy, the sensory disturbances, the loss of sexual desire and sexual vigor without psychic manifestations, muscular weakness and wasting, and changes in electric reactions.

The spinal disease is to be differentiated from **multiple neuritis** by its insidious rather than acute onset, by the presence of visceral symptoms (incontinence of urine, impotence, crises), of lightning pains, of girdle-sensation, of optic atrophy rather than neuritis, often by the absence of nerve tenderness, and of muscular weakness and wasting.

Posterior spinal sclerosis may bear a close resemblance to **syphilis of the spinal cord,** but with the latter the clinical picture is likely to be atypical, while the knee-jerks may be present and even exaggerated, headache and papillitis are more commonly present, and other symptoms of syphilis may be more or less obvious.

Cerebellar tumor may present many of the symptoms of posterior spinal sclerosis, but lightning pains are likely to be absent, the knee-jerks are variable (sometimes absent, sometimes present), vesical symptoms are wanting, severe and persistent headache is a usual symptom, and papillitis, rather than optic atrophy, occurs.

Treatment.—While the lesions of posterior spinal sclerosis are little amenable to treatment, much can sometimes be done by judicious management to mitigate the severity of the symptoms, and possibly to prevent the advance of the disease. Of primary importance is the maintenance of the general health, the avoidance of intercurrent disorders, and the prevention of complications. If there is a history of syphilis or evidence of that disease, with the possibility of inadequate specific treatment, mercury (by inunction, by hypodermic injection, by internal administration) or iodids (sodium, potassium, strontium, lithium, hydriodic acid) or both may be administered within the limits of tolerance. Either or both of these remedies may also be tried carefully in the absence of syphilis. Intraspinal therapy in tabes is the most popular method at the present time of employing salvarsan or neosalvarsan. These drugs should not be injected directly because of dangerous toxicity. To overcome this Swift and Ellis devised a technic in which these drugs are injected intravenously, blood serum subsequently withdrawn and injected into the spinal canal. The technic is described by Kolmer as follows: "From 0.6 to 0.9 gm. of salvarsan or neosalvarsan is injected intravenously. One hour later 40 c.c. of blood are withdrawn directly into centrifuge tubes and allowed to coagulate, after which it may be centrifugalized. The following day 12 c.c. of serum are pipeted off and diluted with 18 c.c. of sterile normal salt solution. This 40 percent serum is then heated at 56° C. for 1/2 hour. After lumbar puncture the cerebrospinal fluid is withdrawn until the pressure is reduced to 30 mm. cerebrospinal fluid pressure. The barrel of a Luer syringe (which has a capacity of about 30 mils) is attached to the needle by means of a rubber tube about 40 cm. long. The tubing is allowed to fill with cerebrospinal fluid, so that no air will be injected. The serum is then poured into the syringe,

and permitted to flow slowly by means of gravity into the subarachnoid space. At times it is necessary to insert the plunger of the syringe to inject the last 5 mils of fluid. It is important that the larger part of the serum should be injected by gravity, and if the rubber tubing is not more than 40 cm. long, the pressure cannot be higher than 400 mm. Usually the serum flows in easily even under a low pressure. By the gravity method the danger of suddenly increasing the intraspinous pressure to the danger-point, such as might occur with rapid injection with a syringe, is avoided." Ogilive's modification of the Swift-Ellis method is as follows: Fresh blood serum is taken from the patient on the day of the injection, from 0.25 to 0.75 mg. of salvarsan, arsenobenzol or diarsenol is added, and it is placed in a water-bath at 37° C. (98.6° F.) for 45 minutes and then 56° C. (132.8° F.) for 30 minutes. The usual quantity of blood serum so treated is 10 c.c.; it is injected into the spinal canal by replacing an equal quantity of cerebrospinal fluid. All patients are required to go to the hospital for from 12 to 24 hours and remain quietly in bed. The lumbar puncture is done in the usual manner by inserting the needle in the median line between the spinous processes of the third and fourth lumbar vertebræ. The discomfort is generally no greater than that experienced in taking blood from a vein; hence no local anesthetic is needed. Rest in bed is essential, but restriction of diet is not necessary. At least 50 percent of the patients do not experience any discomfort, and are able to resume their work the following day. Head pains, such as follow lumbar puncture, in which fluid is not replaced, do not occur. The use of intraspinal injections of autoserum (salvarsanized) has affected an improvement in a large number of cases and many observers claim for it a distinct value. The estimate of its ultimate effect can be determined only by much longer observation than has been possible since the inauguration of the treatment. *Coordinated movements*, to re-educate the coordinating power of ataxic subjects by definite exercises, produce great improvement in locomotion. Among other drugs that have been used are salts of iron, of zinc, of arsenic, of silver, and of gold, strychnin, belladonna, ergot, quinin, and phosphorus. Lancinating pains and crises may require the administration of antipyrin, acetanilid, phenacetin, sodium salicylate, codein, or even of morphin. Suspension of the body from the head, in order to exert traction upon the spine, has been practised at different times for many years, and in some cases with encouraging results. Overextension of the spine by raising the feet of the recumbent patient over his head, with flexion of the trunk, has also been employed with the same object. Rather a more promising mode of procedure than any of those yet mentioned consists in courses of gymnastics calculated to improve and restore the failing coordination. The patient is systematically instructed and trained in the most varied movements, from the simplest to the most complex, in this way retaining the faculties of all the nerve-fibers whose functions have not been lost by destruction of their axis-cylinders. All forms of exercise should, however, be kept within the limits of fatigue. Massage and baths are capable of maintaining the general nutrition, to which, further, a proper diet and a suitable mode of life should be directed. Cystitis is to be avoided, so far as possible, and extension of inflammation to the pelvis of the kidney prevented; and the formation of bed-sores is to be guarded against. Arthropathies may require surgical or orthopedic treatment.

LOGWOOD.—See Hematoxylon.

LORDOSIS.—See Spine (Curvature).

LOTION.—A solution or mixture of medicinal agents intended for external application. It usually consists of some soluble astringent salt dissolved in water, with perhaps some glycerin or alcohol. A *fomentation* is a similar preparation used hot. A *collyrium* is an eye-wash, and generally contains a soluble astringent salt, dissolved in rose-water or distilled water, in the proportion of 1 to 4 grains to the ounce. The only official preparation suitable for a lotion is **lead-water.**

Black lotion or wash is prepared by adding calomel, 30 grains, to lime-water, 10 ounces, producing the black oxid. It is used as an application to syphilitic sores. **Goulard's lotion** contains liquor plumbi subacetatis. See Liquor. **Yellow lotion** or wash is prepared by adding mercuric chlorid, 18 grains, to lime-water, 10 ounces, producing the yellow oxid. It is a favorite application for syphilitic sores.

LOZENGES.—See Troches.

LUCID INTERVALS.—These may occur in the course of a mental disease, and are defined by Bucknill and Tuke as not consisting in a mere cessation of the violent symptoms of the disorder; but as intervals in which the mind, having thrown off disease, has recovered its general habit. The party must be capable of forming a sound judgment of what he is doing, and his state of mind such that any indifferent person would think him capable to manage his own affairs.

LUDWIG'S ANGINA.—An acute cellulitis, usually of streptococcic origin, which begins in the region of the submaxillary gland, spreads along the connective tissue planes of the neck and involves the floor of the mouth and walls of the pharynx. It generally occurs during an infectious disease but may be due to traumatism or carious teeth. The neck becomes swollen and indurated and the mouth and throat very much inflamed. As a rule the onset is sudden, but the characteristic violent local and general symptoms may be preceded for a few days by localized swelling and tenderness of the submaxillary gland. Edema of the glottis may cause sudden death or fatal septic pneumonia; pleurisy or pericarditis may occur if the morbid process extends to the mediastinum.

Treatment consists of free multiple incisions, the removal of necrotic tissue, cauterization with carbolic acid and iodin, drainage-tubes and hot moist dressings. Stimulants should be given freely and antistreptococcic serum injected whenever it can be obtained.

LUETIN REACTION.—The luetin test is performed by injecting 0.05 c.c. of luetin intracutaneously in two places on the left arm and at the same time 0.05 c.c. of a control suspension, consisting of the medium without any growth of spirochetes, at two points on the right arm. Local inflammation on the left arm, appearing in two to ten days and sometimes resulting in the formation of a pustule, is regarded as a positive test. The test is often negative in the earlier stages of syphilis.

The various diagnostic tests for syphilis are now extensively employed. Microscopic search for the spirochete is of value in the untreated primary and secondary stages. The complement-fixation test becomes positive a few weeks after the appearance of the primary lesion and is generally regarded as indicating an active syphilitic process. The luetin test may be positive in latent or inactive syphilis when the Wassermann is negative. Further experience with the luetin test is necessary in order to determine its real significance (MacNeal).

LUMBAGO.—A form of muscular rheumatism affecting the muscles of the loins and their tendinous attachments. It is one of the most common and painful forms of rheumatism. It is most frequently found among workmen. Its onset is sudden, and in very severe cases it completely incapacitates the sufferer, and he may be unable even to turn in bed or arise from a sitting posture. As a rule, it is a transient affection, lasting from a few hours to a few days. It may be constant in character or occur only when the muscles are drawn into certain positions. Instead of being painful, it may take the character of a simple ache, which is relieved by pressure.

Treatment.—Rest of the affected muscles is of the first importance. Porous plasters are believed to be efficacious by the public. A hypodermic injection of morphin into the affected muscles will relieve the severe and agonizing pain. Acupuncture, in acute cases, is a most effective treatment. Sterilized needles, 3 or 4 inches in length, may be thrust into the lumbar muscles at the seat of pain, and after 5 to 10 minutes withdrawn. The relief is often immediate. The constant current is sometimes beneficial. The thermocautery may be employed in light strokes over the affected muscles. Blisters may be tried in obstinate cases. Hot fomentations are soothing, and, at the outset, a Turkish bath may cut short the attack. Salicylates are the standard remedy in all forms of myalgia. See Salicylic Acid. In chronic cases potassium iodid may be used, and guaiacum and sulphur have been strongly recommended. Proper clothing and diet are needed. Large doses of nux vomica are sometimes beneficial. See Rheumatism.

LUMBAR PUNCTURE.—Spinal (subarachnoid) puncture is used for anesthesia, and it has become a measure of marked value both for diagnosis and treatment. Tapping of the spinal theca may be practised readily and with impunity, provided perfect asepsis be observed, in any interlaminal space between the second lumbar and the first sacral vertebræ. It has been found valuable in diminishing intracranial pressure, as, for instance, in tuberculous meningitis. Great benefit has been derived from it in uremic convulsions. Lumbar puncture should be performed in cases of doubtful infantile paralysis. It is the only means available at present of differentiating between epidemic meningitis and that form of anterior poliomyelitis which resembles it so closely. In tetanus magnesium sulphate and tetanus serum are administered by injection following lumbar puncture; similarly antimeningococcus serum is given in epidemic cerebrospinal meningitis. See Intraspinal Anesthesia, Meningitis.

LUMBRICOIDS.—Large round-worms (*Ascaris lumbricoides*) infesting man and animals. See Worms (Round).

LUNACY.—A popular name for insanity, so called from the traditional belief that it was influenced by the moon. For the divisions and legal aspect of insanity see Insane (Laws Relative), Insanity. See also Delirium, Mania, Melancholia, etc.

LUNGS, CIRRHOSIS (Chronic Interstitial Pneumonia).—A chronic inflammatory disease of the lungs, characterized by an overgrowth of the connective tissue.

Etiology.—(1) Sequel of croupous pneumonia; (2) fibroid phthisis; (3) fibrinous pleurisy; (4) bronchopneumonia; (5) inhalation of dust—pneumoconiosis; if due to stone-dust—chalicosis; to coal-dust—anthracosis; metallic dust—siderosis.

Pathology.—The disease is generally unilateral, the chest on the affected side being retracted and the heart displaced. The lung is greatly atrophied, only leaving the interstitial tissue, and is frequently so shrunken that its contour is totally changed. If due to tuberculosis, cavities may be found. Microscopically, an overgrowth of connective tissue is seen. The unaffected lung is in a condition of emphysema.

Symptoms and Clinical Course.—There is a severe cough, accompanied by slight or profuse expectoration, mucopurulent in character. On account of the diminished size of the lung dyspnea is a common symptom. Fever may be absent, and the health remain good for many years. If due to tuberculosis, pulmonary hemorrhages are common.

Physical Signs. Inspection.—There is retraction of the chest on the affected side. The apex-beat is displaced.

Palpation.—Vocal fremitus may be diminished or increased, depending upon involvement of the pleura.

Percussion shows impaired resonance on the affected side, and hyperresonance on the opposite side.

Auscultation.—There is heard cavernous or amphoric breathing at the apex, but feebler at the base of the lung, with large and small mucous râles.

Diagnosis.—The affection has to be distinguished only from Tuberculosis (*q. v.*).

Prognosis.—It is fatal in from 10 to 15 years.

Treatment is palliative. A change of occupation and out-of-door gymnastics may be demanded. See Tuberculosis.

LUNGS, CONGESTION.—An increase in, or abnormal fulness of, the capillaries of the air-cells:

active, when the result of an accelerated circulation; *passive,* when caused by an impeded outflow from the capillaries. For etiology, diagnosis, and treatment, see HEMOPTYSIS.

LUNGS, CONSUMPTION.—See TUBERCULOSIS (Pulmonary).

LUNGS, EDEMA.—An exudation of serum into the pulmonary interstitial tissue and the alveoli of the lungs, characterized by dyspnea, cough, and a frothy, blood-streaked expectoration.

Etiology.—Pulmonary edema is the result of stasis, occurring when the outflow of venous blood in the lung meets an obstacle that cannot be overcome by the right ventricle, as in cardiac diseases in which the left ventricle fails. It also follows Bright's disease and alcoholic excesses, causing cardiac depression and lung inflammations.

Pathologic Anatomy.—The lung tissue is swollen, and does not collapse when the chest is open. The elasticity of the tissue has disappeared, and it pits upon pressure. If following congestion of the lungs, the color is red; if a symptom of general dropsy, its color is pale. On cutting into the edematous spots an enormous quantity of albuminous fluid, sometimes clear, at other times of a red color, mixed more or less with blood, flows over the cut surface.

Symptoms.—The preeminent symptom is dyspnea, the breathing being hurried, labored, and rattling, all the accessory muscles of respiration being called into action. The sense of oppression and anxiety is extreme. There is also a constant, harassing, short cough, and the expectoration of a blood-streaked, frothy mucus. The action of the heart may be tumultuous or feeble. The face is at first flushed, but as the left ventricle fails, or if the effusion into the air-cells is sufficient to prevent the entrance of air, symptoms of cyanosis rapidly supervene, the pulse becoming feeble, the surface cold, the breathing shallow and hurried, the cough suppressed, stupor replacing the restlessness, soon deepening into coma.

Percussion.—If there is no other lung-disease, the percussion-note is but slightly, if at all, impaired.

Auscultation.—The vesicular murmur is lost by the diffused subcrepitant and bubbling râles.

Diagnosis.—Acute pneumonia in the earlier stages is the only condition likely to be confounded with edema of the lungs, but as the two diseases progress, the picture of pulmonary edema is so characteristic that it cannot be mistaken.

Prognosis is grave, and particularly if the disease occurs in pneumonia, heart-disease, or Bright's disease. In the majority of instances it is a terminal symptom, coming on in all forms of acute and chronic diseases.

Treatment.—As a rule, remedies are useless. The indication is to stimulate the left heart, and this is best done with hypodermic injections of strychnin sulphate, 1/24 grain, repeated every half hour; citrated caffein, 3 to 5 grains; spartein sulphate, 1 to 2 grains every hour or two, or digitalin, 1/60 to 1/30 grain, repeated every hour or two. Two or more of these drugs may be advantageously combined. Atropin sulphate, 1/60 to 1/100 grain, and ergot in some form are valuable remedies. Occasionally relief follows a free venesection or the application of wet cups. Alcoholic stimulants are often invaluable. These means may be aided by counterirritation to the chest, hot mustard foot-baths, active saline purgatives, and diuretics.

LUNGS, EXAMINATION.—See CHEST (Examination).

LUNGS, HEMORRHAGIC INFARCTION (Pulmonary Apoplexy).—An effusion of blood into the air-cells and interstitial tissue of the lungs.

Etiology.—It is usually the result of an embolus which comes from the heart or from a thrombus in the pulmonary artery. The smaller vessel becomes dilated after the embolus lodges, and from the effect of the blood-pressure the vessel ruptures, giving rise to the condition.

Pathology.—The infarction is usually in the periphery of the lung and of a conic shape—the base toward the pleura, the apex toward the root of the lung. The red patches of infarction are clearly seen on the pleura. The infarction, when cut, collapses readily.

Symptoms.—These are of an indefinite nature. Naturally, there is dyspnea, and if there is a valvular disease of the heart with expectoration of dark blood, a blowing breathing at the lower lobes, and dulness on percussion, we may suspect pulmonary apoplexy

Treatment should be directed to the cause. The prime indications are to bring down the blood-pressure with such drugs as aconite, in doses of 3 to 6 drops of the tincture every 3 or 4 hours, and to reduce the frequency of the pulse-beat by avoiding excitement, and the applications of ice-cloths over the chest for periods of 10 minutes. A hypodermic of 1/4 a grain of morphin is often the best thing to prevent excitement and danger of further hemorrhage.

LUNGS, INFLAMMATION.—See PNEUMONIA, TUBERCULOSIS, PLEURISY.

LUNGS, INJURIES.—Injuries of the lungs may occur from mere contusion or compression of the thorax; they are very common as a result of fractures of the ribs; and occasionally they occur as a result of external wounds, penetrating from the outside. The wound may be superficial or deep; it may be punctured, incised, or lacerated, with or without the entrance of foreign bodies, and it may be so trivial that it is never diagnosed, or it may cause instant death. The simpler forms of wound heal at once by first intention, without any inflammation, and with very great rapidity. Severe contusion, owing to the extravasation into the air vesicles, is attended with a greater amount of consolidation and with rusty, blood-stained sputum for several days, but the dulness rarely extends, and there is little or no fever. If, however, the extravasation is very great, or there is an external wound, so that the blood decomposes, intense septic pneumonia, and even gangrene, may follow; but there is always such an amount of pleural effusion, and the lung, as a rule, in these cases is so collapsed and compressed against the back of the thorax, that the physical signs are very obscure.

Symptoms.—The two characteristic signs of wound of the lung are hemorrhage and the escape of air. The former may take place into the bronchi, so that the sputum consists either of pure blood or of a frothy, bright-red mixture, which in a day or two becomes rusty and black; or it may collect in the cavity of the pleura (hemothorax), and gradually soak into the surrounding tissues, so that the skin on the loins becomes dark and ecchymosed; or it may escape externally, mixed with air, or almost pure. So with the air. In very rare instances, when the vesicles alone are torn without the pleura being injured, it may escape into the cellular tissue of the lung and make its way along the outside of the bronchi into the mediastinum, and so gain the root of the neck; or it may collect in the pleural cavity, entering at each expiration, until it distends the thorax to its utmost and compresses the lung against the back; or, what is far more common, without entering the pleura at all, it finds its way across into the cellular tissue, and gives rise to surgical emphysema; or, finally, if there is a large open wound, it is sucked in and out of the chest at each respiration, mixed more or less with blood.

Beside these, other symptoms are usually present. The shock of such an injury is severe and sometimes fatal, even when the amount of bleeding is not great; anxiety and distress are always marked; sometimes the dyspnea is slight, but usually it is severe, and if the lung becomes rapidly collapsed, it may be extreme; there is a constant sense of irritation and tickling in the throat, with an intense desire to cough, but the deep, fixed pain in the chest prevents it, and if the hemorrhage is severe, the patient may sink rapidly into a state of collapse.

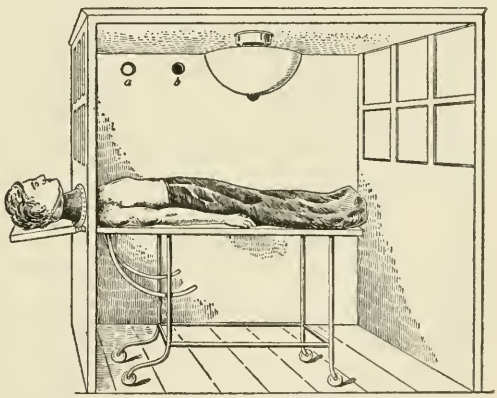
Treatment is directed to control of the hemorrhage by compression and the use of hemostatics, fixation of the chest, and general supportive measures. See HEMOPTYSIS.

Pneumatocele, hernia, or prolapse of the lung is an occasional but rare complication of injuries of the thorax. It may be either immediate or secondary. In the former case there is generally a wound of some extent in the parietes, and the lung is forced out through it by a violent effort at expiration when the glottis is closed. It may be injured itself or it may not, but as soon as it is squeezed out through the rent, it expands so that it cannot return, and rapidly becomes congested. In extreme cases it may be strangulated. If seen shortly after the accident, an attempt may be made to return the protrusion, and, if necessary, the wound may be slightly enlarged for the purpose; but if some time has elapsed, and the tissue is very much congested, it is better left where it is to slough off and granulate over; or its separation may be assisted by ligature or actual cautery. A very few instances are recorded in which, owing to extensive injury of the thorax, an immediate prolapse of the lung has occurred without an external wound.

The consecutive variety may not make its appearance until some considerable time after the receipt of the injury, and if there has been a wound, it must have healed first. It forms a soft, circumscribed tumor, projecting through the wall of the thorax under the skin, swelling out on expiration and shrinking on inspiration. On coughing there is a distinct impulse; if it is pressed upon, it collapses readily, with a feeling of soft crepitation, and the margins of the opening can be plainly felt. It is resonant on percussion, and the respiratory murmur is loud and coarse in comparison. In some cases it is the result of extensive rupture of the intercostal muscles; in others, where its formation is very gradual, it is probably due to chronic inflammation weakening the walls of the thorax at one spot, and allowing the lung slowly to force its way through. The only treatment required is a belt or truss, according to the size and situation of the protrusion, to restrain it and protect it from injury.

For further discussion of injuries of the lung, see CHEST (Injuries), PLEURA, PLEURISY, PNEUMONIA.

LUNGS, SURGERY.—The dangers of intrathoracic surgery have been lessened by the ingenious methods devised for preventing collapse of the lung when the pleura is widely opened. Both positive and negative pressure are employed. The former prevents collapse of the lung by distending it from within, the latter by making suction upon its exposed surface. When positive pressure methods were first introduced, and for sometime thereafter, they were assailed as being dangerous, but evidence based upon continued animal experiments and also upon the results of their application to the human subject, show that



SAUERBRUCH'S PNEUMATIC CABINET.

a. Opening of pipe connecting with suction pump; *b*, valve to let in air, and regulate the negative air pressure. —(Bryant and Buck's *American System of Surgery*.)

the objections were theoretical rather than practical. Kuttner, Dreyer, Robinson and others have demonstrated that the air exchange in the trachea, the venous pressure, the aortic and pulmonary pressure, and the expansion of the thorax are the same under positive pressure as they are under negative pressure.

With regard to the apparatus employed, that for positive pressure is simpler than that for negative. Robinson and Leland state that the requirements of any positive pressure apparatus

are a supply of compressed air; an anesthetizing segment; a device for introducing air and ether into the respiratory tract; a means of varying the resistance of the exhaled air. It would seem that all of these requirements are not perfectly met by any single apparatus thus far devised, but they are present in sufficient degree to make the ingenious instruments of great practical value.

Sauerbruch's apparatus for negative pressure is an air tight cabinet in which the surgeon operates. The patient's head projects outside the cabinet and a tight fitting rubber collar is placed around his neck. Negative pressure is obtained by means of an electric suction air-pump. As the bronchioles are subjected to ordinary atmospheric pressure at the time that the thorax is exposed to negative pressure, collapse of the lung does not occur. It is interesting to note that an increased number of successful intrathoracic operations are being done in the clinics where this apparatus is in use. And see Intratracheal Insufflation of Ether.

Incision of the lung (pneumotomy) has been practised in cases of gangrenous cavities, abscesses caused by the extension of suppuration from other parts into the lung, abscesses connected with foreign bodies, bronchiectatic cavities, provided they are single (multiple ones can hardly receive much relief this way), and tubercular cavities, if there is only one, and the cough is very harassing. In one or two cases a similar operation has been practised for hydatid disease, and a few instances are recorded in which tumors have been removed from the lung. The localization of the disease and the treatment of the pleura are the chief difficulties. No incision may be made until the existence and accessibility of the cavity have been proved by puncture, and even then the greatest care is required, for the lung, unless it is consolidated by inflammation, is so yielding that a thick-walled sac can easily be pushed to one side. As a rule, cavities should not be approached from behind, for the large vessels run for the most part along the posterior surface of the bronchi. The size of a cavity cannot be estimated from the amount of fluid that is coughed up; according to Godlee, upward of a pint may come within 24 hours from a space that would not hold so much as 44 c.c. If a cavity is found, the lung tissue should be incised, and explored as far as possible with the finger, part of a rib being removed if necessary, and a large drainage-tube inserted. The shape is always very irregular, and it must be a long time before the sloughs have separated, and cicatrization can procure its obliteration.

The treatment of the pleura presents unusual difficulties. There can be no doubt that it is not advisable to incise a putrid cavity in the lung unless the pleural surfaces are adherent. If there is localized gangrene, and if it has already lasted for some time, the danger is not so great; adhesions are usually present under these conditions, and the lung is so consolidated by inflammation that it is in but slight danger of collapsing; but in acute cases and in bronchiectasis it is impossible to be certain. An attempt made be made to find out by ascertaining the mobility of the lung; if a needle is driven through an intercostal space into the pulmonary tissue, it will show to a certain extent by its movement whether the lung is fixed or not, but it is very easy to place too much reliance upon this. In some instances it may be possible to suture the two surfaces together and wait for a week, or to procure adhesions by means of the cautery applied to the intercostal muscles, but often it is impossible to wait so long, and even then the adhesions are so soft and delicate that the greatest care must be taken not to break them down (Moullin).

Excision of lung tissue (pneumonectomy) has been suggested to remove diseased portions. To remove the apex, the third or fourth rib is excised without opening the pleura until it is removed. The lung is then grasped and drawn into the pleural opening, which it plugs, and relieves the distress occasioned by allowing the air to enter. The portion of lung to be removed is ligated *en masse* and then cut away, the stump being seared with the cautery. The wound in the pleura is closed and sealed with collodion. The ligature must be firmly applied and asepsis must be rigid (Pyle). The results of the operation are not yet definitely determined.

LUPINOSIS (Lathyrism, Chick-pea Disease).—An affection due to prolonged use of meal made from the chick-pea (or vetches) which is mixed with barley and wheat. It is observed in India, France, Italy and Algiers. The symptoms are gastro-intestinal derangement, pain accompanied by weakness and tremor followed by spastic paralysis of the legs with exaggerated reflexes. Treatment consists in removing the cause and relieving the symptoms.

LUPULIN.—The yellow, resinous powder of hops, composed mainly of dried glands from the strobiles of the plant; it is the *lupulinum* of the U. S. P. Its oleoresin is official. Dose, 5 to 15 grains. In nervous irritability lupulin may be used as a calmative and hypnotic. In irritable bladder, in alcoholism, and as an anaphrodisiac in chordee, gonorrhea, spermatorrhea, and other affections of the genitourinary organs, it is serviceable. See Hops.

In dysmenorrhea:

℞. Lupulin, ʒ j
Confection of rose, q. s.
Make into 20 pills. One pill 3 times a day.

LUPUS ERYTHEMATOSUS.—A cutaneous new growth characterized by well-defined reddish patches covered with yellowish or grayish adherent scales.

Symptoms.—The disease begins as one or more rounded or oval, pinhead-sized to pea-sized erythematous spots, which increase in size, either by peripheral extension or by coalescence of neighboring lesions. When fully developed, the disease appears as one or more sharply marginated, reddish or violaceous patches, varying in size from a small coin to the palm of the hand. The surface is covered by grayish or yellowish scales, firmly adherent to and dipping down into the patulous

and distended openings of the sebaceous glands. The border of the patch is somewhat elevated, while the central portion is slightly depressed. Whitish atrophic scarring is usually present, and is characteristic of the disease. There is more or less infiltration and thickening. The subjective symptoms consist of moderate itching and burning.

The region most frequently affected is the face, particularly the cheeks and nose. The lips and, more rarely, the buccal mucous membrane may also be attacked.

The disease pursues a slow course, lasting months, and at times years. Occasionally involution of the patches occurs, with or without the persistence of scars.

Etiology.—The cause is obscure. Erythematous lupus is essentially a disease of adult life. It is more common in women than in men. Disorders of the sebaceous glands act as predisposing causes.

Diagnosis.—Lupus erythematosus may be distinguished from lupus vulgaris as follows:

Lupus Erythematosus.	Lupus Vulgaris.
1. Develops in adult life.	1. Develops in childhood or youth.
2. Disease is superficial.	2. Disease is deep-seated.
3. The lesions well-defined, scaly patches.	3. The lesions discrete papules and tubercles.
4. Sebaceous ducts patulous or distended.	4. Sebaceous system not involved.
5. Ulceration never occurs.	5. Ulceration with scarring nearly always present.

Prognosis.—Favorable as to ultimate cure, but guarded as to duration of disease.

Treatment.—But little reliance is to be placed upon internal treatment, although such drugs as iodin, arsenic, cod-liver oil, etc., are occasionally of value.

The local treatment consists of the use of sedative or stimulating applications, caustics, or surgical manipulation, according to the nature of the case.

Inasmuch as a certain number of cases recover spontaneously, with little or no scarring, the milder remedies should always be given a fair trial before proceeding to the use of caustics and the like.

Most cases do well under stimulating applications. An admirable method is vigorously to rub into the part, every day or every other day, sapo viridis or the tincture of green soap. This may be followed by a soothing ointment. Plasters are frequently of great value. Those most employed are the ordinary mercurial plaster and a 10 to 20 percent salicylic acid plaster.

When these remedies fail, and when the affection is severe and of long standing, one may cautiously resort to the use of such caustics as pure carbolic or trichloracetic acid, liquor potassæ, nitrate of silver, etc. Scarification and superficial curetting are often followed by good results. Sulphur, either in ointment (1 to 2 drams of precipitated sulphur to 1 ounce) or lotion, is a most efficient remedy.

A combination of sulphur and tar makes a useful formula:

℞. Precipitated sulphur, ʒ j
Oil of cade, ʒ j
Zinc oxid ointment, ℥ j.

Apply twice a day.

Crocker speaks well of the use of collodion, either alone or with salicylic acid (10 to 30 grains to 1 ounce) incorporated in it.

Liquid air or, preferably, carbon dioxid snow has been used with excellent results.

LUPUS VULGARIS.—A tuberculous cellular new growth, characterized by reddish or brownish patches consisting of papules, nodules, and flat infiltrations, usually terminating in ulceration and scarring.

Symptoms.—The disease commonly begins as numerous pinpoint-sized to pinhead-sized, grouped or disseminated, reddish, yellowish, or brownish flat papules. They are softer than the surrounding skin, in which they appear to be embedded. Hutchinson has likened their appearance to "apple jelly."

These papules develop later into pea-sized or larger tubercles or nodules, which ultimately become aggregated in variously sized and shaped patches covered with imperfectly formed epidermis. After a variable duration the nodules coalesce, chiefly by individual extension, forming dull red, raised, soft patches.

The lupus nodules or patches may remain stationary for some time, but sooner or later undergo retrogressive change. The lesions may disappear by absorption, leaving a somewhat scarred, scaly, and atrophic skin (*lupus exfoliativus*), or, as is the more usual course, by ulceration, with resulting crusts and cicatrices (*lupus exedens, lupus exulcerans*). At times exuberant granulations spring up upon the borders of the ulcer (*lupus hypertrophicus*), or there may develop even papillomatous outgrowths (*lupus papillomatosus*).

The most frequent seat of lupus is upon the face, particularly the nose, cheeks, and ears. The trunk and extremities may also be involved. Besides the skin, lupus occasionally attacks the mucous membrane and cartilage of the nose, mouth, pharynx, larynx, or ears.

Subjective symptoms are, as a rule, wanting, although there may be slight pain.

The course of the disease is eminently chronic, the affection persisting for years, and frequently a lifetime.

Etiology.—The vast majority of cases begin before the age of 20, and many before the age of 10. The disease, however, is never congenital.

Lupus vulgaris is due to the invasion of the skin by the tubercle bacillus.

Pathology.—A section of lupus tissue shows, under the microscope, sharply circumscribed nests of cell-infiltration in the deeper layers of the corium. Epithelioid cells are present in varying numbers, and giant cells in abundance. Tubercle bacilli are few, and only discoverable by examination of many sections. When ulceration occurs, the

centers of the nodules undergo coagulation necrosis and fatty degeneration.

Diagnosis.—The diseases most likely to be confounded with lupus vulgaris are the tubercular syphiloderm, lupus erythematosus, and epithelioma.

Lupus Vulgaris.	Tubercular Syphiloderm.
1. Develops usually before the age of puberty.	1. Develops after the age of puberty.
2. Course slow.	2. Course rapid.
3. History, perhaps, of scrofulous hereditary tendency.	3. History of infection.
4. Concomitant signs of tuberculous diathesis.	4. Concomitant signs of syphilis.
5. Nodules soft.	5. Nodules hard.
6. Ulcers are comparatively superficial, with irregular, undermined edges; discharge slight; crusts scant and reddish-brown.	6. Ulcers are deep, with sharp-cut edges; discharge copious; crusts bulky and greenish.
7. Scars yellowish, shrunken, and hard.	7. Scars whitish, soft, and smooth.
8. Refractory to all but destructive measures.	8. Rapid healing under the iodids and mercury.
Lupus Vulgaris.	**Epithelioma.**
1. Develops usually before puberty.	1. Develops in middle and advanced life.
2. Course extremely slow.	2. Course more rapid.
3. Little or no pain.	3. Usually painful.
4. Ulcers multiple and superficial.	4. Ulcers single and deep.
5. Edges and base soft.	5. Edges and base hard; characteristic pearly border.

Prognosis.—The disease runs a decidedly chronic course. The prognosis depends upon the age of the patient and the form, extent, and duration of the disease. Occurring in small, circumscribed patches, the prognosis is favorable.

Treatment.—General hygienic measures, such as nutritious diet, fresh air, exercise, etc., should receive attention. In many cases the administration of such remedies as cod-liver oil, iodid of iron, etc., is indicated, although no direct curative influence is to be expected from their use. Thyroid extract and tuberculin have been used in some cases with encouraging results. Their curative value, however, is at the present time still conjectural.

Local treatment has for its object the extirpation of the lupus tissue with as little resultant scarring as possible. Before resorting to chemic caustics or surgical interference, it is well in some cases to employ milder measures. In hyperemic cases the condition is sometimes improved by the continued application of calamin lotion. Mercurial plaster occasionally exerts a beneficent influence on the disease. A salicylic acid (20 percent), creosote (40 percent), or resorcin plaster has been used with good results. Most cases, however, require more heroic treatment. The *solid stick of silver nitrate* is useful in the treatment of small discrete lesions. It is bored into the tissue until the nodule is destroyed. Every few days new lesions are attacked. *Pyrogallic acid* is a slow but practically painless caustic. It may be used in ointment or as a paint.

Brocq advises the following:

℞. Pyrogallic acid, Salicylic acid, each, gr. 1
Collodion, ʒ j.

Paint on the part every day until a slough is produced.

Arsenic trioxid is a rapid caustic, exerting a selective action upon diseased tissue. It is, however, very painful, and can only be used over small areas, on account of the danger of absorption.

℞. Arsenic trioxid, gr. xx
Powdered acacia, ʒ j
Water, q. s.

Spread on lint and apply for 24 hours. Then poultice until slough comes away.

Zinc chlorid is an efficient caustic, not so painful as arsenic. It does not, however, select diseased tissue.

℞. Zinc chlorid, ℥ xvj
Powdered opium, ℥ jss
Hydrochloric acid, ʒ vj
Boiling water, ʒ xx.

(Middlesex Hospital formula.)

To 1 ounce of the solution add 2 drams of wheaten flour. Spread the paste upon lint and apply for 24 hours.

Curetting is an extremely valuable procedure. It is often supplemented by the use of a caustic or the application of the Paquelin cautery.

Scarification is a most useful measure, particularly in diffuse superficial patches. Numerous parallel incisions, crossed at right angles by others, are made through the skin by means of a sharp scalpel or scarifier. This is often advantageously followed by the application of an iodoform ointment or a bichlorid lotion.

The *galvanocautery* and the *Paquelin cautery* find a distinct field of usefulness in the treatment of certain forms of this disease.

Direct *exposure to sunlight* for 4 to 5 hours a day for months is reported to be effective. Remarkably good results have been attained by the use of the X-rays.

LYCETOL.—A tartrate of dimethyl diethylenediamin (dimethyl piperazin). It is said to be a reliable diuretic and uric acid solvent, free from untoward effects on the stomach, even though its use be long-continued. Dose, 15 to 30 grains daily in carbonated water or in lemonade.

LYCOPODIUM.—A very mobile, pale yellow, fine powder, consisting of the spores of the club-moss (*Lycopodium clavatum*) and of other species

of Lycopodium. Lycopodium is odorless, tasteless, floats on water, which does not wet it, and burns quickly when thrown on a flame. It should be free from pine-pollen, starch, sand, and other impurities, which are detected by means of the microscope the lycopodium spores being about 1/800 of an inch in diameter, four-sided, and reticulated, with short projections on the edges. They contain about 47 percent of a bland, fixed oil.

The plant was formerly considered to be diuretic and antispasmodic, and was used in rheumatism, epilepsy, and pulmonary and renal disorders. The powder is now employed quite extensively in pharmacy to facilitate the rolling of a pill-mass and to prevent adhesion of pills to each other. It makes an excellent absorbent and protective powder when dusted over an excoriated surface, as seen between the thighs of infants.

LYMPHADENOMA (Hodgkin's Disease; Lymphatic Anemia, Lymphadenosis Pseudoleukemia; Malignant Lymphoma.)—A form of anemia characterized by a hyperplasia of the lymphatic glands, usually a hypertrophic condition of the spleen, and without leukocytosis.

Etiology.—It generally occurs in people under 25 years of age, the majority of cases collected by Gowers being males. The exciting cause is not known. It has been attributed to constant irritation of the skin, to decayed teeth, to nasal catarrh—these conditions exciting a local glandular swelling which becomes general.

Pathology.—A hyperplasia of the lymph-glands is always present. A hypertrophic condition of the spleen is found in the majority of cases. The cervical lymph-glands are usually the first to enlarge, and soon involve the whole chain of glands. The axillary and inguinal glands are next affected. The marrow of the long bones is said to be converted into the soft lymphoid material. The liver is often enlarged, and is the seat of lymphoid tumors.

Symptoms and Course.—In the early stages the blood is either normal or there is a slight degree of anemia. Later there is a leukocytosis, the adult cells (polymorphonuclear leukocytes) alone being greatly increased. Myelocytes are occasionally found. With the advance of the destruction of red cells there is a corresponding diminution in the percentage of hemoglobin. The enlargement of the superficial glands of the neck usually marks the onset. They may be small and movable at first, but later involve the superstructures, and become hard and painful. They rarely suppurate. The liver and spleen are usually found enlarged. With the increase in the size of the lymph-glands there is a corresponding impoverishment of the blood. Dyspnea may be common. If there is enlargement of the abdominal lymphatics, pressure-symptoms arise, and there will be edema of the lower extremities. In the beginning there is slight fever, with a variation in the daily temperature, that in the evening being higher.

Diagnosis.—Syphilis may give rise to enlargement of the lymphatics, but the history will clear up the doubtful nature and an examination of the blood will confirm it.

Tuberculous glands usually occur in younger persons, and generally suppurate. In Hodgkin's disease suppuration is rare. In scrofulous (tuberculous) glands ordinarily only one chain of glands is involved, and usually these are the submaxillary, while in Hodgkin's disease the anterior and posterior cervical glands are generally first affected. The tuberculin test should be employed.

In tuberculous adenitis the liver and spleen are not enlarged to so great a degree as in pseudoleukemia. Lastly, as the disease advances, in pseudoleukemia there is a corresponding degree of anemia, as shown by the blood examination.

Leukocythemia is differentiated by its characteristic leukocytosis.

Carcinoma of lymphatic glands is generally secondary to cancer in another region. Lymphosarcoma tends to invade neighboring tissues. Diagnosis in malignant disease is confirmed by microscopic examination of a section of the tumor.

Prognosis.—Recovery is rare. Death usually occurs before the end of the third year of the disease.

Treatment.—If the glands are superficial, they should be excised, to prevent the disease spreading. Neighboring glands should also be removed. Late in the course an operation does no good. Of medicines, arsenic seems the most effective. Any of the prescriptions recommended under ANEMIA (*q. v.*) may be given. The injection of arsenic into the involved tissue is said to be especially valuable. Bone-marrow, sodium cacodylate or atoxyl may be used. With the use of medicine it will also be beneficial to surround the patient with the best possible hygienic conditions or recommend a change of climate. Phosphorus, in doses of 1/100 of a grain after meals, may also be given. Iodid of potassium in 10-grain doses, cod liver oil, iron, strychnin, inunctions of iodin (1 percent) are recommended. Improvement is reported as resulting from X-ray treatment. Local applications have never proved of much benefit.

LYMPHATICS, DISEASES. Lymphangitis, or inflammation of the lymphatic vessels, is generally associated with more or less inflammation of the lymphatic glands.

Etiology.—The most common cause is the absorption of septic or of infective products from a wound, which, however, is often very trivial, such as a simple scratch, abrasion, sting, or puncture; more rarely, the inflammation may follow upon mere irritation of the skin, as a chafe of the heel, excessive friction, or sunburn.

Pathology.—The walls of the lymphatics become infiltrated with cells, swollen, and softened, while the endothelium is shed and the lymph contained in the vessels often undergoes coagulation. The inflammation spreads to the surrounding tissues, but seldom higher in the course of the lymphatics than the first set of glands, which also become swollen and infiltrated and arrest the further absorption of the septic products. It may terminate in resolution, or in suppuration in and around the glands or, more rarely, around the lymphatics

themselves. Sometimes the septic products appear to escape the glands, and general blood-poisoning ensues.

Symptoms.—In severe cases lymphangitis generally begins with a chill or rigor, followed by high temperature and fever, and perhaps vomiting and diarrhea. Red lines, when the superficial lymphatics are affected, are seen running from the wound to the nearest lymphatic glands, with here and there erysipelatous patches of redness. There are generally pain and tenderness, especially in the region of the swollen glands, and swelling and edema, sometimes of the whole limb. It may be differentiated from phlebitis by the redness being superficial and in the course of the lymphatics, not in the course of the veins, by the absence of the cord-like and knotty feel of plugged veins, and by the presence of glandular enlargement; from erysipelas by the redness having no defined margin, and generally running in lines.

The treatment consists in attending to any wound or abrasion, allaying other sources of irritation that may be present, and placing the inflamed part at rest in an elevated position. Hot fomentations of poultices, or glycerin and belladonna, may be applied, and abscesses should be opened as soon as they form. If any swelling is left, pressure, or ammoniac and mercury plaster, may be used to disperse it.

Lymphatic varix, or lymphangiectasis, is very rare. It is attended by a condition of elephantiasis of the parts where the lymphatics are blocked. When the superficial vessels are affected, "the varix first appears in the form of small elevations, giving the skin an appearance which has been compared to the rind of an orange. It subsequently takes the form of little vesicles, covered with a thin layer of dermis" (Erichsen). At times the dilated lymphatics form distinct tumors (*lymphangiomata*).

Treatment.—Slight elastic pressure and protection from injury or irritation.

Lymphatic fistula, or lymphorrhea, though exceedingly rare, is a condition sometimes met, and more especially in the groin, scrotum, or labium. It is said to be due to a wound of a lymphatic or to the giving way of a varicose lymphatic, but the cause is not clearly understood.

Lymphadenitis, or inflammation of the lymphatic glands, may be acute, subacute, or chronic.

Acute or subacute inflammation of lymphatic glands is nearly always secondary to inflammation of the parts from which the afferent lymphatics proceed. Indeed, in most inflammations there is some tenderness of the neighboring glands. The lymphatic vessels themselves often escape, although the glands may become extensively involved, and even suppurate. The inflammation, however, rarely proceeds further in the course of the lymphatics than the first series of lymphatic glands, although it often spreads to the surrounding tissues (*perilymphadenitis*). The changes in the inflamed gland are like those of other inflammations. The whole gland is enlarged, the vessels dilated, and the lymph sinuses crowded with cells. Microorganisms similar to those found in the inflammatory lesions, giving rise to the lymphadenitis, have been discovered in the glands.

The symptoms are tenderness, heat, pain, and swelling, followed by redness of the skin and edema. The gland, at first movable, becomes fixed, and if the process runs on to suppuration, the usual signs of an abscess ensue. Familiar examples of lymphadenitis are seen in the **bubo** of gonorrhea, in the tender glands of erysipelas, and in the suppurating bubo of soft chancre. In from 2 to 3 weeks after the appearance of the chancroid, in the proportion of about 1 case in 4, a single lymphatic gland in the groin becomes swollen, painful, and tender; the overlying skin becomes red, edematous, hot, swollen, and inflamed; a soft spot appears upon the swelling, and after a little while there is decided fluctuation and an abscess is formed in the gland.

The treatment consists in subduing the inflammation of the part from which the lymphatics proceed, painting the glands with glycerin and belladonna, applying a hot poultice, and, if suppuration has occurred, in making a free incision. Some surgeons dissect out the glands if suppuration threatens. As soon as a bubo beings to swell and becomes tender, it is advised to charge a syringe with the 1 : 500 solution of corrosive sublimate or with a 3 percent solution of carbolic acid and to inject a few drops into the gland, repeating this in different portions of the diseased structure until 15 or 20 drops of the solution have been introduced. If this does not arrest the formation of pus, it will be necessary to wait, and when the pus is formed lay the abscess freely open.

Chronic lymphadenitis is very common in strumous children, especially in the neck. The affection of the glands can frequently be traced to some exciting cause, as the irritation of pediculi on the head, eczematous affections about the mouth, enlarged tonsils, or carious teeth. It also occurs as a result of chronic affection, especially of tuberculosis and syphilis. The glands slowly enlarge and become infiltrated with small round cells; while in the tubercular case nonvascular areas containing giant cells, lymphoid corpuscles, and tubercle bacilli are found. The enlargement may subside, or the inflammatory products may caseate, and suppuration occur in or in and around the gland; at times the caseous mass may dry up and become cretaceous, or atrophy or fibroid thickening may ensue. In rare instances, it is said, the tubercle may become disseminated, leading to general tuberculosis.

Symptoms.—The glands, when those of the neck (the most common situation) are affected, enlarge on one or both sides of the neck, but without pain. They are at first distinct and movable, but later often coalesce and become adherent to the surrounding parts. After a time they may soften and break down: the skin then becomes adherent and red, gives way, and a curdy pus is exuded. After the abscess has been opened, a portion of the broken-down gland may be seen in the floor of the ulcer, the edges of which are bluish-pink and undermined. The ulcers are very indolent,

and, when finally healed, leave characteristic raised, puckered, pinkish-white scars. Concomitant signs of struma or tubercle are frequently present.

Treatment.—Any source of irritation, such as pediculi, carious teeth, etc., should be sought and removed; and if the patient is syphilitic or tuberculous, specific treatment is indicated. If suppuration threatens, the glands should be removed. If an abscess has already formed, it should be opened early to prevent scarring. This may be done by a small incision, after which the capsule of the gland may be cleared out by a Volkmann's spoon. Should an indolent ulcer or sinus remain, as often happens if the abscess is allowed to burst spontaneously, it should also be scraped with a Volkmann's spoon and its edges destroyed by silver nitrate or potassium hydroxid or, better, excised. With good drainage established, Bier's suction glasses may be efficient. In some cases injection of iodoform emulsion or iodoform packing may be advantageous. If streptococci or staphylococci are found in the pus, autogenous vaccines may be of decided value.

Treatment of Tuberculous Glands.—The X-rays have been used with success. Bier's constriction hyperemia may be markedly beneficial. (The elastic bandage may be used at first, then if an abscess forms, after incising and evacuating, suction should be applied.) Tuberculin injections, the results of which seem very encouraging, should be tried. (See Tuberculosis.) If no improvement results in three months the bovine strain should be used. In adults and those with a family history of the disease the human bacillus is generally the cause, but in children the bovine type is usually found, due to milk infection. According to Ritchie, to the bovine type is generally due glandular, skin, and eye tuberculosis; to the human, bone and lung varieties. Another valuable remedy is guaiacol in the form of inunctions.

LYMPHATISM.—See Status Lymphaticus.

LYSIDIN (Methylglyoxalidin).—Lysidin is prepared by the interaction of sodium acetate and ethylendiamin hydrochlorid. It is a bright-red crystalline mass, very hygroscopic, and characterized by a peculiar mouse-like odor. It is sold in a 50 percent solution. Lysidin is recommended as a solvent for uric acid deposits, being given in doses of 1/2 and 2 1/2 drams of the 50 percent alkaline solution dissolved in an excess of carbonated water. It is claimed that lysidin possesses five times the power of piperazin.

LYSOL.—An antiseptic and disinfectant saponified product of coal-tar, chiefly composed of cresols, occurring as a clear brown, oily liquid, readily miscible with water, and forming clear solutions with glycerin, alcohol, chloroform, and various other fluids. It is generally employed in a 1 percent solution, and only as a local application. It is said to be superior to carbolic acid, creolin, and other analogous coal-tar products as a germicide, but it has no advantage over other antiseptics of established reputation, and is only efficient in solutions of sufficient strength to be irritating or caustic. It is useful to arrest epidemics or in prophylaxis, and is particularly serviceable in disinfection of privies, premises, ships, and stables, being readily soluble, active, and cheap. A solution of 1 : 1000 is said to destroy streptococci in 15 minutes.

LYSSA.—See Hydrophobia.

M

MACROGLOSSIA.—Hypertrophic development of the tongue, a condition seen in cretins, in whom it is probably due to lymphangioma. See TONGUE.

MADELUNG'S DEFORMITY.—This is a progressive forward (rarely backward) subluxation of the radiocarpal joint, due to relaxation of the ligaments or to disturbance in the growth of the radial epiphysis. Eighty per cent. of the cases occur in girls during adolescence. The lower end of the ulna is prominent, the radius often curved, and the hand usually adducted but occasionally abducted. Extension and sometimes flexion of the wrist are impaired. The treatment in the early stages is a retentive apparatus, *e. g.*, a leather cuff. At a later period tenotomy, reduction through an incision, or cuneiform osteotomy of the radius may be indicated (Stewart).

MADURA FOOT.—See MYCETOMA.

MAGNESIUM.—Mg; atomic weight 24.3; quantivalence II; specific gravity 1.75. One of the metals of the alkaline earths, widely distributed in inorganic nature and forming also a constituent of animal and vegetable tissues. The physiologic effects of its salts are antacid and laxative.

Therapeutics.—Magnesia and magnesium carbonate are used as antacids and laxatives, in acidity, sick headache, flatulent colic, etc., and as antidotes in poisoning by acids, arsenic, phosphorus, and mercuric and cupric salts. The citrate is an agreeable laxative, cooling and acceptable to the stomach. The sulphate (Epsom salt) is one of the most efficient of the saline cathartics, and has a wide field of application. In acute inflammatory conditions, renal and cardiac dropsy, ascites from obstruction of the portal circulation, increased blood-pressure within the cranium, intestinal obstruction without acute inflammation, the constipation of lead-poisoning, and habitual constipation from deficiency of the intestinal secretions, this agent will be found to be exceedingly serviceable. Acute dysentery is well treated by magnesium sulphate combined with diluted sulphuric acid, and followed by opium and starch enemata. Bleeding from hemorrhoids and uterine hemorrhage are often relieved by the same combination when other agents fail. In acne vulgaris and other obstinate eruptions due to derangement of the stomach and intestinal canal good results are often obtained by a purgative dose of the sulphate daily before breakfast or by doses of 5 grains in water 3 or 4 times a day. The same salt, finely triturated, makes an excellent dusting-powder for cases of acne rosacea. A saturated solution of magnesium sulphate, continuously applied, has beneficial influence on local inflammation, especially erysipelas and orchitis.

In heartburn:

℞.	Calcined magnesia,	ʒ ss
	Peppermint-water,	℥ jss
	Tincture of orange,	ʒ j.

Give at a draft.

In dyspepsia with acidity:

℞.	Magnesium carbonate,	gr. xx
	Compound infusion of gentian,	ʒ xj
	Compound tincture of cardamom,	ʒ j.

Give at a draft, twice daily.

In obstinate constipation:

℞.	Magnesium sulphate,	℥ ij
	Glycerin,	℥ j
	Water,	℥ iv.

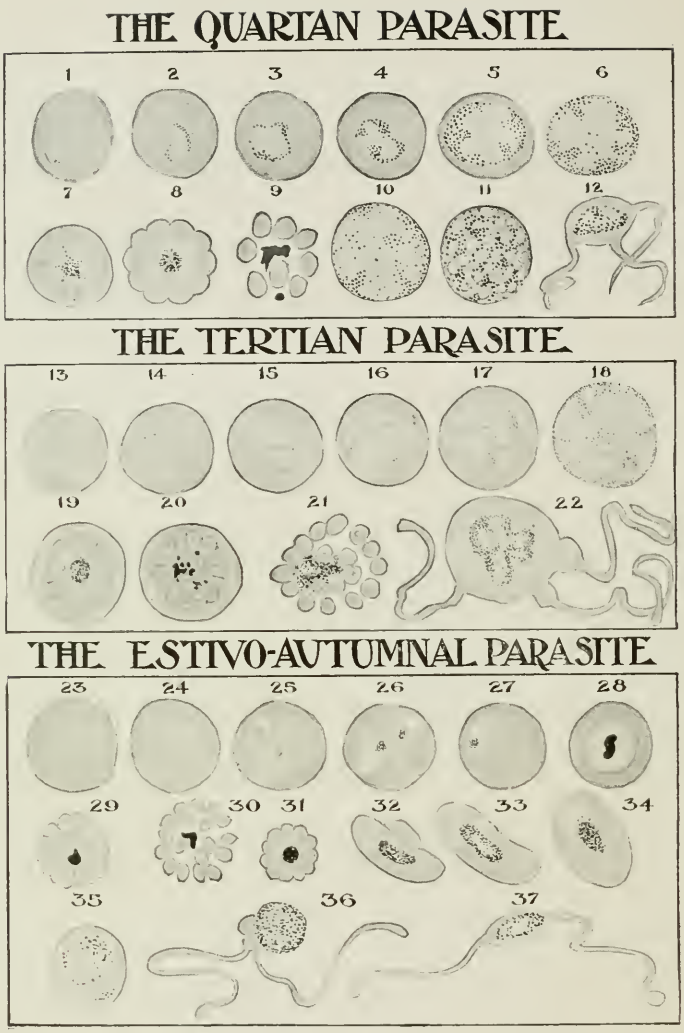
Use as a rectal injection.

Incompatible with *magnesium oxid* are: Acids, copaiba (forms a solid mass), water (in small quantity hydrates it). With *magnesium salts* are: Alkalies, arsenates, carbonates, lead acetate, lime-water, oxalates, phosphates, silver nitrate, sulphites, tartrates.

Preparations.—**M. Carbonas**—light, friable masses, or powder, odorless and tasteless, insoluble in alcohol, almost insoluble in water. Dose, 10 to 60 grains. **M. Oxidum,** *magnesium oxid, magnesia*—is made by heating the light carbonate in a crucible to expel nearly all the carbonic acid. A white, light and very fine powder, almost insoluble in water, insoluble in alcohol, and gelatinizes with 15 of water after standing 1/2 hour, having become hydrated. It is a constituent of pulvis rhei compositus, and ferri hydroxidum cum magnesii oxido. Dose, 10 to 45 grains. **M. Oxidum Ponderosum,** *heavy magnesium oxid, heavy magnesia*—is a white, dense and very fine powder, corresponding in other properties and reactions to magnesia, except that it does not gelatinize with water. It is made by calcining the heavier carbonate, and is much slower in action than the light magnesia. Dose, 10 to 45 grains. **M. Sulphas** (*Epsom salt*)—colorless prisms or acicular needles, slowly efflorescent, odorless, of cooling, saline taste, and neutral reaction, very soluble in water, insoluble in alcohol. Is a constituent of infusum sennæ compositum. Dose, 1 to 8 drams in plenty of water. **M. Sulphas Effervescens**—is prepared from the sulphate 50, sodium bicarbonate 40.3, tartaric acid 21.1, citric acid 13.6. A coarsely granular, white, deliquescent salt, of acid taste and reaction, soluble in water, insoluble in alcohol. Dose, 1 to 8 drams. **Liquor M. Citratis**—prepared from the carbonate 15, citric acid 33, syrup of citric acid 60, potassium bicarbonate 2 1/2, water to 360. Dose, 6 to 20 ounces, for catharsis.

MAGNET.—Strictly speaking, a magnet is a body having the power to attract the unlike pole of another magnet, or to repel the like pole, and

PLATE I.



DESCRIPTION.

Quartan 1, 2, 3, 4, 5, and 6, show the development from the hyaline form to the mature intracellular (6) and large extracellular (10) forms; 11 shows vacuolization of an extracellular form; 7, 8, 9, show segmentation stages; 12, the flagellate form.

NOTE.—In the tertian and estivo-autumnal organisms the same phases are shown.

NOTE.—

A. Relative depth of color in the erythrocyte host, deepest in the quartan, lightest in the tertian.

B. Comparatively coarse, scant, and dark granules of the quartan as compared with the tertian.

C. Tendency to shrinkage in the erythrocyte host of quartan *vs.* large pale host of tertian.

D. Peripheral arrangement of pigment in development stage of tertian and quartan followed by central grouping initiating segmentation.

E. Greater regularity in quartan as compared with tertian forms.

F. Relative number of segments.

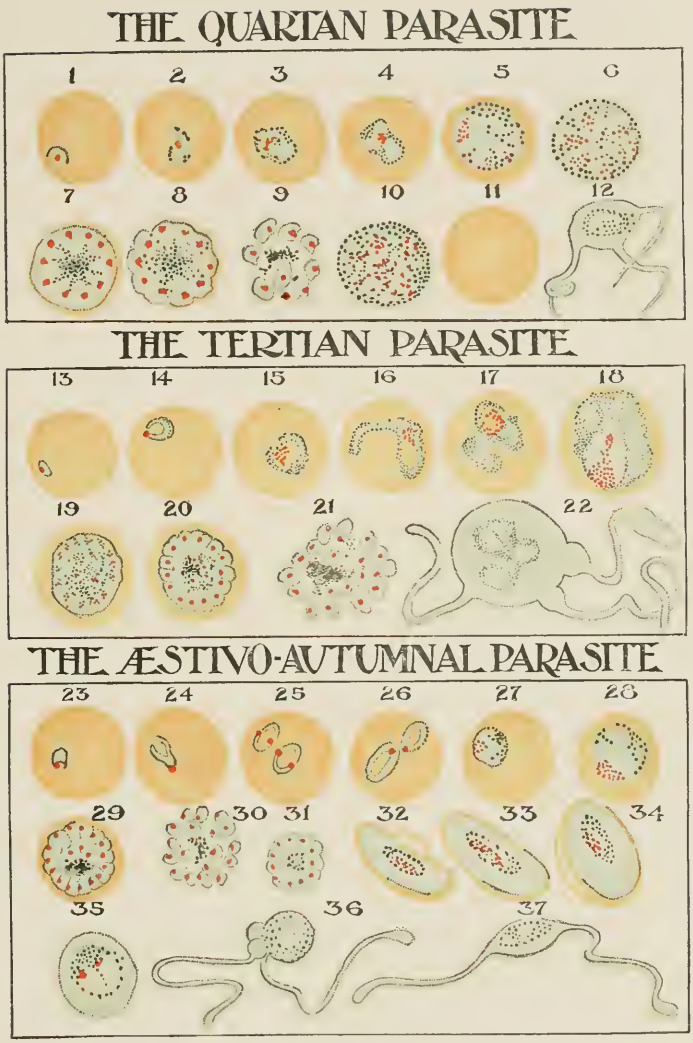
G. Greater density and clearer outline of quartan forms.

H. Star-like arrangement of pigment in early segmentation stage of quartan.

I. Relatively small flagellate forms of quartan and estivo-autumnal.

J. The peculiar ovals and crescents of the developed estivo-autumnal form, its scantily pigmented spherical form (35) and the ring bodies of the early stage.

—*Greene's Medical Diagnosis.*)



DESCRIPTION.

Malarial organism of types shown in plate but treated with Wright's stain.

Quartan Parasite.

1. Non-pigmented form.
2, 3, 4. Young organisms showing chromatin bodies (red) and pigment granules.
5, 6. Full-grown parasites, the former intracellular, the latter extracellular.
7, 8. Presegmentation forms.
9. Segmentation.
11. Normal blood cell.
12. Flagellate body.

Tertian Parasite. The forms are self-explanatory in connection with the preceding description.

Estivo-autumnal form. Various ring forms are shown together with the characteristic crescents, Nos. 32, 33, 34.

(In both this and the preceding plate the drawings are almost entirely based upon personal observation, though certain forms have been adapted from Thayer's valuable monograph.)—(*Greene's Medical Diagnosis.*)

also to attract easily magnetizable bodies. Lodestone, an oxid of iron, is a natural magnet. The electromagnet is a piece of soft iron temporarily magnetized by induction or by insertion into a helix. The electromagnet is used for locating and extracting foreign bodies, especially from the eye. See Eyeball (Injuries).

MALACOSTEON.—See Bone (Diseases).

MALARIAL FEVERS (Malaria). Synonyms.—Chills and fever; ague; fever and ague; swamp fever; intermittent fever; remittent fever; paludism; miasmatic fever.

Definition.—A specific infectious disease depending upon the presence in the blood of a protozoan parasite, the hematozoon or plasmodium malariæ of Laveran, which develops within, and at the expense of, the red blood-corpuscles of the infected individual, resulting, according to the species and number of the parasites present, in more or less periodic febrile paroxysms or in continued fever.

Distribution of the Disease; Climatic and Telluric Conditions under Which Malaria Prevails; Manner of Infection.—Malarial fever is especially prevalent in moist tropical districts, but occurs in almost all parts of the world, being absent only from the coldest regions. The most pernicious forms are seen in tropical Africa, India, South America, the East and West Indies; here the disease prevails throughout the year. In temperate countries malaria is most prevalent during the later summer and early fall. Moisture favors the development of the disease, which is particularly frequent in lowlands bordering upon rivers, lakes, and marshes; it is rare in mountainous districts. Drainage and cultivation prevent the disease, while extensive turning up of soil often gives rise to an outbreak. In malarious regions unaccountable cycles of variation in severity and frequency of the disease often occur. Mosquitos prevail in all regions and under all conditions favorable to malaria. The dark-skinned races are much less susceptible to the disease than are the whites.

The Manner of Infection.—The only mode of infection is through the bites of mosquitos belonging to the genus anopheles. The experiments and observations of Manson, Ross, Grassi, Bignami, and Bastianelli have shown that certain varieties of mosquitos are normal intermediate hosts of the hemameba malariæ, which undergoes a sexual cycle of existence, lasting about 10 days, in the walls of that insect's intestine. At the end of the period large numbers of sporozoids become stored in the cells of the salivary gland, from which they are introduced into the human body with the bites. In its human host the parasite reproduces itself asexually by sporulation. It breaks up into sporocytes each of which penetrates a red blood cell in which it grows and upon which it feeds. When mature it breaks into spores. Some of the sporocytes, however, are sexual cells, gametocytes, and do not break up into spores. If they gain entrance into the mosquito they reproduce themselves sexually. See Mosquitos.

The period of incubation lasts apparently from several days to several weeks.

The Infectious Agents.—The hemamebæ malariæ were discovered in 1880 by Laveran. They have since been shown to belong to the class of sporozoa, order of Hemosporidia. Three distinct species of the parasite have been differentiated: (1) The tertian parasite; (2) the quartan parasite; (3) the estivoautumnal parasite.

The first two parasites are associated with more or less regularly intermittent fevers; the last variety with fevers which may be regularly intermittent, but are more often irregular or continued.

1. **The Quartan Parasite.**—This organism exists in the blood in great groups, all the members of which are approximately at the same stage of development and pass through their cycle nearly in unison. The cycle lasts almost exactly 72 hours, at the end of which time the parasites which have reached maturity undergo sporulation, the fresh spores attacking new corpuscles. Sporulation of a group of parasites, if it has reached a sufficient size, is always associated with a paroxysm in the infected individual. The immediate cause of the malarial paroxysm is thought to be the liberation of some toxic substance, probably by the parasites at the time of sporulation.

Not infrequently 2 or 3 groups of parasites are present. When this is the case, they almost always reach maturity on different days, resulting in paroxysms on 2 successive days, with a day of intermission between, or in daily paroxysms. Very rarely the presence of multiple groups causes irregular or continued fever. In a triple quartan infection the disease assumes a daily or quotidian type.

In its youngest form the quartan parasite is represented by a minute, colorless disc, about 1 mm. in diameter, lying within the red corpuscle. This shows more or less active ameboid movements. As it increases in size the activity of the ameboid movements diminishes, and fine, dark pigment granules begin to develop. These show a lazy motion in the younger forms, but are almost motionless in the adult bodies. The pigment granules lie about the periphery of the parasite, the outlines of which are usually quite distinct. The red corpuscle tends to retract about the growing organism, and sometimes assumes a somewhat deeper, slightly brassy color. At the end of about 3 days the parasites reach a size about two-thirds that of the normal red corpuscle, while the rim of the retracted corpuscle becomes almost imperceptible. At this stage the pigment begins to collect toward a single point, usually at the center of the parasite, flowing in radial lines. The organism then breaks up into from 6 to 12 radially arranged leaflets, surrounding the central pigment like a roset. Finally, the surrounding shell of red blood-corpuscles ruptures and the separate segments spring apart, appearing as small, round, colorless bodies. These represent complete young parasites, and immediately attack new red blood-corpuscles, to pursue again their cycle of existence.

Not all adult bodies undergo segmentation. Some become vacuolated and fragmented, a process indicative probably of degeneration. From other full-grown bodies there are developed, at

times, actively motile filaments (flagella), which will be spoken of later.

2. **The Tertian Parasite.**—The tertian parasite, like the quartan, exists in the blood in great groups. Its life cycle, however, lasts but 48 hours, so that sporulation occurs every other day. Infections with 2 groups of organisms segmenting on successive days are common, the disease assuming a quotidian or daily type. Infections with multiple groups, causing irregular or continued fever, occur, but are rather uncommon.

The tertian parasite shows certain morphologic differences from the quartan organism. In the early stages the parasites are more actively ameboid; the pigment granules are smaller, more motile, and show less tendency to accumulate about the periphery of the body. The parasite is paler and less refractile, and at maturity reaches a larger size. The surrounding corpuscle expands with the growth of the parasite and becomes progressively decolorized. At segmentation the pigment does not flow in toward the center in such characteristic radial lines as in the quartan organism, when the number of segments is materially larger, ranging usually from 12 to 20 or even 30.

3. **The Estivoautumnal Parasite.**—This variety is responsible for the more serious, more chronic, malignant or pernicious forms of malaria. The estivoautumnal parasite differs from the tertian in that the regular arrangement in groups is less frequent. When this is the case at the beginning of an attack, multiple groups, as a rule, rapidly appear, resulting often in the development of irregular or continued fever. The parasite of estivoautumnal fever is smaller than the tertian or quartan organisms, and, as a rule, only the earlier stages are to be found in the peripheral circulation. The later stages and segmenting forms are to be found only in internal organs, especially the bone-marrow, spleen, or, in some pernicious cases, in the brain or intestine. The earliest stages are represented by very minute, colorless bodies, which often are sharply refractive, and frequently assume a ring-like appearance. Commonly, these ring-like forms show rapid transitions into disc-like or actively ameboid bodies. The amount of pigment contained is relatively slight, the earliest granules being so minute as to be almost imperceptible. At full development the parasites may be no more than half the size of a red corpuscle. Segmentation occurs in the same manner as in the tertian parasite.

A certain number of full-grown forms do not, however, segment, but accumulate larger, coarser, pigment granules, and develop gradually into an ovoid or crescentic shape, about which the rim of the red corpuscle may, with difficulty, be distinguished. Usually only a bit of red corpuscle is visible, hanging from the concave side of the crescent. At times these bodies may be seen to change into round forms with a central clump or ring of pigment.

The Flagellate Forms (Gametocytes).—In all three forms of parasites delicate motile filaments may develop from certain full-grown forms. In the estivoautumnal organism these come only from the round bodies derived from crescents. Their appearance is preceded by extremely active dancing movements of the pigment granules, after which suddenly from 1 to 4 of such filaments, 2 or 3 times the length of the diameter of a red cell, break out from the periphery. These are at first attached to the mother body, but often break loose and swim about with active serpentine motion. In several instances these bodies have been observed to penetrate other full-grown parasites. The significance of flagellate bodies has long been a question of dispute. The remarkable observations of McCallum, however, make it extremely probable that they are sexual elements, the penetration representing a process of fecundation. It is apparently only these fecundated bodies which are capable of undergoing further development within the stomach-wall of the mosquito.

Symptoms.—The symptoms of malarial fever differ according to the species of parasite with which the individual is infected.

Quartan Fever.—In infections with a single group of the quartan parasite the symptoms consist of regularly intermittent paroxysms occurring every fourth day at nearly the same hour. The paroxysm consists of 3 stages: (1) Chill; (2) fever; (3) sweating. The entire duration of the fever, which begins often before or during the chill, amounts to as much as 10 to 12 hours in severe cases. The chill varies greatly in intensity, and may be entirely absent, though chilly sensations are present in over 95 percent of the cases. This is followed by a sensation of extreme heat, which may last from but a short time to several hours. Both stages are often associated with severe headache, pains in the back and extremities, nausea, vomiting, and sometimes diarrhea. The febrile stage is usually succeeded by profuse sweating, the temperature rapidly falling, generally to a subnormal point, the patient experiencing great relief from all his symptoms. Between paroxysms the temperature is usually subnormal.

Infections with 2 or 3 groups of parasites following on different days, resulting in paroxysms occurring on 2 successive days, with a day of intermission between, or in daily paroxysms are common. Occasionally irregular or continued fever, as a result of infection with multiple groups of parasites, may be present.

Tertian Fever.—The paroxysms here occur every other day. Infections with 2 groups of tertian parasites are very common, resulting in daily paroxysms. Multiple infections with irregular fever are rare.

Tertian and quartan fever are the commonest types in temperate climates, and in the more severely malarious regions prevail during the healthy season.

Estivoautumnal Fever.—Estivoautumnal fever is the prevailing type in the severely malarial districts of the tropics, and occurs in temperate regions only at the height of the malarial season. The manifestations differ from those of tertian and quartan fever, (1) in that the paroxysms are, as a rule, much more irregular; (2) they are much

longer in duration; (3) the chills are more frequently absent; (4) the fever is often irregularly intermittent, remittent, or continuous in character, owing probably to the presence of multiple groups of parasites.

When the fever is regularly intermittent, the paroxysms occur usually about 48 hours apart; the intervals, however, may be as short as 24 hours, and in other instances longer even than 48. As a general rule, the longer the interval, the longer is the paroxysms, which may, in some instances, last more than 36 hours. When the fever is irregular and continuous and chills are absent, the clinical picture may closely resemble that of typhoid fever.

The spleen is enlarged in all forms of malaria, and in the majority of instances it is palpable. Herpes on the lips is common. Urticarial eruptions are occasionally seen.

Pernicious Fevers.—With severe estivoautumnal infections the malarial paroxysms may assume an extremely malignant, and often rapidly fatal, form. These intense infections are often referred to as "pernicious." There are several well-recognized types of pernicious fever.

The *comatose* type is the commonest. With the onset of the paroxysm the patient becomes profoundly unconscious. Local paralyses or irritative symptoms may be present.

In other instances the pernicious paroxysm may assume an *algid*, *choleriform*, *hemorrhagic*, *sudorific*, *bilious*, *gastralgic*, or *pneumonic* type. The picture in choleriform malaria may be similar to that in Asiatic cholera.

Malarial Hemoglobinuria.—The malarial paroxysm may be accompanied by hemoglobinuria. These instances are unusual, excepting in certain very malarious tropical districts. This extremely grave condition of paroxysmal hemoglobinuria is also known as **black-water fever.** The symptom usually arises in individuals who have had repeated attacks of malaria; rarely or never does it occur with the first manifestations of the disease.

Sometimes, if the first attack is not fatal, several successive paroxysms may be accompanied by hemoglobinuria. More commonly, however, the recovery from a hemoglobinuric paroxysm is followed by at least a temporary disappearance of the symptoms of malaria. This is probably due to the fact that with the extensive blood destruction the parasitiferous corpuscles are almost all destroyed, and the parasites, being set free, are killed. Often the hemoglobinuric attack is postmalarial. In all instances the onset occurs with an intense chill, rapidly followed by the passage of deep red and then almost black urine. If death does not occur during the immediate paroxysm, it may follow shortly afterward from complete suppression of the urine, or, after several weeks, from a severe acute nephritis.

Malarial Paroxysms with Long Intervals.—Cases of malaria may occur in which the paroxysms occur at long intervals—5 or 6 days to several weeks. These symptoms, which may occur with all 3 types of infection, are due to the fact that so many parasites are destroyed at the time of sporulation that practically a new incubation period must be passed through before the number is sufficient to cause symptoms again.

Sequels and Complications.—Relapses are frequent in ill-treated malaria. They may occur after long periods—months, and even years. There is no essential difference between the symptoms of the relapse and the initial attack.

Anemia.—Owing to the destruction of red blood-corpuscles, resulting from the growth of the parasite, anemia is a common sequel. In some instances it may assume a pernicious type.

Chronic Malarial Cachexia.—In patients with ill-treated or frequently recurring infections, a condition of grave cachexia sometimes develops. There are marked anemia, enlargement of the spleen and of the liver, and a tendency toward dropsical effusions.

Nephritis.—Acute nephritis may accompany or follow an attack of malarial fever, as of any other severe acute infection. The course is usually mild, though sometimes grave chronic changes may follow.

Amyloid degeneration has been noted after long-continued and frequently recurring malaria.

There is some evidence that **cirrhosis of the liver** may follow malaria. Its frequency, however, is probably much exaggerated.

Peripheral neuritis may occasionally occur.

Complications.—Mixed Infections.—Pneumonia, typhoid fever, tuberculosis, or any acute infectious disease may complicate malaria. An individual with malarial cachexia is probably more susceptible to most acute infections than a healthy subject. There is nothing especially characteristic about the course of these cases.

Pneumonia, as a complication of malaria, pursues its usual course.

In individuals with combined **typhoid** and malarial infections the malaria usually remains quiescent during the course of the typhoid fever, reappearing again with or after defervescence. Sometimes, however, active symptoms of the two diseases may be present at the same time. These instances are, however, unusual. *There is nothing to show that the course of typhoid fever in malarious districts differs in any essential way from that in other parts of the world.*

Pathologic Anatomy.—In individuals dead from acute malaria there is more or less marked pigmentation of all the organs. The **spleen** is always greatly enlarged and soft. The other changes depend upon the especial localization of the parasites, which varies in different cases. When the **brain** is especially affected, the capillaries are crowded with parasites, actual thromboses sometimes occurring. There may be numerous punctate hemorrhages. Finer degenerative changes in the neurons themselves have been described by Monti. In other instances the organisms seek especially the mucous membrane of the **stomach** and **intestines**, resulting in great injection of the mucosa with hemorrhage and superficial ulceration. The liver is enlarged, shows great numbers of parasites and macrophages in its capillaries, and often areas of focal necrosis not dissimilar to those seen in other

acute intoxications. Similar areas are to be found in the **spleen** and the **bone-marrow**, where great accumulations of parasites and pigment are also to be found.

In chronic cases the spleen is enormously enlarged and shows extensive fibrous changes. Similar changes are sometimes to be found in the liver and bone-marrow.

Diagnosis.—In most instances the diagnosis of malaria is simple, and based upon the nature of the paroxysms—chill, fever, sweating—and their characteristic periodicity.

Chills and fever, however, do not of necessity mean malaria and a positive diagnosis is only to be made by an examination of the blood and the discovery of the parasites. Examination of the blood is, perhaps, best made with the fresh specimen though the examination of dried and stained blood films, prepared according to the ordinary methods, is also satisfactory.

The disappearance of the symptoms under treatment with quinin is strong confirmatory evidence that the process is malarial.

In instances of continued or remittent fever the process may so far simulate typhoid that the distinction is impossible without an examination of the blood or the therapeutic test.

Prognosis.—In temperate climates the prognosis is almost always good. This is always true with tertian and quartan fever. In estivoautumnal fever there is always a certain danger that pernicious symptoms may appear.

Pernicious Malaria.—The prognosis, when pernicious manifestations appear, is always very grave. In the comatose cases death may occur a week or more after the beginning of treatment, when the blood is entirely free from parasites, a result, apparently, of the grave anatomic and chemic changes produced by the acute infection.

Hemoglobinuria.—The prognosis in hemoglobinuria, occurring with or after malaria, is always grave.

Prophylaxis.—Since extermination of the mosquitos belonging to the genus anopheles means the wiping out of the disease, attempts should be made to destroy the larvæ by disinfection (with kerosene) and drainage of the breeding places, and by removal of stagnant water. See DISINFECTION.

Mosquitos should be excluded from houses by wire netting. Careful screening of the malarial patient is important, in order to prevent infection of mosquitos. Exposure after nightfall should be avoided since the mosquito is chiefly nocturnal in its biting habits. Quinin has been proved to be of decided value as a prophylactic and 5 to 10 grains should be taken daily by new arrivals in malarial districts and also at intervals by the residents. Arsenic and iron are advocated by some observers as prophylactics; their value, however, probably lies in their increasing the quality and quantity of red blood-corpuscles.

Treatment.—In every case of acute malaria the patient should, if possible, be compelled to give up his occupation for at least 2 days. He should have physical and mental rest. If there is constipation, a purgative should be given. Medicinally, the treatment is simple and absolutely satisfactory, consisting in the administration of quinin. At present quinin or some salt of the alkaloid is used in malaria instead of preparations of cinchona, and the various methods of using this drug are described by Stitt as follows:

By Mouth.—This is the usual method and is the one to be preferred in all cases where other methods of administration are not necessitated. It is usual to give the quinin in capsules or cachets, the pills and tablets being often so hard that they do not dissolve in the alimentary tract. The method usually in vogue in military services is to give quinin sulphate in acid solution. This method is trying to the stomach.

By Subcutaneous Injections.—This method is liable to be followed by necrosis and abscess formation or fibrous indurations. Quinin and urea hydrochlorid is preferable either for subcutaneous or intramuscular injection. The present view is that subcutaneous injections deserve condemnation.

Intramuscular Injections.—Many prefer this method to the subcutaneous. It is best to inject the solution into the gluteal muscles above the ischial tuberosities. Of course in the use of quinin salts through the medium of the hypodermic needle everything must be aseptic and the skin of the patient painted with iodin.

Intravenous Injections.—Bass and many others think that when quinin cannot be administered by mouth it should be given intravenously. Not only is there the objection of inflammatory reactions or necrosis when the drug is given subcutaneously or intramuscularly but the absorption of the drug is so slow that the patient may die before we obtain the desired effect. Ross condemns the subcutaneous method and recognizes the advantages of the intravenous method over the intramuscular one when rapidity of action is desirable. In giving quinin intravenously Bass thinks that 10 grains at one time is sufficient and that a 20-grain dose is not without danger. When used in cerebral malaria he repeats the 10 grains intravenously in 8 hours if the drug cannot then be given by mouth. Bass thinks that theoretically amyl nitrite might relax the cerebral capillaries which are obstructed by parasite-infected red cells and thus enable the quinin in the circulation to reach such cells. The best known method of administering quinin intravenously is that of Bacelli. In this method 1 gram (15 grains) of a soluble salt of quinin is given in 10 c.c. of water. MacGilchrist has shown experimentally that such a strength of quinin (1 : 10) will coagulate blood serum. In Stitt's opinion this is a dangerous method and should not be used. There is no doubt as to the necessity for using the intravenous channel in cerebral or algid types of perniciousness when intramuscular injections do not give results. The generally accepted method is to use a salvarsan technic with a dilute solution of quinin, giving 1 gram (15 grains) of some soluble salt of quinin in 250 mils salt solution. MacGilchrist considers the very soluble acid salts as hemolytic and prefers to give quinin base—3 pints of a solution of the alkaloid, containing about 12 grains. Some authorities recommend the administration

per rectum of a soluble salt of quinin in about 3 times the usual dose by mouth or hypodermically. It is considered applicable in cases where there is marked vomiting. It certainly is the least satisfactory way of giving quinin.

Dosage and Length of Treatment.—In Panama the standard treatment is to give from 3 to 5 grains of calomel followed by 2 ounces of 50 percent magnesium sulphate. So soon as the diagnosis is made give 15 grains of quinin 3 times daily (45 grains in 24 hours) and continue such treatment for a week or until the temperature has been normal for 5 or 6 days. Then give 10 grains 3 times daily for 10 or 12 days. Tonics of iron, arsenic and strychnin are valuable in treating the anemia, but it is not advisable to add small doses of quinin to such tonic mixtures. In Nocht's method we give the quinin in small doses repeated several times in the day, as 3 or 4 grains given 5 or 6 times daily. Such treatment is thought advisable when there is a tendency to hemoglobinuria or when giving quinin to pregnant women. There is frequently hesitancy in giving quinin to pregnant women but unless the malaria is controlled the patient will be apt to abort. Potassium bromid is thought to control the ecbolic influences of quinin. In a benign malarial infection Manson prefers to wait until the hot stage has been passed and the patient is beginning to perspire, his idea being that the headache and other symptoms are aggravated and that very little advantage is gained by treatment during the early part of the paroxysm. He gives 10 grains at the onset of the sweating stage and afterward 5 grains, 3 or 4 times daily, for the following week. He then gives a daily tonic containing arsenic and iron, with a quinin treatment every seventh day for about 2 months. For regularity he advises the quinin treatment on Sunday giving a dose of salts in the morning followed by three 5-grain doses during the day. Manson notes the danger of large doses of quinin as producing not only serious disturbances of sight and hearing but pronounced cardiac depression as well. There are many who speak highly of Warburg's tincture in treatment. It is both laxative and sudorific. The dose is 1/2 ounce (15 mils) which contains about 5 grains of quinin sulphate and 4 grains of extract of aloes. As a rule, it is better to give the quinin and the laxative as such. More recently the tendency has been to give large doses of quinin, not only for its greater curative value but, as well, for the prevention of relapses. Craig, however, states that in his experience with estivoautumnal infections he has yet to see a single case, in which treatment was promptly instituted, that did not recover with a daily treatment of 30 grains.

Drugs Other than Quinin.—Salvarsan and neosalvarsan have been extensively used and with some success in benign infections but without material effect in malignant tertian ones. Some have thought that salvarsan aided the specific action of quinin. It has been claimed that radium and X-ray treatment, when directed to the spleen, assist the action of quinin. Methylene blue, next to quinin, has been considered as the most valuable drug. It is given in 2-grain doses every 4 hours. Surveyor has recommended picric acid in the treatment of malaria in doses of 2 grains 2 or 3 times daily. Recently hectin, a remedy somewhat similar to the cacodylates, has been strongly recommended by the French. It is given intramuscularly in 2-grain doses. It is said to be valuable when there is a leukopenia as it has a tonic action. It has been recommended to combine this treatment with quinin. It is said to be a good substitute for quinin in "blackwater fever."

Treatment of Hemoglobinuria.—The treatment of hemoglobinuria depends upon its relation to the malarial paroxysm. If acute malaria exists, as revealed by the presence of actual parasites, quinin should be administered intravenously or hypodermically. On the disappearance of the parasites it is advisable to reduce the quantity of quinin, continuing treatment as in any other case. If the parasite is absent, the case should be treated symptomatically—with rest and careful diet and tonics. Recrudescence of malarial paroxysms after an attack of hemoglobinuria should be treated in the ordinary manner. See BLACKWATER FEVER.

The treatment of the various sequels of malarial fever presents no special points.

Arsenic has a well-established reputation in the treatment of the grave **postmalarial anemias** and **cachexias.**

℞.	Arsenic,	gr. $\frac{2}{3}$
	Quinin,	gr. xl
	Reduced iron,	ʒij
	Extract of gentian,	q. s.

Make 30 pills or capsules. One pill or capsule after each meal.

The new arsenical compounds, especially sodium cacodylate, are recommended.

In some of these instances the removal of the patient to a healthy region where there may be no danger of a reinfection may be imperative.

MAL DE MER.—See SEA-SICKNESS.

MALE FERN.—See ASPIDIUM.

MALIGNANT EDEMA.—See GANGRENE.

MALIGNANT PUSTULE.—See ANTHRAX.

MALINGERING.—The feigning of disease. The simulation of various morbid conditions is common. There are many cases of professional malingering, principally encountered by street car, railroad and accident insurance companies. The surgeon of the army, or navy, or prison must especially be on his guard against malingering. In the voluntary and short service attempts are not so usual. Headaches, rheumatism, colic, diarrhea, and other more or less subjective affections are complained of. In continental armies, mutilation and resort to imitation of chronic diseases are comparatively common. To avoid conscription, an infinite variety of artifices is resorted to. Functional affections so closely simulate organic disease that suspicion is often disarmed. Hysteria or neurasthenia explains the greater number of cases, a deranged nervous system being responsible. In these cases the simulation may be

voluntary. In other cases the patient may voluntarily exaggerate symptoms or add new ones to those already present. In a third group of cases fraud is attempted, through some strong motive, by deliberate simulation of an injury or disease. Paraplegia, incontinence of urine, joint affections, in short, almost any disease which does not admit of palpable objective demonstration, may be feigned. A sudden shock, the pressure of poverty, or the absolute necessity for immediate exertion will often effectually and permanently arouse a bedridden hypochondriac of years, and restore him to usefulness and his friends.

When face to face with the deliberate malingerer, natural cunning must be overcome by the superior sharpness of science. Incontinence of urine, dysentery, hemoptysis, jaundice, and insanity are among the most favorite rôles of such persons. The yellow conjunctivæ of jaundice can hardly be feigned; incontinence of urine is often found attended by an expulsive effort; blood from the lungs is not always mixed with pulmonary mucus, and blindness, deafness, or paralysis are not always proof against some shock or mental impression. A blood test will determine whether an anemia is genuine or not. The X-ray will expose a feigned fracture. Skin lesions deliberately produced can be detected by the application of a fixed plaster-of-Paris dressing. Simulated cancer is readily disproved by microscopic examination. The stethoscope and absence of bacilli and fever will expose feigned tuberculosis. Epilepsy that is simulated may be detected by a hypodermic of apomorphin or a pinch of snuff. Feigned blindness and deafness may be discovered by special tests. See Blindness, Ear (Examination). Electricity may clear up apparently anomalous nervous symptoms; the stethoscope and sphygmograph record the actual condition of the heart. Administration of chloroform or ether will expose feigned contractures, wry neck, paralysis, as well as unconsciousness. Simulated unconsciousness, or anesthesia, may be detected by the electric current. Subjective sensations are hard to detect, and it is often well to give a patient the benefit of the doubt.

MALLEIN.—See Glanders.

MALLET FINGER.—See Baseball Finger.

MALPRACTICE.—A term applied to the treatment of a disease that is contrary to that taught by experience, or a failure on the part of a medical practitioner to use such skill, care, and judgment in the treatment of a patient as the law requires; and thereby the patient suffers damage. If due to negligence only, it is *civil malpractice.* But if done deliberately, or wrongfully, or if gross carelessness or neglect have been shown, or if some illegal operation (such as criminal abortion) be performed, it is *criminal malpractice.* See Abortion.

MALT.—The seed of common barley, germinated until the maximum amount of diastase, the ferment that converts starch into grape-sugar, is developed. It is nutritive and valuable also, for the diastase, which aids in the digestion of farinaceous foods. It is employed in wasting diseases, preferably mixed with milk. Many popular "foods" consist mainly of granulated extract of malt. **M. Ext.,** the soluble principles of malt, mainly diastase and glucose, in a concentrated form, unfermented. Dose, 1 to 8 drams. **M. Liquors,** fermented and clarified solutions of malt that have been subjected to vinous fermentation, hops being added to prevent acetous fermentation subsequently. *Beer* is made by a comparatively slow fermentation, and contains about 2.5 percent of alcohol. *Ale* and *porter* are fermented more rapidly, and contain about 4.7 percent of alcohol. The malt used in making porter is browned, giving the liquor a darker color. Malt liquors contain about 5 percent of albuminous matter, 2 of phosphates, and 1 of carbon dioxid.

MALTA FEVER. Synonyms.—Mediterranean Fever, Neapolitan Fever, Rock Fever, Undulant Fever. An endemic fever observed along tropic or subtropic sea coasts or river banks, of irregular course, with undulatory pyrexial relapses, profuse sweats, rheumatic pains, arthritis, and enlarged spleen. It occurs chiefly in the countries bordering on the Mediterranean Sea. A number of cases have been observed, however, in Porto Rico, Cuba, the Philippine Islands, etc. The disease attacks most frequently the young.

Etiology.—The cause of this infectious disease, the micrococcus melitensis, discovered by Bruce, is found in the spleen. It generally occurs singly, occasionally in pairs, or in chains, is aerobic and nonmotile, although according to some observers it has one or several flagella, and grows fairly well upon the ordinary media such as agar. Pale colonies are observed in about three days.

In most cases infection can be traced to goat's milk, but not always. Even mere contact with the infected goats or with their blood may transmit the disease. Laboratory infection seems to occur more readily with Malta fever than with glanders of plague. A case is reported in which the probable source of the contagion was the patient's habit of laying his cigarette from time to time on his work table.

Symptoms.—After an incubation period of about a week the disease develops gradually, the onset being marked by headache, anorexia, insomnia, and lassitude. The disease is of long and indefinite duration. The undulations of pyrexial intensity are the most constant and characteristic feature of the disease. Constipation, profuse perspiration, and frequent symptoms of neuralgic and of arthritic nature accompany its course. There is enlargement of the mesenteric glands. The spleen, too, is enlarged and softened after death, and many of the other organs are congested, but Peyer's patches are not enlarged or ulcerated, and ulceration is not present in other parts of the small intestine. There are no red spots.

Diagnosis.—The disease may be overlooked because of its infrequency. It may be differentiated from typhoid fever by the negative Widal test, by the study of the temperature chart, from malarial fever by the absence of the plasmodium of malaria in the blood and by the therapeutic

test. A most valuable means of diagnosis is the agglutination test—the serum of the patient's blood reacts upon fresh cultures of the micrococcus melitensis. The blood is allowed to stand for 24 hours, the serum pipeted off, and it is diluted to a given degree, say 1:11, with distilled water, or even 1:22, with normal saline solution, and added to some of the pure culture of the micrococcus. In distilled water the micrococcus retains its motility and does not clump for an indefinite time. With serum from a typhoid patient no reaction occurs. A control test should be made with normal blood serum from a healthy person.

Treatment.—The general measures indicated for typhoid fever are advised. An initial dose of calomel or castor oil should be given. Food should be liquid during the febrile period, and either the cold bath or pack used every time the temperature reaches 103° F. Symptomatic treatment is otherwise indicated. No drugs have any special influence on the fever. Serum therapy does not seem very promising. One case, however, is reported to have been cured by the administration of Malta fever antitoxin. During convalescence iron and plenty of nourishing food are indicated. A change of climate may promote convalescence.

MAMMARY ABSCESS.—See BREAST (Diseases).

MANGANESE.—Mn = 54, quantivalence II, IV. A silver-white metal having the general properties of iron. It is used in medicine and pharmacy in the form of oxid, sulphate, permanganate, and hypophosphite.

Therapeutics.—The salts of manganese in small doses improve the appetite and the digestion and stimulate the action of the heart. Potassium permanganate is a powerful oxidizing agent, and hence is actively antiseptic, disinfectant, and deodorant; but its germicidal power is limited. It is considered by some authorities to be an efficient emmenagog. Used internally, it is probably not absorbed in its own state.

The salts of manganese are used in amenorrhea, gastrodynia, and pyrosis, and in many skin-diseases and in jaundice. Manganese is becoming more of an acknowledged remedy in derangements of the menstrual function, as irregular or scanty menstruation, amenorrhea, menorrhagia, and even metrorrhagia. The best preparation is the dioxid, in freshly made pills of 2 grains each, of which 1 to 5 pills may be taken twice or thrice daily.

Potassium permanganate has generally been the preparation given when the effects of manganese were desired; but it is a difficult matter to get patients to take it for any length of time. It is employed as an antiseptic and oxidizing agent in such affections as diphtheria, scarlatina, septicemia, erysipelas, etc., in which it may be given internally and used locally at the same time. It is given with apparent benefit in dyspepsia, flatulence, lithemia, and obesity, and has often seemed to be of service in acute rheumatism. In amenorrhea it is reported to be very efficient, and has lately been used with success as a remedy for the bites of venomous serpents and for other animal poisons. For internal use the drug should be given in pill, as the taste of a solution is very disagreeable. Locally, it is frequently employed (1 dram to the pint) to correct fetor in cancer, ulcer, caries, abscesses, ozena, and it will destroy the odor of a foul breath or that of the fetid perspiration of the feet. It is used both as a test and as a corrigent for organic impurities in drinking-water. The stain left on fabrics may be removed by sulphurous acid, but, as sulphuric acid is formed in the reaction, the fabric should be immediately washed or rinsed in water. Potassium permanganate has lately come into use as an antidote against morphin or opium in the stomach. It exerts no oxidizing effect, in the presence of albumin, on atropin, hyoscyamin, hyoscin, caffein, cocain, aconitin, veratrin, pilocarpin, muscarin, or phosphorus (Murrell).

Preparations.—**M. Dioxidum Præcipitatum,** is chiefly manganese dioxid, MnO_2, with small amounts of other oxids of manganese, a heavy, fine black powder, odorless and tasteless, insoluble in water or alcohol, giving off oxygen gas at a red heat, and if heated with hydrochloric acid it causes the evolution of chlorin gas. Dose, 2 to 10 grains. **M. Sulphas,** colorless prisms, of slightly bitter and astringent taste and faintly acid reaction, very soluble in water, insoluble in alcohol. Dose, 2 to 6 grains. **Potassii Permanganas,** deep, purple-violet prisms, of sweet and astringent taste, neutral reaction, soluble in 16 parts of water with a scanty, brown residue, decomposed by alcohol and heating to 464° F. It should be kept in well stoppered bottles, and should not be triturated or combined in solution with organic or readily oxidizable substances. Dose, 1/2 to 2 grains in pill. For the **Hypophosphite,** see PHOSPHORUS.

MANIA.—A form of insanity marked by great exaggeration of nervous action. It may occur suddenly or follow an attack of melancholia. The patient presents an infinite variety of moods, is the subject of hallucinations and illusions, often shows a tendency to destroy what he comes in contact with, and is untidy; there is a marked change in character and decided insomnia. There is rapid and progressive emaciation. The brain is found to be in a hyperemic condition. The disease is probably due to a loss of the inhibitory action of the highest controlling centers of the brain. Mania is most common in young adult life. Heredity is a strong predisposing cause, while mental strain, bereavements, shocks, and alcoholism may act as exciting causes.

Varieties.—**Acute delirious mania,** typhomania, is a psychosis of sudden onset, attended with increased bodily temperature, and marked by delirium with sensuous hallucinations, marked incoherence, restlessness, refusal of food, loss of memory, and rapid bodily wasting, terminating frequently in death.

The term **menstrual mania** is often used for attacks of mania occurring at the menstrual epoch. Homicidal, suicidal, and various hysteric impulses are common.

Mania-a-potu is an attack of acute delirium during a debauch, or in those who have drunk

heavily and eaten little for a comparatively short time. See ALCOHOLISM.

Asthenic mania is mania in which there is a general anemia associated with neurasthenic symptoms. See HYSTERIA, NEURASTHENIA.

Dancing mania is a hysteric mental state in which, through sympathy and imitation, dancing of a most grotesque and extravagant character occurs. Usually epidemic.

Delusion mania is the result of fixed delusions, either causing or associated with the maniacal outbreak. See DELUSION.

Erotic mania, erotomania, presents systematized delusions of an erotic character, not necessarily accompanied by animal sexual desire.

Nymphomania is a morbid, irresistible impulse to satisfy the sexual appetite, peculiar to the female sex.

Epileptic mania follows an epileptic paroxysm, and is often of a most violent kind, the maniacal acts being of the most treacherous and malicious character. See EPILEPSY.

Hallucination mania presents visual, olfactory, and other sense hallucinations. See HALLUCINATION.

Homicidal mania is any variety of mental disease in which there is a desire or an attempt on the part of the patient to commit murder. The condition may be the result of delusions that the persons attacked either are persecuting or going to kill the patient, or of the excessive excitement that vents itself in destructiveness, combativeness, or desire to kill; or there may be a morbid desire, impulse, or craving to do murder, or the homicidal act may be unconsciously done during an acute delirium or a paretic or epileptic maniacal impulse.

Morphinomania is the insane craving for the stimulating action of morphin—a moral insanity. See OPIUM.

Puerperal mania is the maniacal outbreak occasionally seen in puerperal women. This is now thought to be of septic origin, although the mental strain through which the female has been passing is a predisposing factor.

Recurrent mania, or chronic mania, with lucid intervals of longer or shorter duration. Generally of alcoholic origin.

Transitory mania, or ephemeral mania, is a rare form of maniacal excitement, of sudden onset, violent and decided in character, accompanied by great insomnia, incoherence, and more or less complete unconsciousness of familiar surroundings. The attack as suddenly terminates, the duration being from a few hours to a few days.

Senile mania is the mental exaltation occurring in persons with senile arterial changes or senile cerebral atrophy. It is soon followed by dementia.

Prognosis.—In about 50 percent of the cases of acute mania not due to organic disease, the patients recover after periods varying from 1 month to several years. A fair proportion make a partial recovery and are able to return to their work, but always showing some alteration in character or affection or some eccentricity or a slight mental weakness. About 20 percent terminate in dementia or mental death, and this is always the fear in each case. Two percent die, either the result of exhaustion or from the organic condition causing or associated with the attack. The question of recovery, partial or complete, is always difficult to determine, depending upon the cause, temperament, disposition, education, nationality, and the normal mentality of the individual. Recovery is usually gradual; rarely sudden restoration occurs.

Treatment.—Persistent administration of drugs appears to have a deteriorating influence on the nerve-centers and their routine use is condemned. It is not advisable to restrain disorderly actions by mechanic means. The best measure to adopt in acute mania is to get the patient to be in the fresh air and work off as much excitement as possible by muscular exercise. Walking a patient about all day will often prove the best hypnotic, and sleep obtained in this way is more valuable than that procured through drugs. In acute cases forced feeding is sometimes necessary, and it is important that abundant nutriment be introduced into the system. Stimulants are often useful, and should be given with food. A dry tongue is an indication for pushing the administration of food and stimulants. Acute mania is with difficulty treated at home, and it is generally necessary to remove the patient from his home surroundings and sympathetic friends. Moral treatment is far more efficacious than drugs in acute mania. In acute delirious mania the great effort should be to produce sleep by various methods. Opium must not be given, as it may produce a slight narcotism for a short time only, and, if the dose is increased, narcotic poisoning and death ensue. Hyoscin finds its greatest and most useful application in maniacal violence and noisiness. Coniin, 1/2 to 3 minims, or 1/10 of a grain hypodermically, conjointly with morphin, is used in acute mania. Duboisin, 1/100 of a grain hypodermically; or 1/100 of a grain by the mouth, gradually increased to 1/30 of a grain of hyoscyamus, when there is no congestion; chloral and bromids, large doses of gelsemium, as 15 to 30 minims, stramonium, belladonna, daturin, veratrum viride, and camphor, cannabis indica, paraldehyd, and digitalis are variously useful. Tincture of iron chlorid, in 5- to 10-minim doses, is of benefit as a restorative in chronic mania. Croton oil, 1/4 to 1/3 of a minim, every hour, is used as a revulsive in mania from acute congestion of the brain. Cimicifuga is often efficient in puerperal mania or that of a pregnant condition. It may be necessary, to temporarily control violent cases, to employ chloroform by inhalation. The cold douche applied to the head while the patient's body is in a warm bath is of service in maniacal delirium. In congestive cases, ice may be applied to the head. Galvanism is also applied to the head and cervical sympathetic region in chronic mania. See DELIRIUM.

MANNA.—The concrete, saccharine exudation of *Fraxinus Ornus*, the flowering ash, and other trees. It contains from 40 to 90 percent of *mannit*, or manna-sugar, which does not undergo vinous fermentation, and is chemically allied to the alcohols and to glycerin. It also contains glucose, mucilage, some acrid resin, and a small

quantity of the glucosid, *fraxin*. There are no official preparations, but manna itself may be given in doses of 1 to 8 drams. Manna is a mild laxative, with some tendency to produce flatulence and colic. It is usually combined with other purgatives, as senna, rhubarb, and magnesia, to disguise the taste and increase the effect. It is a constituent of the official infusum sennæ compositum. Manna may be administered dissolved in milk.

MARASMUS (Infantile Atrophy; Simple Wasting).—The form of wasting termed marasmus is a nutritional disorder, and occurs independently of any constitutional disease, as tuberculosis or syphilis, in which diseases, of course, an extreme condition of wasting is seen.

Etiology.—Marasmus occurs in bottle-fed babies. It is rare in country children, and in those in the city who have good care and hygienic surroundings, but is common in dispensary practice, among the poor and neglected. The principal causes, therefore, are improper feeding, and lack of sunlight, fresh air, and healthful surroundings. Excepting the atrophied condition of the muscular system, there are no characteristic pathologic lesions. All the organs after death may be found in an apparently normal condition.

Symptoms.—The symptoms are those of starvation—the child steadily loses weight and strength. The eyes are large and sunken, the fontanels usually open, the skin becomes wrinkled and hangs from the bones in folds, and the child presents an old appearance. The appetite, which early may have been good, diminishes, and after a time becomes nearly lost. In other cases it is irregular, being ravenous at times. The bowels may be normal, but are more often constipated or irregular, and contain a large proportion of curds. Vomiting at times is a prominent symptom. The child is usually listless or apathetic. The temperature is generally subnormal (96° to 97° F. per rectum). Unless arrested by treatment, the course is steadily downward, death occurring from the extreme degree of malnutrition or exhaustion, or from an intercurrent disease.

The prognosis in a child under 6 months old is very unfavorable, and even while they are improved by treatment, relapses are likely to occur. Older children more frequently recover.

Treatment.—Hygienic treatment is important, and consists in daily bathing, massage with oil, warm clothing, and, if the temperature is subnormal external heat by hot-water bottles, etc.

In order to expand its lungs the child should be made to cry once or twice a day by mild flagellation or alternate hot and cold baths.

The principal treatment is the institution of proper feeding. When practicable, wet-nursing will be the best means of giving nourishment, but in cases in which this method cannot be used, a properly modified milk diet must be given. No set rules can be laid down for all cases, as the digestive powers will be found to vary, but generally a mixture, such as that given below, will be found to agree with a weak child 4 or 5 months old:

℞. Cream, Whey, Water,	each,	℥ j
Sodium bicarbonate,		gr. x
Milk-sugar,		1 teaspoonful.

This may be partially peptonized by adding extract of pancreatin, or peptogenic milk powder, and allowing to stand in a temperature of about 110° F. for 8 or 10 minutes. It should be given from a bottle every 2 hours, and as the child's digestive powers increase, the amount should be increased, and later milk substituted for the whey.

No medicines internally are of any use in marasmus, but any indications should be properly met, and it is well to begin the treatment by giving, for 2 or 3 days, mercury in small doses to clear out the intestinal tract.

℞. Mercury and chalk,		gr. ij
Sodium bicarbonate, Sugar of milk,	each,	gr. xij.

Mix and make 12 powders, and give 1 every 2 hours until 4 are taken, repeating daily for 3 days, and giving every morning following about 1/2 a teaspoonful of magnesia dissolved in milk or water.

The child should be weighed regularly, as this is the only reliable means of judging as to its progress. See INFANT FEEDING, MILK (Modified).

MARJOLIN'S ULCER.—An epithelioma developing from the edge of a chronic ulcer or an old scar. It is very painful and secretes a foul discharge. Late in its course the anatomically related lymph nodes become affected. Diagnosis may be made by excising a piece of tissue from the margin of the ulcer and examining it with the microscope.

Treatment consists in free extirpation of the diseased area together with removal of the associated lymph nodes; and, in advanced cases in which the diseased area is upon an extremity, amputation is demanded.

MARRUBIUM (Hoarhound).—The leaves and tops of *M. vulgare*. They contain a bitter principle, *marrubiin*, and a volatile oil. In small doses hoarhound is a mild stomachic tonic; in larger doses a laxative, diuretic, and diaphoretic. It exerts a soothing effect in catarrh of the nasal passages, and is, therefore, an ingredient of various cough mixtures. Dose, 20 to 60 grains.

MARSH-FEVER.—See MALARIAL FEVER, MALTA FEVER.

MARSH-MALLOW.—See ALTHÆA.

MASSAGE.—A method of effecting changes in the local and general nutrition, action, and other functions of the body by rubbing, kneading, and other manipulations of the superficial parts of the body by the hand or an instrument. A male operator is called *a masseur*, a female operator a *masseuse*. Persons skilled in massage should have a general knowledge of the superficial anatomy of the body and the position of the chief organs. Massage means treating the soft parts, muscles, organs, etc., only, while by Swedish movements is meant the movements of the joints, as flexion,

extension, adduction, abduction, pronation, supination, traction, etc.

Metzger, of Wiesbaden, divides massage into 4 principal manipulations:

1. **Effleurage (Stroking).**—(1) With palm of one hand, used on small surfaces. (2) With palms of both hands, used on large surfaces (is most generally used). (3) With thumb or thumbs, on tendons or between muscles or small surfaces. (4) With tips of fingers, on tendons or between muscles or small surfaces. Light stroking has a soothing influence on the system; heavy stroking has stimulating influence on the superficial structures, increasing the arterial, venous, and lymphatic circulation.

2. **Frictions (Firm Circular, Semicircular, or To-and-fro Motions.)**—(1) With one hand, used on small surfaces. (2) With both hands, used on large surfaces. (3) With thumb or thumbs, used on small surfaces, as the face, below the eyes, hand, around joints. (4) With tips of fingers, used on small surfaces, as the face below the eyes, hand, around joints. This manipulation reaches deeper than the former, to the subcutaneous connective tissue and fat overlying the muscles, its aim being to transform pathologically changed parts into a condition that will permit them to be incorporated into the healthy tissues by absorption by the veins and lymphatics.

3. **Pétrissage (Kneading or Pinching).**—(1) With two thumbs, used to get the effect upon a certain small localized area. (2) With thumb and fingers. (3) With two hands, used on large surfaces. (By pinching is meant the squeezing of the muscles between the fingers and the fleshy part of the palm.) The aim of this manipulation is to reach the separate muscles or groups of muscles; to reach as deep as possible; to cause circulatory, nutritive, and alterative changes in the soft tissues within reach—muscles, tendons, organs, etc.

4. **Tapotement (Tapping or Percussing.)**—(1) Clapping, used with palms of both hands. (2) Hacking, used with ulnar border of hands. (3) Pinctating or titillation, used with tips of fingers with a shoving motion. (4) Beating, used with clenched hand, with the ulnar edge, or with the knuckles. These manipulations are mainly used on muscular parts, as the back, back of legs, gluteal region, and well-developed subjects in general.

It is well known that the circulation at the surfact is not so active as that of the interior of the body; therefore in massage effleurage is applied first in order to warm the surface—to stimulate the blood and lymph changes, to remove the old epithelial scales, that the pores and sebaceous glands may be freed from matter which causes obstruction. The frictions which are next applied reach a little deeper. Pétrissage goes below the skin and fat overlying the muscles, and reaches the muscular structures the deep-lying organs. Tapotement imparts its stimulus to the deepest structures.

General massage is useful when the nutritive functions are to be extensively stimulated, when tissue changes in the different organs are to be promoted and the excretion of waste products increased.

Local massage accelerates the circulation in the blood-vessels and lymphatics and greatly increases the nutrition in the parts, promotes excretion, makes muscles firmer, and increases muscular power. It is of especial value in infantile paralysis, in cases in which splints or supports have been worn for a long time, in hysteric affections of the joints and limbs, and in long-standing paralysis.

Massage is applied to the abdomen in cases of atonic dyspepsia with flatulent distention. In constipation a course of kneading and rubbing throughout the length of the colon may lead to regularity of action, and is of especial value in cases of fecal accumulations. See CONSTIPATION.

MASSES (Massæ).—Pill masses are official under this name. There are two official masses:

Massa Ferri Carbonatis.—100 gm. ferrous sulphate; 46 gm. monohydrated sodium carbonate; 38 gm. clarified honey; 25 gm. sugar; syrup and distilled water, each q. s. Dose, 4 grains.

Massa Hydrargyri.—33 gm. mercury; 10 gm. glycyrrhiza; 15 gm. althæa; 9 gm. glycerin; honey of rose, 33 gm. Dose, 4 grains. See PILLS.

MASSOLIN.—A pure culture of the bacillus bulgaricus of Massol. The culture has the tendency to prevent the growth of pathogenic and pyogenic organisms. It is recommended in suppurative conditions.

MASTIC (Mastiche).—A concrete, resinous exudation from *Pistacia Lentiscus*. Alcohol dissolves about 90 percent, including the resin, *mastichic acid*, the remainder consisting of another resin, *mastichin*, which is soluble in ether and resembles copal. There are no official preparations, but mastic is an ingredient of the official Pil. Aloës et Mastiches. Dose, 20 to 45 grains.

Mastic was formerly used for supposed properties analogous to those of other oleoresins, but its application is now confined to dentistry, being employed as a temporary filling for carious teeth. A solution in ether is applied on cotton with moderate pressure, and remains as a firm plug after evaporation of the solvent.

MASTITIS.—See BREAST (Diseases).

MASTOID DISEASE, AND OPERATION.—See EAR (Disease of Middle).

MASTURBATION.—Production of the venereal orgasm by the hand. The evils arising from this habit have been generally exaggerated. With children, if there is any cause, such as an adherent prepuce, phimosis, or a very long foreskin, circumcision will generally effect a permanent cure. The operation makes a distinct break in the habit, and, combined with close supervision and good moral treatment, complete emancipation may be obtained. In girls cleanliness of the genital organs, with close supervision, may remove the trouble. With older girls only moral treatment will be of use. The practice is often a symptom of mental deficiency or the first indication of psychologic disturbance, and has too often been regarded as the cause instead of the result of insanity. Moral treatment failing, mechanic methods, such as tying the hands after undressing at bedtime, arranging so that the

patient does not sleep alone, or fastening a hard body, like an empty cotton-reel, over the spine, so that resting upon the back will be prevented, may be tried. Blistering the penis or labia is a severe measure, and, used alone, is not likely to be followed by any permanent benefit. Free purgation or regular emptying of the rectum, and the removal of thread-worms or anal irritation are not to be overlooked. Bad companions, filthy conversation, and impure literature are to be avoided. Open-air exercise, pushed to fatigue; plain, unstimulating food; and change of amusements and surroundings, will improve the physical tone. Drugs are not to be depended upon when there is a continual struggle between an unhealthy sexual appetite and a weakened will. Potassium bromid or sodium bromid, with potassium iodid, and cold baths, are occasionally used with benefit. Blistering of the occiput and upper cervical spine may be occasionally useful in allaying excitability of the sexual centers. It is a question whether warnings against the evils of the practice, of which nothing is known, will prevent or promote indulgence in it. Such warnings must be most judiciously administered to innocent and sensitive youths.

MATCHES, Poisoning by.—See PHOSPHORUS (Poisoning).

MATICO.—The leaves of *Piper angustifolium*, containing a crystallizable acid, *artanthic acid*, also resin, tannin, and a volatile oil. Its odor is aromatic, and its taste astringent, spicy and somewhat bitter. Dose, 1 1/2 to 1/2 drams.

Matico is an aromatic tonic and stimulant, also aphrodisiac, vulnerary and hemostatic. It acts like cubeb on the urinary passages, and is an excellent alterative stimulant to mucous membranes. It has been used with considerable success in mucous catarrhs, as gonorrhea, leukorrhea, and chronic cystitis, also in epistaxis, hemorrhoids, menorrhagia, hemoptysis, hematemesis and other hemorrhages. The under surface of the leaf is so formed as to promote coagulation of blood if applied to a bleeding surface, and is a good local hemostatic for trivial cuts or wounds.

Fluidextractum Matico.—Dose, 1/2 to 1 1/2 drams.

MATRICARIA.—The dried flower-heads of *Matricaria chamomilla*, German Chamomile. They contain 1/4 percent of a blue volatile oil, the color of which is due to *azulen*, also a bitter extractive, tannin, etc. There are no official preparations, but the flowers may be eaten or a decoction used almost *ad libitum* (average dose, 4 drams).

Matricaria is a mild tonic, in large doses emetic, anthelmintic and antispasmodic. It is much used in Germany, and in this country is a popular domestic remedy among German people, who use it in infusions as a diaphoretic. It is the *chamomilla* of the homeopaths.

MAXILLARY SINUS.—See NOSE (Accessory Sinuses)

MAY-APPLE.—See PODOPHYLLUM.

MEAL, TEST-.—See STOMACH-CONTENTS (Examination).

MEASLES (Morbilli; Rubeola).—An acute, infectious, highly contagious disease, characterized by a well-marked prodromal stage, with coryza and fever, followed by a characteristic eruption on the face and body. While probably due to a **microorganism**, the proof of this is wanting, as the specific germ has not yet been determined.

Measles occurs in wide-spread epidemics, being most common in the spring of the year. It is **contagious** from the time of the beginning of catarrhal symptoms, being most contagious during this period and while the rash is coming out. With the fading of the eruption and subsidence of the catarrh the communicability diminishes.

The duration of the infective period is about 3 weeks, or as long as the patient is desquamating or the cough remains. Children of all ages over 6 months are very susceptible to measles, and they usually contract it the first time they are fairly exposed to the contagion. Exceptions to this rule occur, some persons not having the disease, though exposed, until later life; others, notwithstanding exposure, never contract it.

One attack usually, though not always, confers immunity. Direct contact with a patient is usually necessary, the infection seldom being carried by a third person, or in fomites, the poison not having the power to cling long to clothing or apartments, as does that of scarlet fever.

The period of incubation is 7 to 14 days, and if 16 days, at the longest, elapses after exposure without the disease developing, the person may be considered safe from the attack.

The pathologic lesions of measles consist of a superficial inflammation of the skin and a catarrhal inflammation of the mucous membranes, including, in some cases, besides the conjunctiva and upper and lower respiratory tracts, which are so constantly affected, those of the middle ear, intestinal tract, and vulva as well. Sometimes in severe cases a pseudomembranous exudate is present in the throat.

Symptoms.—The prodromal or catarrhal stage is characterized by the symptoms of a "cold," with lacrimation and photophobia, coryza, and a hard bronchial or, sometimes, a croupy cough. The child is irritable and peevish. A somnolent condition is often present at this time, and in some cases a headache or earache is complained of. Rarely a convulsion marks the onset. The tonsils and fauces are usually congested, but not so severely as in scarlet fever. The cervical lymph-glands are in many cases enlarged early. The temperature during this stage is elevated, varying from 100° to 104° F., which increases until the rash is fully developed.

The symptoms mentioned, when occurring in a child, strongly suggest the probability of an attack of measles; and when on the second or third day there are seen on the hard palate papules of a dark purplish color, a diagnosis may safely be made without waiting for the eruption to appear upon the skin.

Koplik's spots—which are characteristic, minute bluish-white spots on a reddish punctate area—may be observed on the mucous membrane of the cheeks and lips, in the preeruptive stage of mea-

sles. They usually disappear when the skin eruption is at its height. The specks observed in thrush have a more yellowish center.

The eruptive stage usually begins on the fourth day, the rash appearing on the neck, forehead, trunk, and extremities, in the order mentioned, taking about 4 days to spread over these parts. The eruption consists of small papules on a slightly reddened base, and is never vesicular or pustular in character. The surface is covered in patches, which sometimes assume a crescentic shape, between which is seen the normal skin. The face, as a rule, is more generally covered than the other parts, and it has a swollen appearance, especially about the nose and eyes.

The rash remains for from 1 to 6 days—4 days on the average—and begins to fade on the parts first affected, while it may still be appearing elsewhere. By the fifth or sixth day of the disease the fever, cough, and other symptoms subside rapidly (their continuance after the rash is fully out would indicate some complication), and by the eighth or tenth day after the beginning of the prodromal symptoms the eruption, except for a mottled discoloration of the skin, which may remain for a few days or a week, has entirely disappeared, and in favorable cases convalescence is rapid. Desquamation of a fine, branny nature is usually seen following the fading of the rash.

The severity of measles markedly varies, some epidemics being quite uniformly of a mild, and others of a severe, type. Different individuals are also more or less severely affected, depending greatly upon the season of the year, the condition of the patient, and the surroundings and care. The severe cases occur more frequently among infants than among older children. In some instances there is no fever and the exanthem is trivial or even absent.

Complications and Sequels.—Bronchopneumonia is the most common complication. Catarrhal or sometimes membranous laryngitis, chronically enlarged lymphatic glands which are apt to become tuberculous, catarrhal or purulent otitis media, conjunctivitis, endocarditis, vulvovaginitis, and, especially in the summer months, intestinal disorders, as enterocolitis, are quite frequent. Keratitis and severe conjunctivitis occur among poor children and may persist for a long time. In many cases the health of the child remains impaired for a long time, and the danger of tuberculosis following measles in a delicate child should be remembered.

Diagnosis.—The fact that the patient has been exposed to the infection, or that there are other cases in the neighborhood, is always a valuable point in reaching a diagnosis in any of the contagious diseases. The marked coryza and dread of light, the erythema of the mouth and fauces, the presence of Koplik's sign, the quite uniform period of incubation, and the characteristics of the rash must all be considered. In certain mild or irregular cases a conclusion can be arrived at only after carefully weighing the symptoms as a whole.

The following table gives the principal points of difference in the eruptive diseases. See EXANTHEMS.

The prognosis in healthy children, under favorable surroundings, is good; but in tuberculous and wasted children, especially when there are serious complications and sequels, it may be of a grave or fatal character. Occurring before the fifth year, measles is a much more dangerous disease than after that age.

Treatment.—Infants and weak children should be carefully protected from exposure to measles. The patient should be isolated in order to prevent the spread of the disease. He should be placed in a large, darkened, well-ventilated room, the bed being protected from drafts by a screen, and when the laryngeal symptoms are severe, the air in the room should be kept moistened with steam. The patient should be kept in bed until the temperature has been normal for a week, and kept in the house for at least a week longer. Water or acidulated drinks, as weak lemonade, should be freely

	MEASLES.	VARIOLA.	VARICELLA.	SCARLATINA.	RUBELLA.
Incubation.....	10 days.....	12 days.....	17 days.....	4 days.....	12 days or longer.
Prodromes.....	3 days. Coryza, cough, etc. Koplik's spots.	3 days. Rigor, high fever, headache, lumbar pains.	A few hours or often none. Very slight.	24 to 48 hours. Angina, vomiting, rapid pulse, high fever.	A few hours. Slight catarrh, etc., usually enlarged cervical glands.
Character of eruption.	Bluish papules; swelling of face; discrete or confluent circular outlines.	Macules, papules, vesicles, and pustules; discrete or confluent.	Vesicles, discrete...	Erythema; scarlet color, confluent or punctate.	Papules; discrete or confluent in patches; rosy color.
Parts first affected.	Forehead, face, or neck.	Forehead.....	Face, scalp, or shoulders.	Neck, face, and chest.	Face.
Desquamation....	Furfuraceous.....	Large crusts.....	Small crusts.....	Lamellar.....	Slight, furfuraceous.
Duration.....	7 to 10 days.....	3 weeks.....	1 week.....	7 to 10 days.....	1 week.
Complications and sequels.	Eye and lungs; tuberculosis.	Larynx and lungs..	.....	Kidney, ear, and heart.	

given, as the thirst is usually great. The diet during the febrile stage should be liquid, milk being the best. There are no remedies which will cut short the attack. The treatment is symptomatic and directed toward making the patient as comfortable as possible and protecting against complications. When the case is first seen, an enema or a mild laxative, such as castor oil, to act upon the bowels, is beneficial, being careful, owing to the irritability of the intestinal tract, not to produce too marked an effect in this direction.

For the bronchial cough and the fever, the following mixture is very useful:

℞. Potassium citrate, ℥ iv
Lemon-juice, ℥ j
Camphorated tincture of opium, Syrup of ipecac, each, ℥ ij
Syrup of tolu, q. s. ad ℥ iij.

Give 1/2 to 1 teaspoonful every 2 or 3 hours.

When there are nervous symptoms, manifested by headache, restlessness, etc., phenacetin or acetanilid, 1/2 grain for each year of the child's age, given every 3 or 4 hours, will give relief.

The eyes should be bathed 2 or 3 times a day with a solution of boric acid (10 grains to the ounce) or with the following:

℞. Mercuric chlorid, gr. 1/100
Zinc phenolsulphonate, gr. iij
Boric acid, Sodium chlorid, each, gr. xv
Aqueous extract of hamamelis, ℥ v
Camphor-water, Distilled water, each, ℥ jss.

Vaselin rubbed on the edges of the lids in the evening will prevent the eyelids from becoming glued together during the night.

For the coryza:

℞. Menthol, gr. x
Liquid albolene, ℥ j.

Apply 2 or 3 times a day in the nares with an atomizer or with a piece of cotton wrapped on a probe.

From the beginning of the attack until desquamation has ceased, a warm bath (95° to 100° F.), followed by inunctions of cacao-butter, should be given daily; and when the temperature is high, sponging the body with cool or tepid water and alcohol, as in other febrile affections, may be safely practised.

The period of convalescence should be carefully watched, and the child allowed plenty of fresh air, but should be guarded against exposure to cold or damp weather.

Creosote and cod-liver oil should be given when there is a tendency to tuberculosis or when a cough remains.

MEASLES, GERMAN.—See Rubella.

MEASURES.—See Weights and Measures.

MEAT.—See Beef.

MEATUS, URINARY.—See Urethra.

MEDIASTINUM, DISEASES.—The mediastinum is the space in the thorax between the pleural sacs, divided into 2 parts: the anterior, situated before, and the posterior, behind, the heart. In the anterior mediastinum are the remains of the thymus gland and the origins of some of the hyoid and laryngeal muscles. It is narrowed at the center, and in the lower part there is some areolar tissue, together with the left triangularis sterni muscle. The posterior mediastinum is larger than the anterior, and contains the aorta, the vena azygos, the thoracic duct, the esophagus and its nerves, the trachea, the splanchnic nerves, and some lymphatic glands. A middle mediastinum is sometimes described, containing the heart and the origin of its great blood-vessels, with the bifurcation of the trachea.

Emphysema of the mediastinum is the presence of air in the cellular tissue thereof, and sometimes exists apart from emphysema of the neck. It has been found in fatal cases of diphtheria in which tracheotomy has been performed.

Inflammation of the mediastinum gives rise to 2 prominent symptoms: dyspnea and severe pain referred to the poststernal region. Physical examination does not render much aid in diagnosis. In most cases of abscess in the anterior mediastinum some history of a cause is obtainable. If not, it is very difficult to distinguish between it and an aneurysm.

Surgical treatment, to open the abscess and establish drainage, is imperative. The inflammatory action is liable to spread, and to involve the lungs or the pericardium.

New Growths.—Almost every form of morbid growth has been encountered in the mediastinum—cancer, sarcoma, osteosarcoma, enchondroma, lymphadenoma, fibrous tumors, steatoma, lardaceous and tubercular masses, and syphilitic gummata. The growth of some is more rapid than that of others, and constitutional symptoms are more pronounced in some than in others. The duration of malignant intrathoracic growths is rarely more than a year. The more prominent symptoms are the cardiac, and the development is inward rather than outward, and only rarely do the chest-walls become eroded. Derangements of the circulation give rise to phenomena of diagnostic importance. It is not from pressure alone, but also from involvement of the vessels themselves, that the symptoms arise. Hemoptysis, sanguineous effusion into the pleura, and infarcts are frequent. Febrile disturbances are not marked, if at all present, at any time. Disturbances of innervation vary in severity and in character. Neuralgic pains are very common. Cough is either reflex or from bronchial irritation. Respiratory phenomena range from paroxysms of dyspnea to orthopnea.

Treatment.—Palliation of the most urgent symptoms is demanded. Bodily rest, freedom from moral disturbances, maintenance of general nutrition, change of air and hygienic conditions, are essential. Certain symptoms call for special treatment, such as counterirritation, sinapisms, and small blisters for pain. Opium, chloral, potassium bromid, and minute doses of antimony may alleviate the distress. Chlorodyne, Hoffmann's

anodyne, and chloroform inhalations are often useful. Paracentesis may be resorted to, and iodin, chalybeates, and other constitutional methods may be employed.

MEDICINES, ADMINISTRATION.—Medicines may be introduced into the circulation by various routes, including the mouth, the stomach, the rectum, the respiratory tract, the veins and arteries, the subcutaneous cellular tissue, and the integument.

The mouth is the usual receptacle for medicines intended for the stomach, but may itself be employed for the introduction of minute quantities of powerful agents. A drop of the tincture of aconite placed on the tongue is quickly absorbed and soon manifests that fact by its symptoms. Many of the small tablets used for hypodermic administration, if placed under the tongue, are readily conveyed into the system, and, used in this way, form a very convenient means of medication with alkaloids and other active principles.

The stomach is the most convenient organ for the absorption of medicines and the one most frequently employed. After having been swallowed, the remedies find their way into the current of the circulation through the walls of the gastro-intestinal blood-vessels and the lacteals. When the stomach is empty and its mucous membrane healthy, crystalloid substances in solution pass rapidly through the walls of its vessels. *Colloid substances* (fats, albumin, gum, gelatin, etc.) require to be digested and emulsified before they can be absorbed. *Iodin* and *iodids* should be given on an empty stomach, so that they may diffuse rapidly into the blood; if administered during digestion, the acid gastric juice and the starch of the food will alter their chemic constitution and weaken their action. *Acids* should be given, as a rule, on an empty stomach, especially when they are intended to check the secretion of the acid of the gastric juice. *Alkalies*, of which sodium bicarbonate may be taken as the type, are given after meals to neutralize excessive acidity, and before meals to stimulate the acid gastric secretions. *Silver oxid* and *silver nitrate* should be administered after the digestive process is ended; if given during digestion, chemic reactions destroy or impair their special attributes and defeat the object for which they were prescribed. *Metallic salts* (especially corrosive sublimate), also *tannin* and pure *alcohol*, impair the digestive power of the active principle of the gastric juice, and should only appear in the stomach during its period of inactivity. *Malt extracts*, *cod-liver oil*, *phosphates*, etc., should be given with or directly after food, so that they may enter the blood with the products of digestion. *Bismuth* should be given before meals, as it is usually employed for its local sedative action on the gastric mucous membrane. *Potassium permanganate* should be given after meals, for in an empty stomach it would irritate the mucous membrane and might possibly produce ulceration thereof. *Arsenic*, and other irritant and dangerous drugs (the salts of copper, zinc, and iron), should be given directly after food, except when local conditions require their administration in very small doses on an empty stomach. *Morphin* by hypodermic injection should only be given when the patient is lying down, unless previously habituated to its use. *Pilocarpin*, administered to produce sweating, should be given when the patient is in bed in a warm room. *Ammonium acetate* acts as a diaphoretic when the recipient is warm in bed, but as a diuretic when the patient is in a cold atmosphere. *Sulphonal* should be given 2 or 3 hours before its hypnotic action is desired, as it is very slow of solubility and absorption (Potter).

Under some circumstances it becomes necessary to introduce medicines directly into the stomach, as in case of the patient's inability to swallow, through narcotic poisoning or other causes. The stomach-pump or the stomach-tube may then be employed to convey both food and medicine to that organ. In obstruction of the esophagus, as from stricture or malignant disease, it may become necessary to make an opening through the abdominal wall and the wall of the stomach itself. Nasal feeding, by the use of a soft catheter with a hard-rubber funnel inserted into its end, is a very efficient method of conveying liquids into the stomach. The eye end of the catheter is oiled and passed gently along the floor of the nose and down the pharynx, the fluid being then poured into the funnel. In many cases, especially insane ones, the patient will so constrict the muscles of the throat as to force the catheter into the mouth; but if it is withdrawn until nearly out of the pharynx, the presence of the fluid as it drops down will excite swallowing, and the patient may be fed as well as if the tube were in the esophagus. This method is particularly serviceable in cases of acute tonsillitis or other painful affections of the mouth and palate also after excision of the tongue, when swallowing is to be avoided as much as possible. See GAVAGE.

The rectum will absorb many substances applied in the form of enemata or suppositories. Those most suited to this route are the salts of the alkaloids in solution, especially those of morphin, atropin, and strychnin, the latter being absorbed more rapidly by the rectum than by the stomach. Acid solutions, if not too frequently repeated, are well administered by this channel. Nutritive enemata must be small, not exceeding 3 or 4 fluid-ounces, or they will not be retained. They become necessary in many cases, especially in cases of gastric ulcer, in order to afford rest to the stomach. It is often found advantageous to have the food predigested before being administered by the rectum, for which purpose pancreatin is used. See SUPPOSITORY, ENEMA.

The respiratory tract admits of the rapid absorption of medicinal substances through its extensive blood-supply. The inhalation of vapors or atomized fluids, the insufflation of powders into the nares, fauces, larynx, etc., and the use of a medicated nasal douche, are methods whereby this channel may be utilized. See INHALANT, HYPODERMIC MEDICATION, INTRAVENOUS INJECTION, INUNCTION, etc.

MEDULLARY ANESTHESIA.—See INTRASPINAL ANESTHESIA.

MEGRIM.—See Migraine.

MEL (Honey).—The substance deposited in the honeycomb by the common honey-bee, *Apis mellifica*, and a few other hymenopterous insects. It consists of a solution of cane-sugar and grape-sugar, with coloring and odorous matters. It is emollient, nutritive, and often laxative, its properties depending mainly on the character of the flowers from which it is taken. It is an excellent vehicle for expectorant gargles, etc. In pharmacy **mellita**, or **honeys**, are thick liquid preparations closely allied to syrups, but having honey as a base. There are three official honeys: **Mel**, **Mel Depuratum**, clarified honey, prepared by heating, skimming, and straining the natural product. **M. Rosæ**, honey of rose; fluidextract of rose 120, clarified honey to 1000. It is used locally as a gargle.

MELANCHOLIA.—A form of insanity characterized by depression of spirits and gloominess, without any adequate cause, the central idea being one of personal unworthiness. As the case develops, delusions, associated with illusions and hallucinations, appear, and the patient may at times show suicidal tendencies. The general nutrition suffers, and in females menstruation is usually suppressed. The usual age at which melancholia appears is during middle life. It follows any depressing cause, acting in conjunction with a strong hereditary tendency. It usually terminates in recovery, but some cases develop into dementia or mania, while others die from exhaustion or commit suicide.

Treatment.—It is generally useless to argue with a patient about the folly of his delusions or hallucinations. Removal of the condition of the brain upon which the morbid feeling depends is important. The first indication is to improve the general health and restore the exhausted nerve force by fresh air, good food, and tonics. Foreign travel is often highly efficacious, but a quiet rest at a health resort is as beneficial in most cases. Removal to an asylum is often productive of great benefit, the orderly, settled life and discipline being efficacious. Refusal to eat is often difficult to treat. It may be necessary to resort to forcible feeding 2 or 3 times daily with milk, meat-extracts, liquid custards, etc. Attention to the gastro-intestinal canal is of the greatest value, as the dyspepsia and constipation of melancholic patients are the greatest barriers to their recovery. Frequent bathing, with friction to the surface, aids in the eliminative action of the skin. Such tonics as quinin sulphate, arsenic, iron, and strychnin sulphate are all of value in building up the patient. As the strength improves, open-air exercise must be added to the other means used. Insomnia must be combated by evening bathing and feeding, and the use of trional, sulphonal, or hyoscin at bedtime. When stupor is present, the effect of the continuous electric current is often markedly beneficial.

MELANEMIA.—See Blood.

MELANODERMA or **MELASMA.**—See Chloasma, Suprarenal Disease.

MELENA OF THE NEW-BORN.—A greater or less amount of blood in the stools of children is not rare, and its presence may be due to blood having been swallowed with the milk, or from lesions in the nose, mouth, or throat. It may come from the large intestine, as in dysentery, when it is red and fluid, or from an ulcer of the stomach or small intestine, when it is black and tarry in appearance. True melena of the new-born, however, is a rare disease. It is more common in hospital cases than in private practice, occurs the first 2 weeks of life, usually the second or third day, is apparently self-limited, when recovery takes place, the course being 5 to 9 days, and after death no lesion may be found in the gastrointestinal tract to account for the hemorrhage. For these reasons it is thought to be of an infectious nature, but further than this the etiology is not known.

Symptoms.—When the hemorrhage is considerable, the child will become suddenly pale and present the symptoms of collapse. The bowel movements will consist of thick, dark blood, and may follow one another in rapid succession, the later ones consisting of bright blood. When the amount of blood lost is slight, it may be discovered only when the napkin is changed, and the little patient will retain a normal appearance. A rise in temperature (101° to 103° F). during the attack has been noticed in all cases. The hemorrhage may recur for several days, and the child is worn out by the excessive loss of blood and becomes emaciated and dies, or, when recovery takes place, convalescence is likely to be long and troublesome. The mortality rate is given as 50 to 80 percent.

Treatment.—Food should be given cold. The infant must be kept absolutely at rest, and if the body and extremities are cold, hot-water bottles should be placed about it. Morphin in minute doses, 1/1000 to 1/500 of a grain hypodermically, or 1 drop of paregoric by the mouth, may be necessary to quiet the child. One-drop doses of spirits of turpentine suspended in mucilage, given every hour, seem to have a controlling influence on the hemorrhages.

In other cases 1-drop doses of chlorid of iron have given good results. Ergotin, in 1/2 grain doses by the mouth or hypodermically, should be tried.

MEMORY, LOSS.—See Amnesia.

MÉNIÈRE'S DISEASE.—The symptom complex known as Ménière's disease is probably the result of a morbid process in the labyrinth or auditory nerve endings. It is characterized by excessive vertigo, loud tinnitus aurium, nausea, vomiting, and other phenomena. The symptoms appear at first in distinct paroxysms, ushered in by a shrill ringing in one ear, followed by pronounced dizziness. Consciousness is impaired; the skin is pale and cool, and the face is bathed in cold perspiration. The first paroxysms are of brief duration, but they may persist for years until overcome, or deafness is complete on that side.

This affection is not to be confounded with epilepsy or apoplexy. The sudden onset of the paroxysm, and the complaint of vertigo, together with ear symptoms, lead to a certain diagnosis.

Treatment.—The following remedies have been

used: Quinin, 5 to 10 grains; bromids, 30 grains; salicin or salicylates, 30 grains; digitalis, 10 minims of the tincture every 4 or 8 hours, along with counterirritation behind the mastoid, and by the continuous current. Pilocarpin, 1/8 grain or less, and ammonium bromid with ammonium chlorid, 15 grains of each, have given relief. Sometimes air charged with chloroform vapor, injected into the eustachian tube, dispels the discomfort.

MENINGITIS.—Inflammation of the membranes of the brain. The several varieties are considered below; and see CEREBROSPINAL MENINGITIS.

Pachymeningitis

Inflammation of the dura; when the external layer is primarily involved, it is termed external pachymeningitis; when the internal layer is primarily involved, it is termed internal pachymeningitis.

Etiology.—External pachymeningitis is a surgical malady, induced by fractures, penetrating wounds, and other injuries of the skull. Internal pachymeningitis is due to blows upon the head without injury to the skull. A predisposition may be created by chronic alcoholism, scurvy, nephritis, and syphilis. Chronic internal otitis and suppurative inflammation of the orbit, and inflammation in the venous sinuses, the result of a thrombus undergoing suppurative changes, may be causes.

The symptoms are very obscure, and are principally those of cerebral pressure. Persistent headache, vertigo, photophobia, anorexia, insomnia, gradual impairment of intellect and locomotion, followed by delirium and convulsions and coma, or by apoplectic attacks and paralysis, are suggestive signs in the aged, or those in whom some one of the causes of pachymeningitis is present. Circumscribed painful edema behind the ear and less fulness of the jugular of the corresponding side are indicative of thrombosis in the transverse sinus.

Diagnosis is always problematic, as the symptoms are masked.

Prognosis is most unfavorable for either form, although the course of the malady is usually slow. Surgical treatment in traumatic cases offers some hope.

Treatment.—External pachymeningitis should be treated surgically. Trephining is indicated in some cases. It is claimed that benefit has followed a thorough course of potassium iodid. In the great majority of cases, however, all that can be done is to treat the distressing symptoms. See BRAIN (Inflammation).

Simple Acute Meningitis

Under simple acute meningitis are classed those cases of inflammation of the pia not due to a specific organism, such as the tubercle bacillus. The affection is most common in children.

Etiology.—Meningitis may follow traumatism of the skull and sunstroke. It also occurs secondary to the infectious diseases, such as pneumonia, scarlet fever, variola, influenza, acute nephritis, or rheumatism, and may result from purulent otitis media, caries of the small bones of the skull, or erysipelas of the head. Some cases are idiopathic, the cause not being apparent.

Pathology.—The cerebrospinal fluid is increased in quantity, and there is an inflammatory condition of the pia, also of the dura and the gray matter of the brain. When the disease continues for a considerable length of time the membranes become thickened, and the pia becomes adherent to the cortical substances. The inflammation may be nonpurulent, but in severe cases pus is found in the pia, the subarachnoid spaces, and over the convolutions of the brain. When recovery takes place the exudate is absorbed, but the membranes may remain thickened and adherent.

Symptoms.—The disease usually comes on gradually, and is indicated by a feeling of malaise, headache, nausea, and vomiting, which symptoms may continue for several days. The vomiting occurs independently of taking food, and, although it is so persistent, it may be associated with a clean tongue. The bowels are, as a rule, constipated. The patient becomes listless, apathetic, and drowsy, and may have a convulsion. Later, there are restlessness, delirium, and, finally, coma; the back of the neck is stiff, and there may be opisthotonos, repeated convulsions, or paralysis. The eyes are set, and optic neuritis may give rise to blindness. There is loss of control of the bladder and rectum. The temperature varies from 101° to 104° F., but there may be hyperpyrexia (106° or 107° F.). The pulse, which at first is very rapid, becomes irregular and slow. In unfavorable cases the symptoms all increase in severity; the coma is deepened, and the respiration becomes of the Cheyne-Stokes character, ending in death. On the other hand, when recovery is to take place, the symptoms remain stationary for a time after the comatose stage is reached, then gradually abate, and consciousness and improvement slowly follow.

The course of the attack is from 4 to 12 weeks.

The prognosis is always grave, and when recovery occurs, there are frequently left traces of the disease, such as blindness, paralysis, speech-defects, or a defective intellect.

Diagnosis.—It is important not to confound true meningitis with the **pseudomeningitis,** which is a purely nervous or toxic condition, occurring with digestive disturbances or with the infectious diseases, as influenza, pneumonia, or the exanthems, and which in children so frequently give rise to grave cerebral symptoms.

Tubercular meningitis is differentiated by the fact that in this affection there are usually prodromes, intermissions in the temperature, an irregular course, perhaps a longer duration, and a greater tendency to coma. The family history and diathesis of the child will give valuable information. An error is easily made, however, in these cases, and the prognosis must therefore be guarded.

In **cerebrospinal meningitis** the onset is more sudden, the course shorter, there may be an eruption on the skin, and it usually occurs in more or less wide-spread epidemics. See CEREBROSPINAL MENINGITIS.

When the diagnosis is at all doubtful, lumbar puncture should be resorted to.

Treatment.—The patient should be kept in a darkened, absolutely quiet room, attended by a careful and intelligent nurse, and given at first a purgative dose (1 to 5 grains, repeated if necessary) of calomel, continuing with smaller doses (1/10 to 1/2 grain) every 3 or 4 hours. Since urotropin seems to have an antiseptic action on the cerebrospinal fluid, its administration is advoctaed in beginning meningitis or when meningeal infection is feared as a complication. To protect against the action of the mercurial, the mouth should be frequently washed with a solution (5 to 10 grains to the ounce) of chlorate of potassium. The hair should be cut short, and an ice-bag kept applied to the head. For the restlessness and wakefulness, a warm bath or sponging with warm water will often have a quieting effect but if not, chloral and the bromids, sulphonal, or trional must be used. Large doses of the bromids (10 to 15 grains every 2 hours for a child 2 years old) may be necessary before the desired result will be secured.

The following formula will be found a convenient combination:

℞. Chloral hydrate, ℥ ss
Sodium bromid, Sodium iodid, each, ℥ ij
Water, ℥ iv.

One teaspoonful in water every 3 hours to a child 3 or 4 years old.

If the treatment outlined above does not lessen the severity of the symptoms, alternate lukewarm and cold douching of the neck and upper part of the spine should be practised 3 times a day, and inunctions of mercury thoroughly applied twice a day. For the relief of severe pain, it may be necessary to give morphin (1/24 to 1/4 of a grain) hypodermically. When the pulse is rapid, irregular, or weak, alcohol in some form and digitalis are called for. Retention of urine may occur, when it will be necessary to use the catheter; and when there is refusal or inability to take food, the patient must be fed by gavage or by the rectum. For the paralysis which may remain after the attack, massage, warm baths, and friction should be employed, but electricity only after all symptoms of central irritation have subsided. Iodid of potassium should be given for a long period when the symptoms persist, as it aids the absorption of inflammatory products. Lumbar punctures have proved beneficial.

Tuberculous Meningitis

Synonyms.—Tuberculous leptomeningitis; basilar meningitis; acute hydrocephalus, water on the brain.

An inflammation of the soft intracranial membranes, more particularly the basal pia mater, attended with or due to the deposit of gray miliary tubercles; characterized by gradual decline of the bodily and mental powers.

Etiology.—It is usually a secondary affection, a sequel to tuberculous disease of some other organ. It occurs most frequently in children between 2 and 6 years of age, although numerous cases are reported between the ages of 20 and 30. The so-called scrofulous children possess a special susceptibility to tubercular meningitis.

Pathologic Anatomy.—The deposition of tubercle usually occurs at the base of the brain. Depositions of grayish-white granules, of a translucent, somewhat gelatinous appearance—miliary tubercle—are distributed along the vessels of the pia mater, resulting in inflammation and the exudation of lymph, with the consequent thickening and opacity of the membranes. The cerebral tissue is not usually involved, although on section the lines indicative of blood-vessels are very much increased in number. The ventricles are distended by a clear or milky, or even bloody, serum. Tubercular deposits occur in the lungs, intestines, and, at times, in other organs. The presence of the tubercles alone may give rise to no symptoms until the exudative products of the resultant inflammation develop.

Symptoms.—The advent is either gradual and insidious, or with convulsions, in which case the after-progress is rapid.

Prodromes.—The child grows irritable, with loss of appetite, loss of flesh, swollen abdomen, constipation alternating with diarrhea, irregular attacks of feverishness, grinding the teeth during sleep, or insomnia. The child exhibits symptoms of headache. The duration of this stage is from 1 week to a month or two.

Stage of Excitation.—The onset is somewhat sudden, with obstinate vomiting, severe headache, convulsions, fever, 102° to 103° F. in the evening, falling to 99° F. in the morning, pulse soft and compressible, with irregular rhythm. On drawing the finger-nail lightly over the surface, a red line results. The symptoms grow progressively worse with exaltation of the special and general senses, the least pinch or even touch causing exquisite pain; there are spasmodic movements of the muscles with contraction and rigidity, and at times even opisthotonos. The duration of this stage is about 2 weeks.

Stage of Depression.—The symptoms of this stage are the result of the pressure of the exudation. The pulse is slow and compressible, with irregular rhythm; the temperature is depressed; there is a tendency to somnolence alternating with quiet delirium, mental stupor, and continual movement of the fingers, as in picking up objects. From time to time convulsions appear with strabismus, oscillation of the eyeballs, followed by intervals of wakefulness, when the headache is excruciating, causing the peculiar, shrill shriek—"the hydrocephalic cry," associated with contraction of the muscles of the face, as if suffering were experienced. Finally collapse occurs, with the Cheyne-Stokes respiration, the coma deepening, followed by death, convulsions often ending the scene. The duration of this stage is from 1 day to 2 weeks.

Diagnosis.—Simple acute meningitis and tubercular meningitis have closely analogous symptoms during the stage of excitation, but the history and clinical course of the two maladies determine the diagnosis.

Prognosis is unfavorable. The usual duration is

3 or 4 weeks after fully developed prodromes. If ushered in by convulsions, the duration is shorter.

Treatment is unsatisfactory. There are no means of retarding the disease. The symptoms should be treated as they develop. Blisters, leeches, active purgation, pustulating ointments, potassium iodid, and mercury are all useless. Lumbar puncture has been praised highly by some.

If the hereditary tendency is marked, nutritious food, cod-liver oil, iron iodid, and quinin may be used in prophylaxis and treatment. See TUBERCULOSIS.

MENINGOCELE.—A meningocele is a congenital hernia protruding through an opening of the skull. When, in addition to the meninges, the brain-substance protrudes, it is termed **encephalocele,** and when this mass also contains liquid, **hydrencephalocele.**

The most frequent site of these tumors is at the occiput, when the protrusion occurs from an opening through or at the edge of the occipital bone; the next most common location is the nasofrontal region; they are rarely seen on other portions of the skull.

Symptoms.—The tumor varies in size from a mere nodule to a size as large or larger than the rest of the child's head, and whatever the exact character of its contents, it can be more or less reduced by compression, but such compression usually produces cerebral symptoms, such as stupor or fretfulness, vomiting, and strabismus. The skin covering the tumor may be tense and covered with a scant growth of hair, or red and vascular.

Diagnosis.—An encephalocele pulsates, and, when the child cries, becomes tense; it is usually opaque, and indistinct fluctuation may be felt. A true meningocele is always small, and, as a rule, pedunculated; its contents admit of complete reduction, and it is translucent.

Prognosis.—The occipital tumors are usually more serious than the frontal ones. In the majority of cases death occurs during the first few weeks of life, the result of meningitis, convulsions, or rupture, and when death does not take place, most of the patients exhibit signs of mental impairment or other evidences of organic brain-disease.

Treatment.—The growth should be carefully protected from injury, operation being justifiable only in case of impending rupture. Repeated tappings and injection of Morton's fluid (iodin, 10 grains; iodid of potassium, 30 grains; glycerin, 1 ounce) have succeeded in cases of meningocele in reducing the tumor, but unless it is pedunculated and very small, the probability of a good result is very remote. See SPINA BIFIDA.

MENINGOCOCCUS SERUM.—See CEREBRO-SPINAL MENINGITIS.

MENINGOMYELOCELE.—See SPINA BIFIDA.

MENOPAUSE.—The period at which menstrual activity ceases. This usually occurs between the fortieth and fiftieth years.

The final cessation of menstruation may occur in one of several ways: it may cease abruptly, there may be a gradual diminution in the amount of blood lost at each successive period until it finally ceases entirely, or there may be a gradually lengthening interval between the periods. Besides the cessation of menstruation there are other phenomena, such as disturbances of digestion, flushes of heat, and nervous derangements. These disturbances may be entirely absent or they may last for a period varying from a few months to 2 years. Associate symptoms of beginning presbyopia must not be overlooked. Return of bleeding after it has once ceased, or profuse bleeding at the time of the menopause, should always arouse suspicion in the mind of the physician. It is frequently caused by malignant disease of the uterus, fibroid tumors or fungous endometritis.

The treatment of the menopause consists in attention to the general health and regulation of the bowels and diet. Plenty of fresh air and a proper amount of exercise will be found beneficial. For the nervous symptoms, change of surroundings and nerve sedatives are indicated. Saline purgatives are especially beneficial. The influence of beginning presbyopia in causing headaches should be considered, and reading glasses ordered. The other reflex phenomena are best treated with potassium bromid, which drug also diminishes the amount of blood determined to the sexual organs. Occasional bleeding or cupping gives relief. Diet should be plain and unstimulating, beer and spirits prohibited, and light wines allowed. Tepid baths are useful. Late hours are to be avoided. Abstracting blood from the uterus generally does harm, but leeches to the anus are sometimes beneficial.

MENORRHAGIA AND METRORRHAGIA.—By the first term is meant profuse or excessive bleeding at the menstrual periods. By the second is meant bleeding between the menstrual periods.

Menorrhagia is a relative term, since the duration of the menstrual period and the amount of blood lost at each period vary so widely in different women. To judge of this condition, therefore, in any particular case the present menstrual condition must be compared with the previous menstrual history.

The causes, pathology, and treatment of the foregoing conditions are practically the same.

The most important **causes** are endometritis, subinvolution and displacements of the uterus, lacerations of the cervix, fibroid tumors, and tubal and ovarian disease. Endometritis is present in the great majority of instances, either alone or associated with one of the above conditions. After the age of 30, cancer of the cervix or of the body of the uterus should always be suspected.

The treatment will depend upon the cause. Cancer and fibroid tumors usually require hysterectomy. Lacerations of the cervix should be repaired, and displacements should be corrected by pessary or operation. Salpingo-oöphorectomy will be necessary in the majority of cases due to chronic disease of the tubes and ovaries.

Thorough curettage will relieve, temporarily at least, a large proportion of cases. Rest in bed, copious vaginal douches of hot water, glycerin tampons, and moderate purgation are all beneficial.

Hydrastis, viburnum, and ergot are the drugs which have given the best results in the above cases. Thyroid extract has been used with success. The following formula will be found useful:

℞. Fluidextract of ergot, ℥ ij
Fluidextract of hydrastis, } each, ℥ j.
Fluidextract of viburnum, }

One teaspoonful in water 3 times a day.

MENSTRUATION.—A periodic discharge of a sanguineous fluid from the uterus and Fallopian tubes, occurring during the period of a woman's sexual activity, from puberty to the menopause. It is suspended during pregnancy and early lactation. The flow is alkaline and composed of blood, shreds of mucous membrane, and vaginal and uterine secretion; it is darker than ordinary blood, and should not clot; its odor is characteristic and disagreeable; the usual quantity is from 4 to 6 ounces.

For discussion of the **anomalies of menstruation**, see AMENORRHEA, DYSMENORRHEA, MENOPAUSE, MENORRHAGIA AND METRORRHAGIA, PREGNANCY, etc.

MENTAL DISEASES.—See INSANITY.

MENTHA PIPERITA (Peppermint).—The dried leaves and flowering tops of *M. piperita*, or common peppermint, having properties due to a volatile oil, in which form it is commonly used. It is an aromatic stimulant, carminative, and antispasmodic, and is valuable internally to relieve flatulent colic, and externally to relieve superficial neuralgia.

M. Pip., Aqua, contains 2 parts of the oil in 1000 of distilled water. Dose, 2 to 6 drams. **M. Pip., Ol.**, the volatile oil. Dose, 1 to 5 minims. **M. Pip., Spt.**, essence of peppermint, contains 10 percent of the oil and 1 percent of the herb in alcohol. Dose, 10 to 45 minims.

MENTHA VIRIDIS (Spearmint).—The dried leaves and flowering tops of *M. spicata*, the "mint" of the kitchen garden. Its constituents and properties are identical with those of peppermint, but its odor and taste differ therefrom. Spearmint corresponds in action to peppermint, but is less powerful. It is employed to correct flatulence and to relieve colic, and makes an agreeable flavoring for mixtures.

Oleum M. V. is the volatile oil distilled from the plant. Dose, 2 to 5 minims. **Aqua M. V.** has 2 parts of the oil in 1000 of distilled water. Dose, 2 to 6 drams. **Spiritus M. V.**, *essence of spearmint*, is an alcoholic solution containing 10 percent of the oil and 1 percent of the bruised herb. Dose, 10 to 45 minims.

MENTHOL.—$C_{10}H_{19}OH$. A secondary alcohol, obtained from oil of peppermint, from which it separates in crystalline form on cooling. Slightly soluble in water, freely so in alcohol, ether or chloroform. Dose, 1/2 to 3 grains, in a pill or spirituous solution several times a day.

Therapeutics.—Menthol is highly praised as an external application in various neuralgias, sciatica, pleurodynia, and toothache. For neuralgia it is used in saturated alcoholic solution painted over the affected nerve. For toothache a crystal introduced into the carious cavity is promptly anodyne. In spray containing 5 to 20 percent it is highly efficient in epidemic influenza and in tuberculous laryngitis. It is a good application in parasitic skin diseases, and has marked value as an antipruritic. Its vapor by inhalation is efficient against cough, and it has considerable power as an anti-emetic, having stopped nausea and vomiting after the usual remedies had failed. For this purpose ten drops of a 20 percent solution in olive oil are given on sugar.

The drug has been used in the vomiting of pregnancy, in hourly doses of a teaspoonful of the following:

℞. Menthol, gr. xv
Whisky, ℥ vj
Syrup, ℥ j.

It is also used as a carminative and in gastralgia, in the dose of 1 to 2 grains 3 times daily in pill or solution.

MERCUROL.—A compound of mercury with yeast nuclein. It contains about 10 percent of mercury. It is used extensively as an injection in 1 percent solution, in gonorrhea and cystitis. Dose, 1/2 to 3 grains, three times a day.

MERCURY (Hydrargyrum; Quicksilver).—Hg = 200; quantivalence II, IV. The only liquid metallic element, hence the common name, *quicksilver*. In medicine the metal, its nitrate, oxids, chlorids, and iodids are the salts most commonly, the sulphid less frequently, used.

Therapeutics.—In small doses, continued not too long a time, it is a tonic, purgative, and alterative. In larger doses, or too long continued, it is likely to produce a condition called hydrargyrism, salivation, or ptyalism. In "biliousness" mercurial purgatives have long been a favorite remedy, blue mass and mercurous chlorid or calomel being usually employed. In syphilis mercuric chlorid and mercuric iodid are generally considered specific. Mercury in the form of calomel is useful in glandular inflammations, and locally in corneal inflammations. Formerly calomel was much used in typhoid fever and malarial fevers. The soluble salts of mercury are highly poisonous.

The metal itself is inert, but by combination with the acids and fluids of the body becomes active, and is easily absorbed in any form. In the blood its effects, in small doses, are tonic, but in quantity it indirectly produces impoverishment thereof. From the blood it enters the tissues, where it remains for an indefinite period, exerting a peculiar influence, termed alterative, on all processes characterized by growth of young cells. It stimulates most of the glands of the body to the production of pathologic secretions, especially the salivary glands and the pancreas. It tends to accumulate in the liver, stimulating the flow of bile. Its excretion is hastened and completed by the use of potassium iodid. In small doses administered for a short time the mercurial preparations are blood-tonics.

A purgative and cholagog pill:

℞. Extract of colocynth, ℥ ss
Powdered scammony, gr. xx
Calomel, gr. xij.

Make into 12 pills; take 1 at night, as necessary.

In chorioretinitis:

℞. Mercuric chlorid, gr. iij
Extract of belladonna, gr. vj.
Make 60 pills; give 1 pill after each meal.

In eczema (calomel ointment):

℞. Calomel, Magnesium carbonate, } each, gr. xl
Cold cream, ℥ j.
Use in eczema.

In dropsy of chronic heart- and liver-disease:

℞. Mass of mercury, Powdered squill, Powdered digitalis, } each, gr. xx.
Mix and make into 20 pills; give 1 pill thrice daily.

In late syphilis:

℞. Mercuric chlorid, gr. j to jss
Potassium iodid, ℥ jss to iv
Compound syrup of sarsaparilla, ℥ j
Water, enough to make ℥ ij.
Give 1 teaspoonful 3 times daily.

In syphilis:

℞. Mercury biniodid, gr. j
Potassium iodid, ℥ ij
Peppermint water, q. s. ℥ iij.
Give 1 teaspoonful after each meal.

In late syphilis, for hypodermic use:

℞. Mercuric chlorid, gr. vj
Sodium chlorid, gr. xxxvj
Distilled water, ℥ iijss.
Inject 5 to 8 drops daily, hypodermically.

In constipation:

℞. Mercuric chlorid, Strychnin sulphate, } each, gr. ss
Quinin sulphate, gr. xij
Extract of belladonna, gr. ij.
Mix and make into 12 pills; take 1 night and morning.

Yellow wash:

℞. Bichlorid of mercury, gr. xv
Lime-water, O ij.
Mix and make into a lotion; apply to syphilitic sores.

Poisoning.—The first symptoms of **salivation** are fetid breath, swollen and spongy gums, having a bluish line along their margins, stomatitis, sore and loosened teeth, inflamed and tender salivary glands pouring out a peculiar, thin saliva of foul odor in large quantity, and a metallic taste in the mouth. Emaciation, pallor, edema, ulcerated skin, erythematous, vesicular, or pustular eruptions, headache, insomnia, neuralgia, tremor through paresis of the muscles of the head and extremities, epilepsy, coma, and convulsions may ensue. An influenzal condition is not uncommon.

Salivation is most readily produced by blue mass, next by calomel, and less easily by gray powder. Children are not easily salivated. Inhalation of mercurial vapors is likely to affect the nervous system most; its internal administration and that by inunction are more likely to produce salivation. Treatment consists in the withdrawal of the mercury, antiseptic mouth-washes, particularly the potassium chlorate, and, later, the use of the iodids as eliminatives.

Poisoning by the bichlorid requires the prompt oral administration of large amounts of albumin, the whites of eggs being most easily obtained. The stomach should be washed out, external heat applied about the body, and stimulants to the respiration and circulation given. It has been suggested that the intravenous injection of calcium sulfid, grain for grain of bichlorid of mercury taken, is the safest and most rapid. An advantage of the intravenous method lies in the assurance that the patient receives the required amount of the antidote and that it is more direct. Calcium sulfid may also be administered by mouth (when the intravenous method is not a practical one) in 2- to 5-grain doses every hour until all symptoms of mercurialism have disappeared, since it is nontoxic. For intravenous administration the solution must be freshly prepared or it loses its sulfur and becomes ineffective. It should not be used stronger than 1 grain to the ounce of water; boiled, then filtered through cotton. If death does not ensue at once, the organic changes in the gastrointestinal tract, such as strictures, sloughs, and destruction of the peptic glands and ulceration, generally cause a protracted convalescence, or may eventually result in a fatal issue.

Preparations.—H. Ammoniatum, ammoniated mercury, "white precipitate," mercuric ammonium chlorid, NH_2HgCl, is used externally. **H. Ammoniati, Ung.,** "white precipitate ointment"—ammoniated mercury 10, white petrolatum 50, hydrous wool fat 40. **H. Chloridum Corrosivum,** $HgCl_2$ (**H. Perchloridum,** B. P.), corrosive chlorid of mercury, mercuric chlorid, "bichlorid of mercury," "corrosive sublimate." Soluble in water and alcohol; antisyphilitic. Dose, 1/80 to 1/10 grain. Very poisonous. **H. Chloridum Mite,** Hg_2Cl_2 (**H. Subchloridum,** B. P.), mild chlorid or subchlorid of mercury, mercurous chlorid, "calomel"—laxative, tonic, and antipyretic. Insoluble in water and alcohol. Dose, 1/20 to 5 grains. **H. cum Creta,** mercury with chalk, "chalk-mixture," "gray powder," contains mercury 38, clarified honey 10, prepared chalk 57, water sufficient quantity. Dose, 1/2 to 10 grains. **H., Emplastrum,** mercurial plaster—mercury 30, oleate of mercury 1, hydrous wool fat 10, lead plaster 59. **H., Arsenii et Iod., Liq.,** Donovan's solution. See ARSENIC. **H. Flav., Lotio,** unof., "yellow wash" for syphilitic sores—corrosive sublimate 18 grains, lime-water 10 ounces. **H. Iodid. Flavum,** HgI, yellow iodid of mercury, mercurous iodid, protiodid. Dose 1/10 to 1/3 grain. **H. Iodid. Rubrum,** HgI_2, red iodid or biniodid of mercury, mercuric iodid. Soluble in a solution of potassium iodid. Poisonous. Dose, 1/50 to 1/10 grain. **H., Massa,** "blue mass," "blue pill," has mercury 33, licorice 10, althæa 15, glycerin 9, honey of rose 33. It is used mainly as a purgative. Dose, 1/2 to 10 grains. **H.**

Nigra, Lotio, unof., "black wash" for syphilitic sores—calomel 30 grains, lime-water 10 ounces. **H. Nitrat., Liq.,** solution (60 percent) of mercuric nitrate. It is used as an escharotic. **H. Nitrat., Ung.,** citrine ointment—mercury 7, nitric acid 17, lard oil 76. **H., Oleat.,** contains yellow oxid 25, distilled water 25, oleic acid to 100. **H. Oxid. Flav.,** yellow oxid of mercury. Insoluble in water; soluble in nitric and hydrochloric acids. It is used in the preparation of ointments, etc. **H. Oxid. Flav., Ung.,** contains 10 percent of the oxid. **H. Oxid. Rub.,** red oxid of mercury. Dose, 1/50 to 1/10 of a grain. **H. Oxid. Rub., Ung.,** contains 10 percent of the oxid. **H. Oxycyanid.** It is said to be less irritating than mercuric chlorid. It has greater antiseptic power than the latter, it is said; and it does not corrode steel instruments. Dose, hypodermically, is the same as the chlorid; it is used locally in 1:5000 solution. **H. Subsulph. Flav.,** yellow subsulphate of mercury, basic mercuric sulphate, "turpeth mineral." Soluble in nitrohydrochloric acid. Dose, for emesis, 2 to 5 grains. **H., Unguent.,** mercurial ointment—mercury 50, lard 25, suet 23, oleate of mercury 2. These are triturated until the globules of mercury disappear under a magnifying glass. It is used to produce the physiologic effects of mercury by inunction. **H. Ung., Dil.,** *Blue ointment* has of the preceding 67, and petrolatum 33, well mixed. **Gray Oil,** *Oleum cinereum,* a semifluid, fatty, mercurial liquid introduced into medicine by Lang, of Vienna, in 1886. It is used in the treatment of syphilis by injections. It is prepared as follows: A given quantity of lanolin—1 or 2 drams—is rubbed up with sufficient chloroform to emulsify it. This mixture is to be thoroughly triturated, during which operation the chloroform will evaporate. While the mixture is still in a fluid state metallic mercury to the amount of double the quantity of the lanolin is to be added, the trituration being meanwhile continued. As a result, a pomade of mercury is left, which represents 2 parts of mercury and 1 part of lanolin. This is called strong gray lanolin ointment. From this salve-basis a 50 percent oleum cinereum, or *gray oil,* may be obtained by mixing 3 parts with 1 part of olive oil. A mild gray lanolin ointment may be made in the same manner as the strong, by taking equal parts of lanolin and mercury and thoroughly mixing them. From this salve-basis a 30 percent gray oil may be made by mixing 6 parts with 4 parts of fresh almond oil or olive oil.

MERYCISM.—See Rumination.

MESENTERIC CYSTS.—The chief tumors of the mesentery are cysts of congenital origin, a sequestration from the intestinal canal (vitelline duct), the pronephros (Müllerian duct) or mesonephros (Wolffian duct) showing an epithelial lining or not, and a wall of muscular or fibrous tissue or both. An hydatid or dermoid cyst and a teratoma or included fetus may also occur, and sometimes an ovarian cyst may become detached from its pedicle and grafted on to the mesentery. Formerly these cysts were held to be chyle cysts from obstruction of the lacteals, or degeneration in the lymphatic glands. Now such chyle cysts, if they occur, are considered quite the exception. The typical cyst should contain fluid with epithelial débris. Blood or chyle may gain entrance secondarily by estravasation. The special *signs* are a movable tumor covered by resonant intestine. At times there are symptoms of abdominal obstruction.

Treatment.—The cyst should be carefully shelled out after pushing aside the mesenteric vessels; only when absolutely necessary should the cyst-wall be sutured to the abdominal wound and drained. If the mesenteric vessels are involved the portion of intestine supplied has also to be excised to avoid gangrene (Spencer and Gask).

MESENTERIC GLANDS.—See Tabes Mesenterica.

MESMERISM.—See Hypnotism.

MESOTAN.—Ericin. The methyl-oxymethyl-ester of salicylic acid. A yellow fluid, containing 71 percent of salicylic acid, is readily absorbed by the skin, and, mixed with an equal quantity of olive oil, is used with friction as an external remedy in rheumatism.

METATARSALGIA (Morton's Disease).—It is characterized by severe neuralgic pain beginning at the side of the distal end of the third or fourth metatarsal bone and extending up into the foot and leg. It is the result of tight shoes. Treatment consists in wearing a flat-foot brace if necessary and properly fitting shoes, or, in extreme cases in resection of the head of the bone or excision of the superficial branch of the external plantar nerve.

METEORISM.—See Tympanites.

METHYL.—In chemistry a radical molecule of the composition of CH_3. It is the base of a large number of compounds, including alcohol, methyl spirit, and several ptomains.

Methyl acetanilid. See Exalgin.

Methyl chlorid is a colorless gas with an odor resembling ether or chloroform, and used to produce local anesthesia. It is applied to the skin in a spray or by means of a cotton tampon. The spray should not continue longer than from 2 to 4 minutes. Its advantages over an ether spray are its noninflammability and its more rapid effect. Methyl chlorid is employed in minor surgical cases, such as opening boils and removing small growths, in pruritus, in neuralgias, and to allay spinal irritation.

Methyl salicylate is the active principle of wintergreen, of which the oil contains about 90 percent. It has the same properties as the oil of gaultheria, and may be used for the same purposes. It is also used to disguise the taste of unpalatable drugs, and as a substitute for the salicylates in rheumatism. It is valuable as an external application in arthralgias. A liniment is prepared as follows:

℞. Ether, Alcohol, Methyl salicylate, each, ʒ j
Soap liniment, enough for O j.
Use as a liniment.

Methyl-violet, or **pyoktanin,** is an anilin dye appearing in the form of a blue, odorless powder, soluble in 75 parts of water. It is a moderately efficient antiseptic, and is not coagulated by albu-

min, and stains the tissues blue. In solutions of 1:2000 or 1:1000 it has been used in ulcerative keratitis, purulent ophthalmia, and in iritis. The same strength solutions have been used in empyema to flush out the pleural sac, and it has been employed in diphtheria and forms of infectious laryngitis. In circumscribed sarcoma and carcinoma deep injections of methyl-violet have been used.

METHYLENE.—CH_2. A bivalent hydrocarbon radicle occurring in many compounds.

Methylene-blue, methylthionin hydrochlorid, is a coal-tar dye prepared from dimethyl anilin; it is much used in the arts and as a stain in bacteriology. Its 10 percent solution is recommended as a local application in diphtheria, tonsillitis, scarlatinal sore throat, and other inflammatory conditions, and internally administered it has proved serviceable as an antiperiodic and analgesic. Dose, 1 to 6 grains in capsule; 2 grains of powdered nutmeg should be given with each dose, to prevent strangury.

Methylene bichlorid, CH_2Cl_2, is a general anesthetic. It is asserted by Genther and Eichholz to be more susceptible of management than chloroform in protracted operations. Much of the methylene bichlorid contains 50 to 75 percent of chloroform. Unof.

METRIC SYSTEM.—A decimal system of weights and measures employed in France, Germany, and other countries, and used generally in the sciences. The standard is the *meter*, the 1/10,000,000 part of a quadrant of a meridian circle of the earth. The standard of capacity is the *liter*, a cubic volume 1/10 of a meter in each dimension. The standard of weight is the *gram*, the weight of 1/1000 of a liter (1 cubic centimeter) of distilled water at its maximum density. The unit of superficial measure is the *are*, a square whose side is 10 meters, or a decameter. As the unit of microscopic measurement, the thousandth part of a millimeter has been adopted. It is called micron or microm, micromillimeter; represented by the sign μ. The multiples are expressed by the prefixes *deca*, *hecto*, and *kilo;* the subdivisions by the prefixes *deci*, *centi*, and *milli*.

1000	meters	= 1 kilometer.
100	meters	= 1 hectometer.
10	meters	= 1 decameter.
.1	meter	= 1 decimeter.
.01	meter	= 1 centimeter.
.001	meter	= 1 millimeter.
1000	liters	= 1 kiloliter.
100	liters	= 1 hectoliter.
10	liters	= 1 decaliter.
.1	liter	= 1 deciliter.
.01	liter	= 1 centiliter.
.001	liter	= 1 milliliter.
1000	grams	= 1 kilogram.
100	grams	= 1 hectogram.
10	grams	= 1 decagram.
.1	gram	= 1 decigram.
.01	gram	= 1 centigram.
.001	gram	= 1 milligram.

In common practice, however, the following divisions only are used, the others being expressed in figures.

10 millimeters	= 1 centimeter.
100 centimeters	= 1 meter.
1000 meters	= 1 kilometer.
1000 cubic centimeters	= 1 liter.
1000 milligrams	= 1 gram.
1000 grams	= 1 kilogram.

The following are the equivalent values:

1 meter	= 39.37 inches.
1 liter	= 1 quart ¼ gill, U. S. measure.
1 gram.	= 15.43 grains.
1 minim	= 0.161 cubic centimeter.

See also WEIGHTS AND MEASURES.

The following **metric conversion table** has been compiled by Mr. C. W. Hunt, of New York:

Millimeters multiplied by .03937 equals inches.
Millimeters divided by 25.4 equals inches.
Centimeters multiplied by .3937 equals inches.
Centimeters divided by 2.54 equals inches.
Meters equals 39.37 inches. (Acts of Congress.)
Meters multiplied by 3.281 equals feet.
Meters multiplied by 1.094 equals yards.
Kilometers multiplied by .621 equals miles.
Kilometers divided by 1.0093 equals miles.
Kilometers multiplied by 3280.7 equals feet.
Square millimeters multiplied by 0.155 equals square inches.
Square millimeters divided by 645.1 equals square inches.
Square centimeters multiplied by .155 equals square inches.
Square centimeters divided by 6.451 equals square inches.
Square meters multiplied by 10.764 equals square feet.
Square kilometers multiplied by 247.1 equals acres.
Hectares multiplied by 2.471 equals acres.
Cubic centimeters divided by 16.383 equals cubic inches.
Cubic centimeters divided by 3.69 equals fluidrams (U. S. P.).
Cubic centimeters divided by 29.57 equals fluidounces (U. S. P.).
Cubic meters multiplied by 35.315 equals cubic feet.
Cubic meters multiplied by 1.308 equals cubic yards.
Cubic meters multiplied by 264.2 equals gallons (231 cubic inches).
Liters multiplied by 62.022 equals cubic inches. (Act of Congress.)
Liters multiplied by 33.84 equals fluidounces (U. S. P.).
Liters multiplied by .2642 equals gallons (231 cubic inches).
Liters divided by 28.316 equals cubic feet.
Hectoliters multiplied by 3.531 equals cubic feet.
Hectoliters multiplied by 2.84 equals bushels (2150.42 cubic inches).
Hectoliters multiplied by .131 equals cubic yards.
Hectoliters divided by 20.42 equals gallons (231 cubic inches).
Grams multiplied by 15.432 equals grains. (Act of Congress.)
Grams multiplied by 981 equals dynes.
Grams (water) divided by 29.57 equals fluidounces.
Grams divided by 28.35 equals ounces avoirdupois.
Grams per cubic centimeter divided by 27.7 equals pounds per cubic inch.
Joule multiplied by .7373 equals foot-pounds.
Kilograms multiplied by 2.2046 equals pounds.
Kilograms multiplied by 35.3 equals ounces avoirdupois.
Kilograms divided by 1102.3 equals tons (2000 pounds).
Kilograms per square centimeter multiplied by 14.223 equals pounds per square inch.
Kilogrammeters multiplied by 7.233 equals foot-pounds.
Kilograms per meter multiplied by .672 equals pounds per square foot.
Kilograms per cubic meter multiplied by 0.26 equals pounds per cubic foot.
Kilograms per cheval vapeur multiplied by 2.235 equals pounds per horse-power.
Kilowatts multiplied by 1.34 equals horse-power.
Watts divided by 746 equals horse-power.
Watts divided by .7373 equals foot-pounds per second.
Calory multiplied by 3.968 equals B. T. U.
Cheval vapeur multiplied by .9863 equals horse-power.
Centigrade multiplied by 1.8+ 32, equals degrees Fahrenheit.
Francs multiplied by .193 equals dollars.

METRITIS.—See UTERUS (Inflammation).

METRORRHAGIA.—See MENORRHAGIA.

MEZEREUM (Mezereon).—The bark of *Daphne Mezereum*, containing an inert, fixed oil, an inactive glucosid, *daphnin*, and an acrid *resin*, which is the anhydrid of a resinous acid named *mezereinic acid*. Mezereum is an ingredient of the compound fluidextract of sarsaparilla. Dose, 1 to 10 grains. **Fluidextractum mezerei**, is too acrid for internal use. Mezereum is a sialogogue, and an intensely acrid, irritant poison, producing violent vomiting, purging, nephritis and gastroenteritis. In small doses it is laxative and diuretic, and has had considerable reputation as an alterative. Externally the recent bark is a powerful local irritant, speedily producing vesication. Mezereum is rarely used internally by itself, but is employed in mixtures with sarsaparilla, etc., as an alterative in syphilis, rheumatism and some skin diseases of chronic type, but with doubtful efficacy. It has been used with good effect in toothache and as a masticatory in paralysis of the tongue. Its principal use is as a local irritant to keep up the discharge from issues or blisters, and to stimulate indolent ulcers.

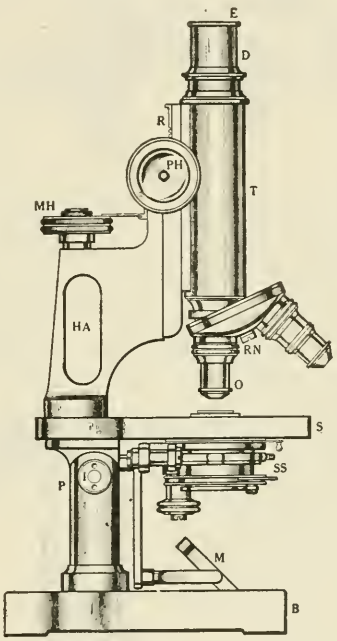
MICROCEPHALUS.—A condition in which a child is born with the skull completely ossified, or one in which ossification has taken place soon after birth.

The operation for the relief of microcephalus is known as **linear craniotomy**; it is performed by making a longitudinal incision through the skin to one side of the sagittal suture, from the occipital bone to the hair line in front, and a transverse incision from the hair line downward. The flap is to be reflected back and a small opening made in the skull by means of a trephine; then, with Rongeur forceps, a groove is cut as far forward as the angle of the wound in front; from this point a lateral groove is made. The parts are then irrigated, all hemorrhage controlled, and the flaps brought together by means of interrupted silkworm-gut sutures. In from 6 to 12 months a similar operation should be performed on the other side of the sagittal suture.

MICROPHOTOGRAPHY.—The production of photographs of microscopic size, usually of large objects. These photographs must then be examined with a magnifier or microscope. In French and German this term is also employed for PHOTOMICROGRAPHY (*q. v.*).

MICROSCOPE.—An optical apparatus for giving an enlarged and distinct image of a minute and near object. There are usually 2 or more lenses or lens-systems, of which one, the objective, placed near the object, gives an enlarged and inverted real image. The other, the ocular, acting like a simple microscope, gives an enlarged virtual image of the real image.

The microscope is the most important laboratory instrument, and should be, so far as means will permit, the best that skill can produce. American microscopes are now as well made as those of foreign firms. The medium form of stand is of preference. The large stand is too heavy and too high. The necessary objectives are a low, a high, and a 1/12 oil-immersion. Two eye-pieces, a low and a high, will be found sufficient for ordinary purposes. The oil-immersion lens should always be cleaned after using by wiping off the oil with an old linen or silk handkerchief or with fine tissue-paper. If the lens is sticky, moisten the cloth with water or, where the oil has dried, with benzol or xylol. The same process may be used for the dry lenses, but it must be done quickly, so as not to soften the balsam in which the lenses are embedded. Ordinarily, a dry cloth is sufficient. The concave mirror is to be used only when some near object, such as wall objects, is reflected into the field of vision or when artificial light is employed. A Welsbach burner, or, better, the incandescent electric light with ground-glass globe, furnishes the best illumination. A piece of blue glass inserted over the mirror or just below the object to be examined will correct the slightly yellowish tint of these lights.



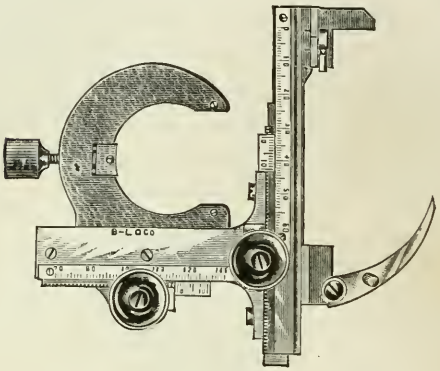
MICROSCOPE.

E. Eyepiece; *D*. Draw tube; *T*. Body tube; *RN*. Revolving nosepiece; *O*. Objective; *PH*. Pinion head; *MH*. Micrometer head; *HA*. Handle arm; *S*. Stage; *SS*. Substage; *M*. Mirror; *B*. Base; *R*. Rack; *P*. Pillar; *I*. Inclination joint.

It must be recognized that the microscope is but an aid to one of our senses. It merely extends our power of observation. The formation of a diagnosis—the first aim of practical medicine—is the result of judgment founded upon observation, and the microscope permits wider application of the sense of sight.

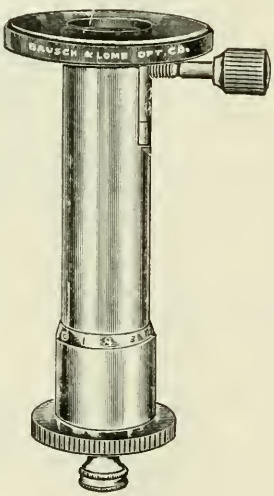
With a **mechanical stage** the microscopist can examine systematically and conveniently an entire slide area. By means of the graduated scale readings, he also can locate a particular point on the field and return to it at any time by simply attaching his stage in the same position and setting his adjustments to accord with his original readings.

The clinical uses of the microscope extend to the investigation of the various discharges and secretions of the body, such as the urine, gastric contents, vomitus, feces, sputum, blood, milk, morbid discharges, cyst contents, cerebrospinal fluid, new growths, parasites, and to examinations of food-stuffs, drugs, and in medicolegal inquiries. Besides the microscope, the use of additional apparatus is required for the examination of tissues, microorganisms, and their secretions and products. As most secretions and discharges of the body are of a fluid nature, they do not require the addition of any medium; but if necessary, a 0.75 percent solution of sodium chlorid, or a 3 percent solution of glycerin in distilled water, having a few crystals or carbolic acid added to prevent the growth of fungi, will suffice. The preparation of specimens for microscopic examination is described under Pathologic Technic (*q. v.*).



Mechanical Stage.

MICROSTOMA.—Any lessening of the size of the mouth, even to complete imperforation of the lips. It is either congenital or traumatic, arising from burns or syphilitic ulcers, etc. It is very rarely seen, except as the result of an accident. If there is complete imperforation, or if the mouth is so small that the child is unable to hold the nipple by the lips, a plastic operation must be immediately performed.



Hand Microtome.

MICROTOME.—An instrument for making thin sections for microscopical examinations. The microtomes of Schanze, Rutherford, Hamilton, Williams, Lewis, Jung, Leiter, Ryder, Minot, Bardeen, Ranvier, and Cathcart are the most used. **A freezing microtome** is one in which the tissue is frozen, in order to secure the hardness required for properly cutting sections. It operates by the rapid evaporation of ether or rhigolene through the medium of a special apparatus, after which the specimen is cut by means of the blade of a carpenter's plane. CO_2 liquid gas, also used, offers the most rapid and convenient method for freezing specimens for sectioning.

Celloidin Microtome.—Of this variety there are 2 types—one in which the section is raised by a screw, the other in which the object is raised by being moved up an inclined plane. (The first variety is preferred by Mallory and Wright.) By means of a sharp blade having the shape of a razor, placed at an angle, the specimen is easily cut after being hardened in celloidin.

Paraffin Microtome.—Frequently paraffin sections may be cut in a celloidin microtome, but one made specially for this work is preferable. That devised by Minot is advised.

MICTURITION.—See Urethra, Urinary Stream, Urine (Retention, Suppression).

MIGRAINE.—A unilateral paroxysmal pain in the head, periodic, accompanied by nausea, often vomiting, intolerance of light and sound, and incapability of mental exertion, the brain being temporarily prostrated and disturbed.

Synonyms.—Megrim; hemicrania; sick headache; bilious headache; blind headache.

Causes.—In the majority of patients the nervous predisposition to migraine is inherited, but whether inherited or acquired, it commonly develops before the age of 30.

Among the many exciting causes are eye-strain, disturbances of digestion, irritation of the ovaries or uterus, worry, exacting mental labor, sexual excesses, and insufficient sleep. The causes of many attacks, however, are wrapped in mystery.

Symptoms.—Attacks of migraine occur in irregular paroxysms, the intervals between being free from pain or nervous disturbance. For a day or two preceding the paroxysm it will be ascertained, on close questioning, that there were a feeling of fatigue without apparent cause, heaviness over the eyes, with some flatulency and indigestion. The attack proper is ushered in by chilliness, nausea, often vomiting, yawning, and general muscular soreness, with intolerance of light, and noises in the ears and incapability for mental exertion, and pain of a sharp, shooting character, of great intensity and persistency, localized most frequently in the frontal, temporal, or occipital regions of the left side; at the same time there is tenderness over the whole side of the head. Rarely, the pain is felt on the right side, and still more rarely on both sides at the same time. The nausea and other digestive symptoms may follow the onset of the pain instead of preceding it. There is more or less disturbance of the circulation, temperature, and secretions of the affected parts. At times there is a marked contraction of the vessels, when the face is pale, the eyes shrunken, and the pupils dilated; again, the vessels may be dilated, when the face is flushed, the conjunctivæ injected, and the pupils contracted. Motion, sound, and light aggravate the acute suffering.

The attack may continue with more or less intensity from a few hours to 2 or 3 days, the average duration being 24 hours.

Diagnosis.—The symptoms are so characteristic that an error seems impossible. It may, however, be confounded with anemic headache, hyperemic headache, dyspeptic or bilious headache, and neuralgic or rheumatic headache. The pains of organic brain disease must be excluded.

Prognosis is favorable. The affection is free from danger to life. In a fair number of cases the susceptibility to attacks declines as the person advances in years, it being rarely seen after 50 years.

Treatment must be directed to the cause. Any eye-strain, digestive trouble, or uterine disease must be corrected. To abort an attack of migraine or dispel a paroxysm after its onset, any one or two of 4 remedies are almost infallible. One is a hypodermic injection of morphin sulphate, 1/4 grain, with atropin sulphate, 1/120 grain, or antipyrin, 20 grains, repeated in an hour or two; or phenacetin, 10 grains, repeated in an hour or two. In many attacks fluidextract of cannabis indica, 2 or 3 drops every half hour or hour for a number of doses, is curative. The local use of menthol pencils eases the pain.

The following may be given:

℞. Acetanilid, gr. xx.
Codein sulphate, } each, gr. v.
Monobromated camphor, }
Make 10 pills. Take 1 pill every 2 hours until relieved.

In the intervals between the paroxysms measures to improve the general system should be used, and to overcome as far as possible any of the etiologic factors in its production. For this purpose extract of cannabis indica, 1/4 grain 3 times daily for several months, is highly recommended. See Headache.

MILIARIA (Prickly Heat).—See Sweat Glands; Urticaria.

MILIARY FEVER (Sweating Sickness).—A rare infectious fever, occurring in epidemics in limited districts in Europe, characterized by miliaria, fever, and profuse sweating. Treatment is expectant and symptomatic.

MILITARY SURGERY.—Military surgery differs little from ordinary emergency surgery. The surgeon in daily practice has learned long ago that every accidental wound must practically be regarded and treated as an infected wound. In this respect the military surgeon of to-day has the advantage over his colleague in civil practice in knowing that the small-caliber bullet inflicts wounds which *per se* are more often aseptic than septic. Senn's experience in Cuba showed that the small jacketed bullet seldom carries with it into the tissues clothing or any other infectious substances. Most of the wounds of the soft tissues, uncomplicated by visceral lesions, which in themselves would become a source of infection, healed by primary intention in a remarkably short time. If infection followed, it usually did so in the superficial portion of the wound in connection with the skin, and, what is more than suggestive, the wound of exit was more frequently affected than the wound of entrance. This can be readily explained from the larger size of the wound and more extensive laceration and tearing of the tissues. In many of the cases ideal healing of the wound did not occur, owing to a sudsequent limited superficial suppuration. The beep tissues were seldom implicated.

The many failures in protecting the more serious wounds against infection are attributable to 3 principal causes: (1) Inadequate supply of first dressing; (2) faulty application of first dressing; (3) unnecessary change of dressing. In all cases in which the first examination does not reveal the existence of complications which require subsequent operative treatment the diagnosis tag should convey this important instruction: "*Dressing not to be touched unless symptoms demand it.*" Such instruction is significant, and must be followed to the letter by all surgeons in subsequent charge of the patient.

For years Senn used as an antiseptic powder a combination of boric acid and salicylic acid, 4 : 1, with the most satisfactory results. He was also partial to sterile absorbent cotton for this particular purpose, as it constitutes a more perfect filter than loose gauze. A teaspoonful of this powder dusted on the wound forms, with the blood that escapes and the overlying cotton, a firm crust, which seals the wound hermetically. Should the primary dressing become saturated with blood, the same powder should be dusted over the wet dressing, and an additional compress of cotton is added to the dressing. After the first dressing has been applied it should not be removed except for good and convincing reasons. Much can be done in the after-treatment in the way of adjusting the bandage and immobilizing the injured part, but the first dressing must remain unless local or general symptoms set in which would warrant its removal. Malaria and yellow fever, in the tropics, are responsible for many unnecessary changes of dressing. The appearance of fever in a wounded man naturally leads to the suspicion that there is something wrong in the wound. Many dressings were changed on this ground; nothing abnormal was found in the wounds, and a day or two later the nature of the fever was recognized, and the patients were either given quinin or were sent to the yellow-fever hospital, in accordance with the diagnosis made. Every change of dressing, more especially in military practice, is attended by risk of infection, and must be scrupulously avoided, unless local or general symptoms indicate the existence of complications which demand surgical intervention. See Gunshot Wounds, Roentgen Rays.

MILIUM (Grutum).—A skin-disease characterized by the formation of small, roundish, whitish, sebaceous, noninflammatory elevations situated just beneath the epidermis. They are found mainly on the face, eyelids and forehead of elderly persons, and may exist in immense numbers. They may undergo calcification, giving rise to *cutaneous calculi.*

Colloid milium is a rare skin disease, characterized by the presence, especially on the bridge of the nose, forehead, and cheeks, of minute, shining, flat, or slightly raised lesions of a pale lemon or bright lemon color. It is a form of colloid degeneration of the skin affecting persons of middle or advanced age.

MILK.—The secretion of the mammary glands of mammalia, consisting of water, casein, albumin, fat, milk-sugar, and salts. Cream consists mainly of the fats that rise to the surface of the milk. Skim-milk is the residue left after the removal of the cream. Buttermilk is cream from which the fatty matter has been removed. It should contain not less than 10 percent of cream. The reaction of milk, when first secreted, is alkaline, but it becomes acid on standing, as a result of fermentative processes.

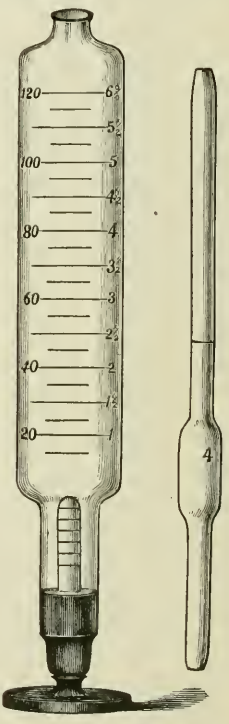
The following table (from Bartley) shows the chief differences between human and cow's milk:

Properties.	Human Milk.	Cow's Milk.
Physical appearance.	Bluish, translucent, odorless, sweetish.	Opaque, white or yellowish-white, distinct odor, feebly sweet taste.
Specific gravity.	1026 to 1036.....	1029 to 1035.
Reaction....	Amphoteric or slightly alkaline.	Amphoteric or slightly acid; becomes quickly acid on exposure to air.
Behavior on boiling.	Does not coagulate, and forms a very slight pellicle, scarcely observable.	Does not coagulate, but forms a distinct pellicle of casein and lime-salts.
Spontaneous coagulation.	Coagulates only after one to two days, at room temperature.	Coagulates after six to twelve hours at room temperature; due to lactic acid.
Coagulation with rennet.	Coagulates incompletely in small, isolated flocculi, never forming visible curds.	Coagulates at body temperature, separating into curdy masses and opalescent whey.
Fat.....	Butter yellowish, similar to cow-butter; sp. gr. at 15° C. = 0.966; melts at 34° C.	Butter yellow-white; sp. gr. at 15° C. = 0.949 to 0.996; melts at 35.8° C.
Composition of fat.	Olein, palmitin, stearin, butyrin, caprin, caproin, myristin.	Olein, palmitin, stearin, caproin, caprylin, caprin, laurin, myristin, arachin, butyrin, lecithin, cholesterin.
Relation of acids.	Volatile acids relatively small; oleic acid, one-half non-volatile acids.	Volatile acids relatively large, oleic acid small, palmitic and stearic large.
Casein.....	Precipitated with difficulty by salts and acids; easily soluble in acids; leaves no pseudonuclein with peptic digestion.	Precipitated easily by salts and acids; precipitate not easily soluble in excess of acids; leaves residue of pseudonuclein.
Composition of proteids.	Lactalbumin, lactoglobulin, and casein; ratio of casein to albumin, 1 to 2 (?).	Lactalbumin and globulin small; casein to albumin, 1 to 7, or even 1 to 10.
Mineral matters.	Relatively small amount: contains one-sixth as much CaO and one-fourth as much P_2O_4 as cow's milk.	Contains relatively large amount.
Bacteria.....	Generally sterile; rarely staphylococcus albus and aureus.	Contains numerous bacteria, and occasionally typhoid, diphtheria, tubercular organisms, etc.
Citric acid...	About 0.05 per cent...	About 0.1 to 0.15 per cent.
Enzymes....	Amylase, lipase, and fibrin ferment.	Amylase, oxidase, and proteolytic ferment.

Determination of Specific Gravity and Percentage of Fat.—The specific gravity of milk may be easily determined by a **lactometer** or **"lactodensimeter"** (such as Quevenne's). The temperature of the milk should always be 60° F.

Estimation of Percentage of Fat.—For this the **lactoscope** of Feser is used. The process, as given by Simon, is as follows:

Quevenne's Lactodensimeter.—(*Simon's Clinical Diagnosis.*)



Feser's Lactoscope.—(*Simon's Clinical Diagnosis.*)

Milk is drawn into the pipet up to the mark "M" when it is emptied into the cylinder "C." The former is then at once rinsed with water and the washings added to the milk. While shaking, water is further added, until the black lines upon the milk-colored glass plug "A" can just be discerned. The figure upon the right of the scale which is reached by the mixture will then directly indicate the percentage amount of fat, while the number upon the left indicates the amount of water that has been added. See COLOSTRUM.

MILK, ARTIFICIAL. See MILK (Modified).

MILK, DRUGS EXCRETED IN.—When taken during lactation, the following drugs are excreted in the milk: the oils of anise, cumin, dill, wormwood and garlic, turpentine, copaiba, the active principles of rhubarb, senna, scammony and castor oil, opium, iodin, indigo, antimony, arsenic, bismuth, iron, lead, mercury and zinc. Acids given to the mother cause griping in the child. Natural salts, as a rule, and the purgative agents above-named, act as purgatives to the child, and potassium salts as diuretics. Turpentine, copaiba and potassium iodid given to the mother, can be detected in the urine of the child. Opium given to the mother may narcotize the child, and mercurials in the same manner may salivate it. Atropin, hyoscyamin, the salicylates and potassium sulphid have been found in the milk after their ingestion by the woman.

MILK, FILTERED.—It has been observed that milk carefully filtered through a thick layer of absorbent cotton is freed from dirt and, to a great extent at least, from germs, and the quality of the milk is in no way altered. In this process we have, therefore, a simple method of sterilizing milk for infants' food without the application of heat, which, no doubt, in many cases changes the nutritive quality, and is in certain instances a cause of scorbutus and other disorders of nutrition.

Milk may be satisfactorily filtered by placing in a clean glass funnel a piece of absorbent cotton about an inch thick, and allowing the milk to percolate through it into the nursing-bottle.

MILK, MODIFIED.—The modification of cow's milk consists in changing the proportions of the different ingredients until they resemble as closely as possible those of mother's milk. The following table gives the average percentage of the different ingredients in cow's milk and mother's milk:

	Cow's Milk.	Mother's Milk.
Fats	4 percent	4 percent
Sugar	4.30 percent	7 percent
Proteids	4.00 percent	1.50 percent
Salts	0.70 percent	0.20 percent
Water	87.00 percent	87.30 percent
Specific gravity	1029	1031
Reaction	Acid (not sterile).	Alkaline (sterile).

By referring to the foregoing table it will be noticed that in altering cow's milk to the standard of human milk the greatest differences to be overcome are in the proportions of the proteid elements, the salts, and the sugar; in cow's milk the two first being too abundant and the last deficient. In laboratories specially fitted up for the purpose milk may be modified exactly to any desired proportions, but in the household or nursery this is not possible, and we are obliged, therefore, to follow certain general and simple rules by which we may practically be able to adjust the milk to the child's digestive powers and furnish its system with the proper elements of nutrition.

To accomplish this end, keeping in mind woman's milk as the standard, it is necessary:

1. To reduce the proteids. This is done by adding water—as much or a little more water than we have milk.

2. To increase the sugar, which at first was deficient, and by dilution has been made still more so. It is necessary to add about 10 grains of sugar to each ounce, or a heaping teaspoonful to each 8-ounce feeding. Milk-sugar is usually recommended, but as it is more liable than cane-sugar, especially in hot weather, to cause fermentation, the latter is better for ordinary use. Whichever is used, it should be dissolved in a little hot water before being added to the milk.

3. To add cream, which at first was sufficient, but has been much reduced by the water which has been added. It is necessary, to bring the fats up to the standard, to add about 1 1/2 to 2 teaspoonfuls to each ounce, or 1 1/2 to 2 ounces of cream to each 8-ounce feeding.

4. It is necessary to add an alkali—about 10 grains of bicarbonate of sodium to an 8-ounce bottle. The salts, by dilution, have been reduced to about the standard.

5. The milk must be freed from germs, which may be practically accomplished by filtering or, if preferred, by pasteurizing.

Milk modified as above would be expressed in the following recipe for a child 6 or 7 months old:

℞.	Cream,	℥ jss
	Milk,	℥ iij
	Boiled water,	℥ iijss
	Sodium bicarbonate,	gr. x
	Sugar,	℥ j.

Mix, filter or pasteurize, heat to 98° F., and feed every 3 hours.

See MODIFIED MILK IN INFANT FEEDING.

MILK, MOTHER'S.—For table giving the average percentage of the different elements of human milk, see MILK, and MILK (Modified).

The color is bluish-white; taste, sweet. Microscopically may be seen great quantities of fat globules and, perhaps, a few epithelial cells. Slight coagulation is produced by adding acetic acid or digestants, such as liquid rennet; but when in a normal condition, it never coagulates in large, hard masses, as does cow's milk.

The first 2 days after parturition the amount secreted is very small, but after 3 to 5 days there should be an abundant supply. Milk is formed to some extent in the gland all the time, but most plentifully while it is being stimulated by the child suckling.

Colostrum is the secretion of the first 2 or 3 days

and it differs quite markedly from the later milk. It is a deep yellow color; is not so sweet as the later milk; has a specific gravity of 1040 to 1046; coagulates into a solid mass by heat; is very rich in proteids and salts, and has a laxative effect. Microscopically there are seen, besides the fat globules, large numbers of granular bodies, known as colostrum corpuscles, which gradually disappear from the milk by the end of a week or 10 days. See COLOSTRUM.

Tests.—When a child fed at the breast does not thrive, the milk should be tested. The specimen used should be the whole quantity, preferably, from a breast, as the quality varies according to the time it is taken, the first milk being poorer in fats and richer in proteids, and the last milk, or the strippings, being rich in fat and low in proteids.

An easy clinical method of testing the milk is the following:

Too high specific gravity shows excess of proteids. Too low specific gravity, excess of fats. The sugar and salts are practically constant.

To ascertain the percentage of fats, take a cylinder holding 10 c.c., graduated to 100 parts; fill to the 100 mark with the milk, and allow the cream to rise for 24 hours. The cream bears the relation of 5 : 3 of the fat, so if the reading on the cylinder shows 7 of cream, the fats would equal three-fifths of 7, or 4.2 percent.

Normal human milk will frequently vary considerably in the percentage of its elements and be at the same time abundantly nutritious to the child which is fed upon it. If the percentages are far from the average, however, and the child shows symptoms of inadequate nursing, much may often be done toward correcting the faulty condition by regulating the mother's mode of life, as regards her exercise and diet. As a general rule, it should be remembered that lean and rare meats and other albuminous foods will increase the fats, and exercise will reduce the proteids. Below are given some of the conditions which affect the secretion of the milk.

1. **Too frequent** or **prolonged nursing** causes the milk to be poor and weak.

2. **Age.**—A woman very young or over 40 is likely to have milk weak in cream and rich in proteids.

3. **Acute illness,** except fevers of a severe type, do not alter the quality. Such fevers, however, will reduce the cream and increase the proteid constituent.

4. **Menstruation** does not materially affect the quality.

5. **Pregnancy.**—The milk of a pregnant woman is usually small in quantity and poor in quality.

6. **Drugs.**—See MILK (Drugs secreted in).

7. **Nervous impressions,** when marked, have a decided effect upon the milk. Fatigue, exhaustion, great excitement, sudden fright, grief, or passion may affect it so as to cause an acute indigestion only, or, in other cases, grave toxic symptoms, as high temperature, great prostration, or even convulsions.

8. **Diet.**—Nitrogenous foods increase the fats and proteids. Vegetable diet diminishes both the fats and proteids. A very low diet diminishes the fats and may either increase or diminish the proteids. An excessively rich diet increases both the fats and proteids. Liquids increase the quantity. Alcoholic drinks or malt extracts, porter, etc., increase the quantity; also the fats and usually the proteids.

9. **Massage of the breasts** is one of the most efficient means of stimulating the milk-supply. It should be done with great care and gentleness, and with every precaution against infection. The entire breast should be rendered aseptic, as should also the hands of the operator, and massage should be done 2 or 3 times a day. Some mild antiseptic ointment may be used with the massage.

See BREAST; MILK.

MILK, PASTEURIZED.—By pasteurizing milk we mean heating it to a temperature of 140° to 160° F. for a period of 20 minutes. This process has been shown to be sufficient to destroy the germs (but not their spores) most commonly to be found in milk, as the bacilli of typhoid fever, cholera, diphtheria, tuberculosis, and the pus germs. Milk thus treated will keep 2 or 3 days in a room at the ordinary temperature, and on ice for several days. Milk heated to 167° F. has no objectionable taste, and it is thought that its digestibility and nutritional qualities are not changed.

MILK, PEPTONIZED.—The following is a simple rule for peptonizing milk: In a clean glass jar containing 4 ounces of cold distilled or boiled water dissolve 15 grains of sodium bicarbonate and 5 grains of pancreatin (extractum pancreatis), to which add 12 ounces of good milk. Set the jar in a vessel of water at a temperature of 105° to 115° F. for from 5 to 20 minutes to partially peptonize, and for 2 hours to completely digest or peptonize.

MILK, PREPARED.—See MILK (Modified).

MILK, STERILIZED.—Sterilized milk is that in which the germs have been destroyed by heat. This can be accomplished absolutely only by heating it to 212° F. or higher on 2 or 3 successive days, as in preparing a culture medium. The ordinary method of sterilizing is to place the milk in jars, which are then exposed to the action of steam for an hour and a half. Heating to so high a degree causes the quality of the milk to be changed, and it is therefore rendered unfit for infant's food, except as a makeshift in very hot weather when ice cannot be procured, or when it is necessary for it to be kept for a considerable time, as in traveling when fresh milk cannot be obtained.

MILK LEG.—See PHLEGMASIA ALBA DOLENS.

MILK SICKNESS (Trembles, Slows, Puking Fever).—An acute infectious disease prevailing in newly settled lands in the western and southwestern States, and acquired from cattle suffering from the "trembles," and transmitted to man through milk, cheese, butter, flesh of affected cattle.

Etiology.—The specific cause unknown.

Symptoms.—Restlessness and malaise are usually the prodromal symptoms. After 2 or 3 days the patient suffers severe epigastric pain, with nausea, vomiting, and constipation; there may be fever of moderate or high degree, and muscular tremors are noticeable.

Prognosis.—The disease is either short and fatal, or recovery may occur after a prolonged convalescence.

Treatment.—This is symptomatic, and consists mainly of food and tonics. Care should be taken to avoid the use of infected food and milk.

MINERAL WATERS.—Natural water differs from distilled water in containing saline and other constituents in varying proportions; from common water, in which they are so small in quantity as not to alter the taste, color, etc., up to the sea-water, having 3 1/3 percent, and that of the Dead Sea, with 26 1/2 percent. Spring waters impregnated with foreign substances so as to have a decided taste and a marked action on the human system are called mineral waters, and may be subdivided into various groups, according to their prevailing constituents, as carbonated, alkaline, saline, sulphureted, silicious, etc. Full analyses of all the principal mineral waters of Europe and America are given in the fifteenth edition of the United States Dispensatory, but a few of the most prominent will be mentioned here.

Alkaline Mineral Waters.—Ems, Germany; Salzbrunn, Germany; Gleickenberg, Austria; Vichy, France; Vals, France; Bladon Spring, Ala.; Congress Spring, Cal.; Seltzer Spring, Cal.; St. Louis Spring, Mich.; Buffalo Lithia Spring, Va.; Hot Spring, Va.; Warm Spring, Va.; Berkeley Spring, Va.; Bethesda Spring, Wis.; Gettysburg Spring, Pa.

These waters are generally cold, those of Vichy and Ems being warm. They contain a considerable amount of sodium carbonate, also sodium chlorid and sulphate, and various other chlorids, carbonates, and sulphates, with carbonic acid gas in varying quantity. Vichy and Vals waters depend for their efficacy almost wholly on the quantity of sodium carbonate contained in them, which is for Vichy from 26 to 50 grains and for Vals about 60 grains to the pint.

Saline Mineral Waters.—Freidrichshall, Germany; Hunyadi János, Germany; Baden-Baden, Germany; Cheltenham, England; Kissingen, Bavaria; Reichenhall, Bavaria; Wiesbaden, Germany; Carlsbad, Bohemia; Püllna, Bohemia; Seidlitz, Bohemia; Marienbad, Bohemia; St. Catherine's, Ontario, Canada; Adelheidsquelle, Bavaria; Kreutznach, Prussia; Saratoga Springs, N. Y., Ballston, N. Y.; Hot Springs, Ark.

These waters are of more complex composition, the various waters of Saratoga containing more than thirty constituent salts. Those usually present are the sulphates and carbonates of sodium, calcium, magnesium, etc. (*magnesian waters*); chlorids of sodium, potassium and lithium(*chlorinated waters*); ferrous salts (*chalybeate waters*), with iodin, bromin, manganese salts, and phosphates in some few. Carbonic acid gas is present in all. Most of them are purgative, some are considered alterative, and many are warm (100° to 160° F.). The most powerful of the saline group is the Hunyadi János, containing about 150 grains each of magnesium and sodium sulphates to the pint; it is effectively purgative. Püllna water is nearly as strong, with 124 grains of sodium sulphate and 93 grains of magnesium sulphate to the pint. Friedrichshall is less powerful, but a better aperient water in 6- to 10-ounce doses. Marienbad contains no magnesium sulphate, but has 36 grains of sodium sulphate, 9 of sodium carbonate, 11 of sodium chlorid, and a small quantity of ferrous carbonate to the pint; in transportation it loses its carbonic acid and deposits the iron; in ordinary doses it is not aperient. Carlsbad water contains 20 grains of sodium sulphate and 9 each of sodium carbonate and chlorid to the pint. "Carlsbad salt" is simply sodium sulphate with a trace of the carbonate. These waters are either imported or are made in the United States.

Sulphurous Mineral Waters.—Aix-la-Chapelle, Prussia; Barèges, South France; Eux-Bonnes, South France; Llandrindrod, Wales; Harrowgate, England; Blue Lick Springs, Ky.; Sharon Springs, N. Y.; Yellow Sulphur Springs, Va.; White Sulphur Springs, W. Va.

These waters contain sulphureted hydrogen gas, also carbonic acid gas and carbonates, chlorids and sulphates of sodium, potassium, magnesium, and calcium; sometimes carbonate and oxid of iron, iodid and bromid of sodium.

Carbonated Mineral Waters.—These waters are cold, contain generally carbonates of calcium, magnesium and sodium (in some, iron), which are held in solution by the excess of carbonic acid, also chlorids of sodium and potassium, sulphates, phosphates, etc.

Silicious Mineral Waters.—Hot Springs, Iceland; and the geysers of Yellowstone Park. The constituents of these waters are chiefly alkaline silicates.

Therapeutics.—An undue value is placed by the laity and interested proprietors upon the medicinal value of mineral waters. The benefit in most instances from them is due to change of climate and scene, freedom from business and home cares and worry, regularity of life and diet, drinking water in quantity, and, in many instances, the substitution of water for alcoholic beverages. Those springs which are furthest removed from the patient's residence, are, as a rule, of the most value to him, as similar invalids whose homes are in the vicinity of the springs are often not benefited by its water.

The principal affections in which mineral waters are esteemed are the following: Cirrhosis of the liver, dyspepsia, gout, rheumatism, uricacidemia, lithiasis, hepatic diabetes, constipation, strumous disorders, obesity, plethora of the pelvic organs, hypochondriasis, skin-diseases, especially those dependent on gastric derangement, phthisis, constitutional syphilis, metallic poisoning, etc. Aperient and purgative waters are useful when a prejudice exists against purgative medicine. See WATER, GOUT, RHEUMATISM, CONSTIPATION, etc.

MIOSIS.—Contraction or decrease in the size of the pupil. See PUPIL.

MIOTICS (Myotics).—Agents which cause the contraction of the pupil. They act by stimulating the motor oculi nerves supplying the circular muscular fibers of the iris, and produce this effect when locally applied or internally administered, except morphin, which acts centrally, and does not affect the pupil when applied locally. Physostigmin (eserin) is the chief miotic for local use, and the

only one employed in ophthalmic practice. Others are muscarin, pilocarpin, and nicotin. *Physostigmin* also contracts the ciliary muscle, leaving the eye accommodated for the near point only, and lessens intraocular tension, antagonizing exactly the eye-actions of atropin. *Morphin* given internally produces miosis by stimulation of the oculomotor centers probably, the dilatation which occurs as death approaches being due to final paralysis of the same (Wood). The *general anesthetics* dilate the pupil in the first and last stages of their action, but contract it in the middle stage, that of complete anesthesia. When in this stage dilatation occurs, it is a dangerous sign of failing respiratory power, unless it is accompanied by symptoms of returning consciousness, as reflex movements and vomiting.

MIRYACHIT.—A peculiar disease observed in some Oriental tribes, the chief characteristic of which consists in mimicry by the patient of everything said or done by another. The same disease is called *lata* by the Javanese. It is also allied to the disease of the "jumpers" of Canada.

MISCARRIAGE.—The expulsion of the fetus between the fourth and the sixth months of pregnancy. See ABORTION.

MISSED ABORTION.—Death of the ovum during the first few months of gestation, followed by symptoms of abortion, which gradually subside without expelling the uterine contents. The ovum may remain inside the uterus for an indefinite period. More frequently decomposition, resulting in some form of sepsis, will occur. The treatment should be complete removal of the blighted ovum. See ABORTION.

MISSED LABOR.—Retention of a dead fetus in the uterus for a variable period of time after the normal expiration of pregnancy. There are usually a few slight pains at term, which gradually subside. Missed labor is most frequently the result of an extrauterine pregnancy that has advanced to term, or of pregnancy in one horn of an imperfectly developed uterus. It may be due to cicatricial contraction of the cervix. See LABOR.

MITRAL DISEASE.—See HEART-DISEASE (Organic).

MIXED TREATMENT.—See SYPHILIS.

MIXTURES (Misturæ).—Aqueous liquid preparations intended for internal use, which contain suspended insoluble substances. The term "mixture" is used somewhat indiscriminately. There are four official mixtures, as follows:

TITLE.	CONSTITUENTS.	PROPERTIES AND DOSE.
MISTURA: Cretæ (*chalk mixture*).	Compound chalk powder, 20 gm.; cinnamon water, 40 c.c.; water, sufficient to make 100 c.c.	Antacid, 4 drams.
Ferri composita (*Griffith's mixture*).	Ferrous sulphate, 6 gm.; Myrrh, 18 gm.; sugar, 18 gm.; potassium carbonate, 8 gm.; spirit of lavender, 60 c.c.; rose water, sufficient to make 1000 c.c.	Tonic, 4 drams.
Glycyrrhizæ composita (*Brown mixture*).	Extract of liquorice, 30 c.c.; syrup, 50 c.c.; acacia, 30 gm.; camphorated tincture of opium, 120 c.c.; wine of antimony, 60 c.c.; spirit of nitrous ether, 30 c.c.; water, sufficient to make 1000 c.c.	Expectorant, 3 drams (child, 1 dram).
Rhei et Sodæ	Sodium bicarbonate, 35 gm.; fluidextract of rhubarb, 15 c.c.; fluidextract of ipecac, 3 c.c.; glycerin, 350 c.c.; spirit of peppermint, 35 c.c.; water, sufficient to make 1000 c.c.	Carminative. Dose, 1 dram.

MODIFIED MILK IN INFANT FEEDING.—*No substitute can compare with mother's milk* for infant feeding; and next to mother's milk modified cow's milk is the best. Where cow's milk is not obtainable, the adaptation has been made from the animal which, in that region, can produce the most abundant supply of milk. Thus in certain places goat's milk or the milk of the ass may be used. Cow's milk in this country has always offered the best substitute in infant feeding. It contains the same ingredients as human milk, but in materially different proportions. The first attempts at feeding with cow's milk were made by simple dilutions with water. This procedure met with success in many instances, and continues to do so when a perfectly healthy, normal baby is the subject. But it was soon found that a certain percentage of infants thus fed developed indigestion. At first attention was focussed on the tough hard curds that these cases either vomited or passed in their movements. This was attributed to the higher amount of proteid that appears in cow's milk as compared with human milk. When simple dilutions failed, the fact that cow's milk differs slightly in its reaction from that of human milk—being amphoteric instead of alkaline—was considered to be the cause of such failures. Therefore lime water was added to all milk given to infants in order to overcome this slight acidity, or bicarbonate of sodium was added to produce a more marked alkalinity. Later on, pancreatizing, or peptonizing as it was then called, was used in special cases to facilitate digestion. Breaking up of the curds was also attempted by the use of cereal diluents which produced a fine division of the proteid matter in the milk mixtures.

The first attempt to direct a more scientific spirit rather than empiric toward the question of infant feeding was in the comparative study of the different ingredients in human milk and cow's milk. The prevalent idea was that an exact reproduction of the percentage composition of human milk would solve all the difficult problems in the use of cow's milk. This premise though a failure, has, as a scientific advance, proved a right

step. The successes of percentage feeding have not been due to the often attempted and as often defeated plan of reproducing or imitating nature, but to the plan of adaptation.

Present Understanding of Percentage Substitute Feeding.—To-day advocates of scientific accuracy in infant feeding make no attempt at blindly following nature, but teach the use of the means nature has given us more scientifically and accurately. Thinking of the elements of milk in percents is the simplest as well as the surest way of dealing with such a complex food. It is *not*, however, a method of feeding in itself, but of adapting the proper parts to the demands of the individual infant. Any successful method of feeding devotes its time to acquiring a complete understanding of the demands and needs of the individual infant. This is the most important premise in infant feeding. There are no rules in infant feeding which a text-book or lecturer can give as absolute or infallible.

Let it be understood, then, that the percentage system is not a method of feeding, but a scientific procedure of computing the ingredients which we are to use in our milk for feedings.

The first step in the intelligent understanding of infant feeding is to know as accurately as possible the feeding history of the infant to be cared for. What food it has been having is hardly sufficient—a knowledge here of the exact amounts of each ingredient, how each of these has been assimilated and how excreted; the amounts at each feeding, and the intervals between feedings; the source of the milk, whether dirty or clean, whether cooked or raw; the weight of the child, its average loss or gain in weight; all these are vitally necessary questions. The age of the child is of less importance and it is often of advantage to form our judgments of the needs and powers of assimilatoin of the infant before we know its age. No rules can be based upon age alone. What the child should have as food depends on far more essential features than age. The physiologic development, the powers of assimilation, the individual response to outside energy, *i. e.*, food, the powers of resistance, the equilibrium of the child in its relation to the outside world—these are the important features of the case. Every child is a law unto himself and only broad principles for treatment can be laid down.

Cow's milk has the following average composition according to König:

Water,	87.7
Casein,	3.0
Whey proteid,	0.4
Fat,	3.7
Sugar,	4.5
Ash,	0.7

Breast milk is composed of water, proteid, fats, sugar and salts. The proteids, fats and sugar, vary widely even within normal limits during different periods of lactation and under various conditions. This is well shown by a comparison of different authorities:

Authorities.	Proteid, percent.	Sugar, percent.	Fat, percent.
Pfeiffer	1.049–3.04	4.20– 7.60	0.70–9.00
Johanesson and Wang	0.900–1.30	5.90– 7.80	2.70–4.60
V. and J. Adriance	0.230–2.60	5.35– 7.95	1.31–7.61
Schlossman	0.560–3.40	5.20–10.90	1.60–9.46

Under even these wide variations a breast-fed infant normally does perfectly well.

The same variations occur from simple cow's milk, especially in the fats and proteids, according to Von Styke: Proteid, 2.19 to 8.56 percent; fat 2.25 to 9.00 percent. This can be almost wholly overcome by using the mixed milk for a herd when the variation ought never to be more than fat 3 to 5 percent; proteid 3 to 4 percent.

But even minimizing these variations is often not enough. The different elements vary in the different breeds of cows. Jersey and Guernsey cows' milk is always higher in its fat percentage; and, what is more important, the form in which the fat is emulsified is different. In Jersey milk the fat globules are large and the emulsion coarse. The digestion and assimilation of fat so coarsely emulsified is very much more difficult than is the finer emulsification found in Holstein, Durham or Ayrshire breeds of cows. Therefore either a pure or a mixed herd from these breeds is best chosen for producing milk for infant feeding. The conditions under which the milk is produced plays an important part. Unless milk is produced under the most approved sanitary and hygienic conditions, such as are demanded by certified milk (10,000 bacteria to the c.c.), disastrous results may follow in the form of acute bacterial intestinal infections, to which is due a large part of the infant mortality, especially in our large cities. Hence first of all in infant feeding we must know the kind of milk we are to use, both as to its average composition and under what conditions it is produced.

The individual ability for assimilation and digestion of the various constituents of milk differs with each infant. No rules can be laid down, but the following general principles (gained from scientific study) are of value.

Amount of Feedings.—The amount given must depend on the size of the infant. At any age an infant's physiologic capacity exceeds what is called its anatomic gastric capacity. Mosenthal's data give perhaps the best figures as to the amounts that can be given at a single feeding:

At the end of the first month 115 c.c., a scant 4 ounces.
At the end of the second month 125 c.c., a trifle more than 4 ounces.
At the end of the third month 145 c.c., a trifle less than 5 ounces.
At the end of the fifth month 170 c.c., a trifle less than 6 ounces.

Intervals of Feeding.—This would rationally depend on the rapidity with which an infant empties its stomach. A breast-fed infant empties its stomach in from one and a half to two hours, because of the physiologic fact that human milk is prepared for its passage into the duodenum

sooner than cow's milk, this latter requiring from three to three and a half hours. This is due to the complex processes that takes place in the stomach during digestion. It has been shown that the weaker the food the more rapidly is the stomach emptied. In its physiologic activity, the stomach begins the secretion of rennin and hydrochloric acid a few minutes after milk first enters so that the coagulation of the casein is finished in a few minutes after milk enters the stomach; the liquid part of the food, water, sugar, and salts are rapidly passed on into the duodenum. The esophageal orifice remains open as long as the contents of the stomach are alkaline and closes when they become acid. Whereas the pyloric orifice responds to exactly the opposite reaction, opening when the fluid portions coming in contact with it are acid, and closing when they are alkaline. The effect is the opposite in the reaction on the duodenal side of the pyloric orifice, which permits of an opening only when the duodenal contents are alkaline. The pyloric orifice reacts by closure to any but finely divided particles, making it difficult for the stomach to empty itself when digesting the more resistant curds formed from cow's milk. It takes longer for an acid reaction to appear because casein predominates to such an extent in cow's milk that the appearance of hydrochloric acid is delayed for two or three hours after the coagulation of cow's milk. After taking human milk, the hydrochloric acid appears between forty minutes and one hour and a half.

The capacity in the healthy infant for digesting and assimilating casein, whether human or cow's appears to be about equal. The difference in the two proteids comes from the great variation in proportion in which the whey proteids and the casein exist in the two milks. The proportion in human milk is almost 1 to 1, while in cow's milk it is 1 to 6. And this difference is the more important when we appreciate the biologic work on the colloidal properties of milk done by Alexander and Bull on the difference of the two proteids. Colloids are of two classes. One is readily coagulated when it comes in contact with electrolytes, such as hydrochloric acid, and after being acted on or coagulated is not reconvertible. These are called irreversible or unstable colloids. Casein belongs to this class.

The other class can be redissolved after dessication and is not affected by electrolytes. They further have the property of protecting the irreversible colloids from the action of electrolytes. The importance of whey mixtures in certain cases where the electrolytic action is too strong or where there is need of protecting the casein from too rapid coagulation is easily comprehended. And this biologic fact explains more clearly why we have such a fine flocculent coagulum formed in human milk as compared with the tougher coagulum or curd found in cow's milk from the action of hydrochloric acid. At present it is even being questioned whether "Casein Curds" are ever due to the casein in cow's milk. It has been argued that because there is no relation between the nitrogen content of the food and the nitrogen content of the stools "casein curds" do not point to proteid indigestion. However, Talbot has proved by indisputable biologic methods that cow's casein does appear in the so-called "casein curd." And there can be little question clinically that casein indigestion does exist and can be produced experimentally in certain cases by the addition of fat-free milk. In some cases the addition of even an ounce of fat-free milk will be sufficient to produce tough curds in the movement, whereas the addition of whey would have no like effect. So it may be safely said that although the proteid element in milk will cause us the least amount of trouble in substitute feeding, yet it can and does cause definite trouble if not properly managed, and may do considerable damage if the symptoms are not recognized and the casein element diminished low enough to check the formation of curds. Whey may even be the portion of the proteid at fault as shown by Meyer's experiment of substituting cow's whey to a mixture of mother's casein and fat, which caused an intestinal upset that did not occur when mother's whey was used in combination with cow's casein and fat.

The digestion of fats in infants is a still more complex problem. Schwartz has shown that the fat globules of cow's milk are rolled together in large clusters and clumps and that the fat globules are surrounded by a zone of clear substance called periglobular substance, which in cow's milk is easily broken through, allowing the globules to flow together into larger clusters. In human milk, the globules are much finer and more evenly distributed about the field and the periglobular substance is not as easily broken through. Upon heating, the periglobular substance in cow's milk seems to become more elastic and the fusion of the fat droplets much less easily accomplished. This may account for the greater digestibility of heated cow's milk over raw cow's milk in some cases. These mechanical differences certainly play important rôles, but there are some chemical and physiologic differences which are of great importance. There is more oleic acid found in human milk which has a lower melting point than fatty acids found in cow's milk (100 to 102° F. in human; 104 to 106° F. in cow's). In human milk there are lesser amounts of volatile acids, and the iodin combining power is higher in human milk—30 to 50 percent—while it is only 20 to 30 percent in cow's milk. Fat is also the last element to leave the stomach and in several instances more fat has been recovered from the stomach contents than had been taken in the previous 24 hours. With an excess of fat in the food, which at present we can only regulate quantitatively, we are not in a position to do anything but reduce the total amount. Future investigations will undoubtedly explain many things and point out how we can better adapt the fat of cow's milk to the infant's digestive capacity. One thing we have learned is that, normally, any percentage above four is fraught with danger, and in the infant below normal a much smaller percentage is alone safe even though there is no sign of fat intolerance or insufficiency shown in the stools.

MODIFIED MILK IN INFANT FEEDING

Uffenheimer claims that all the necessary ferments exist from the first in infants, so that it is possible that starches can be broken down and the double sugars split into simple sugars, in which condition alone can they be absorbed from the very first. Milk sugar has the slowest ratio of absorption. The amyolytic action of saliva is very weak before the sixth month, but after that time it increases rapidly until at the tenth month the action is double the strength of that at birth. From then until the fourth year there is very little gain in strength. Sugars and starch cause little trouble in the normal infant, but they may become very important and disturbing elements if the fat assimilation is much disturbed. According to Finkelstein, sugars and starch together with the salts may become the most important factors in alimentary decomposition and intoxication. "Sugar," says Finkelstein, "is the element that produces the temperature in these cases of decomposition."

The importance of salts in metabolism has been increasing steadily as our appreciation of their intimate relation and significance in vital processes has become more exact. Human milk supplies less salts than cow's milk, but the amount of salts that is capable of absorption in human milk exceeds that in cow's milk by about 20 percent. And the amount retained varies even more, being about 40 to 50 percent for human milk and only 15 percent for cow's milk. When there is fat intolerance the salts appear in the stools as soaps, and the loss of these salts cannot be made up by the addition of salts to the feeding. The salts principally affected are calcium and magnesium. These salts are also changed into insoluble forms by heating, and this important fact may explain the objection to heated milk when there is need of salts in the infant's metabolism. The rate and amount of absorption also changes during any illness, especially intestinal, though the extent of these changes has not been worked out, but their close relation to the weight curve when given in sufficient or insufficient amounts is fairly indicative of their importance. The next few years will probably see many changes in the knowledge of their exact and relative importance. It is necessary for us to consider these more scientific findings of late years as dominant factors in any attempt at feeding infants. We must understand the physiologic processes in an infant, and appreciate as fully as our present knowledge will allow us to do what these physiologic powers will permit in the digestion of the different food stuffs which we give in cow's milk. Besides appreciating these physiologic facts of digestion we must also understand the needs of each individual child. An infant needs nourishment for more purposes than an adult. The necessity for growth is far greater in infancy than at any other time. This body substance can alone be supplied by the proteid or nitrogen element in cow's milk. The younger the child the higher is the percentage of nitrogen that can be utilized. This varies greatly in health and disease. It is undoubtedly less during sickness, but may even exceed the normal during convalescence. Proteid also goes toward the repair as well as the building up of the body, and under certain conditions it may lend itself to furnishing body heat and energy, though when used for this it is far from being an economical process, as over 25 percent is not available for body heat and is given off as free heat. This function of supplying heat and energy is better supplied by the carbohydrate portion of the diet which has the same value per gram as the proteid, but is far more easily and completely vitalized and protects the wasteful combustion of proteid more than any other element. Heat and energy are supplied to a far less degree by the fats, which, however, go toward the increase in weight and stored-up energy. Just how this is accomplished is not perfectly clear nor is it known in what proportions the fats are carried through the blood and lymph.

In determining the needs of an infant, therefore, its weight is an important factor and, except during the time of sickness when the weight is less, fairly represents the physiologic stage of development. It must also be remembered that during convalescence from acute infections other than alimentary disorders the needs and power of assimilation may far exceed that indicated by the weight. At such a time the age plus the approximate normal needs is a better guide in determining the immediate needs of the infant. It has been generally accepted that during the first two or three months 110 calories per kilo are needed, that from the third to the sixth month 100 calories suffice, and from the sixth to the twelfth month from 90 to 80 calories are needed. The demand for body growth on the proteids in the early months has been noted. This is calculated to amount to about 7 percent of the caloric need during the first year, or it may be even more since the utilization of cow's proteid is probably not as great as human.

In estimating the energy quotient of the different elements found in milk, Rubner's figures are accepted.

1 calorie is the amount of heat necessary to raise 1 liter of water to 1 degree Centigrade, and, according to Rubner,

1 gram of fat yields 9.3 calories,

1 gram of carbohydrates yields 4.1 calories,

1 gram of proteid yields 4.1 calories,

Or, if we wish to use ounces and quarts,

1 ounce of fat yields 288 calories,

1 ounce of carbohydrates yields 123 calories,

1 ounce of proteid yields 123 calories,

Or

1 percent of proteid in 1 ounce of mixture will yield 1.23 calories,

1 percent of carbohydrates in 1 ounce of mixture will yield 1.23 calories,

1 percent of fat in 1 ounce of mixture will yield 2.88 calories.

So that taking milk at 3.50 percent proteid, 4.75 percent carbohydrates, and 4 percent fat, we have about 20 calories to the ounce, or about 670 calories to the quart. Fat free milk or skimmed milk will yield about 400 calories per quart, while gravity cream (16 percent) will yield 860 calories per pint.

MODIFIED MILK IN INFANT FEEDING

It will be apparent to any student of the subject that a complete understanding of an infant's needs cannot be met simply by supplying a sufficient number of calories irrespective of the quantity of each ingredient used. The physiologic capacity of the infant must be gauged, its power of assimilation studied and the particular individual element appreciated. In judging the powers of assimilation the stools are an important factor from two different standpoints; first of all, macroscopic, chemical and microscopic study must be carried out if we wish to know whether digestion is normal. The stools of a normal infant are one or two yellow, soft, homogeneous ones. If there is an excess of proteid, the stools are a brownish yellow color, with a cheesy odor, and have an alkaline reaction. Tough casein curds the size of kidney beans may appear which are insoluble in ether and are hardened by formalin. When there is an excess of starch in the food, the movements are a darker brown color, have an aromatic acid odor, and an acid reaction. This excess of starch tends to increase the bacterial fermentation and may produce the excessive scalding so often seen in intestinal fermentation with loose movements. Starch granules may also be found by chemical examination. The fat stools are pale gray, soft, slimy, or green with small soft curds which give the characteristic chemical reactions and pictures of neutral fat globules or fatty acid crystals or fatty soaps.

On the other hand, the importance of the intestinal flora and the influence of the different elements of food on their activity are only now becoming evident. In this the sugars undoubtedly play a big part and their balance with the proteid constituent is an important element in whether fermentative or putrefactive processes will predominate or whether the normal equilibrium will be maintained.

In order to accomplish these results with any assurance of success we must think of the different elements that enter into feeding in the most exact terms, which are percents. Otherwise our specialized knowledge will not carry us as far on the road to success as we are entitled to go. The processes in calculating these percents may be as simple or as complex as we wish to make them. The simpler we make them the more serviceable they will be, but the accuracy, and ability to get whatever percents of the various elements we need to meet the demands of each case must not be sacrificed to our ease in giving directions.

If we take cow's milk to be on the average fat 4.00 percent, sugar 4.75 percent and proteid 3.50 percent; and gravity cream to be fat 16 percent, sugar 4.50 percent, proteid 3.20 percent; fat-free or skimmed milk to be fat 0.0 percent, sugar 4.50 percent, proteid 3.20 percent, they will give us fairly constant and accurate averages in making up mixtures from the mixed milk of a good herd. If we wish to compute any desired formula the process is a very simple one and the necessary figures to remember are brought down to a minimum. Thus if we wish to feed a child ten months old, weighing 22 pounds, a mixture composed of 4 percent fat, 7 percent sugar and 1.50 percent proteid, 8 ounces at a feeding and 5 feedings in 24 hours, we would have the following example:

4/16 of 40 (ounces in total mixture) = 10 ounces of 15 percent cream would give 4 percent fat.

10 of 16 percent cream would also yield 10/40 of 3.20, the proteid in 16 percent cream or .80 percent of proteid.

10 ounces of 16 percent cream would also yield 10/40 of 4.50 sugar in 16 percent cream or 1.12 percent sugar. So that 10 ounces cream would furnish 4 percent fat, 1.12 percent sugar and 0.80 percent proteid, and this subtracted from the original amount wanted would give what was still needed or 0.0 percent.

$$\frac{4 = \text{percent of fat wanted}}{16 = \text{percent of cream used}} \text{ of } 40 = \text{ounces in total mixture.}$$

= 10 ounces of 15 percent cream, which gives 4 percent fat.

10 ounces of 16 percent cream would also yield 10/40 of 3.20 (percent of proteid) in 16 (percent cream) or .80 percent proteid.

10 ounces of 16 percent cream would also yield 10/40 of 4.50 (percent of sugar in 16 percent cream) or 1.12 percent sugar, so that 10 ounces of cream would furnish 4 percent fat; 1.12 percent sugar; 0.80 percent proteid, and this subtracted from the original amount wanted would give what was still needed or fat 0.0 percent; 5.90 percent sugar; 0.70 percent proteid. .70 percent proteid is derived from the fat-free milk or skimmed milk which has a working percentage of

Fat 0.0 percent; sugar 4.50 percent; proteid 3.20 percent.

We need then

$$\frac{.70 \text{ (percent of proteid needed)}}{3.20 \text{ (percent of proteid in fat free milk}} \text{ of } 40$$

= 8.75 ounces of fat-free milk.

8.75 ounces of fat-free milk contains not only .70 percent of proteid, but also

$$\frac{8.75 \text{ (ounces of fat-free milk)}}{40 \text{ (total quantity fat-free milk).}} \text{ of } 4.50 \text{ (percent of sugar in}$$

= .97 percent sugar.

In 8.75 ounces of fat-free milk so far we have

Fat	Sugar	Proteid	
4 %	1.12	.80 %	from .10 oz. of 16 % cream
0	.97	.70	" 8.75 " " fat-free milk
4 %	2.09	1.50 %	18.75

5 percent of sugar is still needed, which can be obtained in the following way:

5 percent of 40 (total ounces in mixture) = .05 x 40 = 2 ounces of sugar of milk, or 4 tablespoons of sugar.

21.25 ounces of water is needed to bring up the total amount to the required 40 ounces.

The caloric value of this food would be figured as follows:

Mixture =4–7–1.50 40 ounces = (1200 c.c.)
4 percent fat =.04 x9.3x1200 =446.4 calories.
7 percent sugar =.07 x4.1x1200 =344.4 calories.
1.5 percent sugar =.015x4.1x1800 = 73.8 calories.
Total, 864.6 calories.

The caloric need of an infant weighing 22 pounds in its tenth month would be about 85 calories per kilo or 850 calories. This mixture then would just about satisfy the caloric needs of this infant.

When whey mixtures are needed the same plan of computing the necessary amounts are carried out as follows:

Mixture wanted: Fat, Sugar, Proteid
3 6 90 whey
50 casein

40 oz. in total mixture.

Using 16 percent cream we have

3/16 of 40 = 7.5 ounces cream = 3 percent fat.

7.5 ounces of 16 percent cream furnishes $\frac{7.5}{40}$ of 3.20 (percent of proteid in 16 percent cream) = .60 proteid, and as 5/6 of this is casein we have the total amount of casein needed and .10 percent of whey is furnished.

We still need .80 (percent of whey proteid) of 40 which equals 32 ounces of whey.

7.5 ounces of cream + 32 ounces of whey = 39.5 ounces amount furnished by cream and whey.

$\frac{39.5}{40}$ of 4.50 (percent of sugar in whey and cream) =4.50 percent sugar furnished, which leaves 1.5 percent of sugar still needed to complete the amount needed, which equals .015x40 = $\frac{6}{10}$ of an ounce of sugar or about 1 1/4 tablespoons of sugar of milk.

Therefore we have Cream, 7.5 ounces.
Fat-free milk, 0.0 ounces.
Whey, 32.0 ounces.
Sugar, 1.25 tablespoonfuls.
Boiled water, 0.5 ounces.

The calories furnished by such a mixture would be:

From the cream, .03x9.3x1200(c.c.) =335 calories
From the proteid .074x4.1x1200(c.c.) =364 calories
and sugar, A total of 699 calories

The question of alkalinity has been a much discussed one but, as stated before, has been very much overestimated. The addition of lime water, besides acting as a mild alkali, stimulates the secretion of hydrochloric acid, so that when lime water is added the total amount of hydrochloric acid is increased and there is very little protective power from the lime water unless given in large proportions. The amount added should always be calculated, with reference to the amount of cream and milk in the mixture and not with reference to the total amount of the mixture. The calculated maximum percent to produce a mild neutralization of the hydrochloric acid secreted by the stomach is 20 percent of the milk and cream, which delays the coagulation of the casein, giving a longer time for the protective action of the albuminoid portions of the proteid to affect some colloidal action on the casein, and so further delaying the coagulation and helping finally to a more rapid evacuation from the stomach because of the smaller size of the coagulum formed. A percentage of 50 to the amount of milk and cream suspends totally the action of the gastric digestion by hydrochloric acid and hastens the emptying of the stomach contents into the duodenum. Sodium bicarbonate acts even more strongly in neutralizing the hydrochloric acid, but exerts no stimulation on the hydrochloric acid secretion of the stomach. It requires 0.68 percent of the milk and cream used to facilitate this neutralization, and 1.70 percent to suspend all action of the hydrochloric acid on the proteid in the food, and so hasten the contents into the duodenum.

Sodium citrate appears to be the ideal protector of casein. For, as has been pointed out before, it has a definite protective action on the casein, being itself a stable colloidal substance with the power of protecting unstable colloids of the casein class, and sodium citrate also combines with hydrochloric acid to form sodium chlorid and so lessens the available hydrochloric acid. Two grams to the ounce of milk and cream used is needed to accomplish this, and double this amount in cases with hyperchlorhydria. For this same purpose a small percentage of gelatin, 1 to 2 percent of the amount of milk and cream in the mixture, can be used as also can decoctions of any of the cereal grains. These weak decoctions from barley, oats, rice, and other cereals contain the colloidal portions of the proteid in these grains without much of the starch. After the 6 months when, as has been seen, starch digestion begins to become useful, the cereal flours can be made use of and they will furnish a slight amount of nourishment, especially if used in the strength of 3 percent for the diluent in our mixtures, so serving a double purpose. They may act also mechanically in the aid of constipation when there is very little choice among the different cereals. The conversion of starch is first into dextrin and then into maltose. The assimilation of the different sugars varies greatly. Lactose (milk sugar) is the least convertible, whereas maltose is the most easily convertible into dextrose, the body sugar, forming two molecules of dextrose, while lactose is capable of forming but one of dextrose and one of galactose. It is not surprising then that the effect on weight is greater from the use of the more easily convertible and assimilable sugars, as cane and malt or even of starch. When prepared with this in view—which means careful dextrinization easily accomplished in an hour by the addition of

takadiastase—its food value is increased in proportion to the amount of malt converted into dextrose. See Infant Feeding, Milk, etc.

MOLDS.— See Parasites (Vegetable).

MOLE.—1. A proliferative degeneration of the chorionic villi, producing a mass of berry-like vesicles attached to the placenta. It is called vesicular mole, and hydatidiform or myxomatous degeneration of the placenta. See Chorion. 2. Also applied to a small, pigmented spot of the skin. See Nevus.

MOLLITIES OSSIUM.—See Bone Diseases.

MOLLUSCUM CONTAGIOSUM.—An epithelial disease characterized by pinhead-sized to pea-sized or larger, smooth, semiglobular, waxy-white or pinkish elevations. The disease is uncommon.

Etiology.—The disease occurs chiefly in the children of the poorer classes. It is probably contagious.

Pathology.—The disease consists of an enormous hyperplasia of the cells of the rete mucosum, the process, in all probability, beginning in the hair follicles. The center of the molluscum tumor is made up of a number of lobules filled with ovoid or rounded, fatty looking, degenerated epithelial cells, designated as "molluscum bodies."

Symptoms.—The lesions are discrete, usually split-pea-sized, of the color of the skin or pinkish, with often a distinct waxy appearance. The summits are somewhat flattened, and contain a central, darkish opening, from which a cheesy secretion may be expressed. They are usually situated upon the face, particularly about the eyelids, cheeks, and chin. They increase slowly in size, eventually terminating in suppuration and disintegration. As a rule, no scarring is left. The lesions are few, a half dozen or more being the usual number present.

Diagnosis.—The characteristic features of the disease are: The size of the lesions; their waxy appearance; the presence of a central orifice giving exit to a whitish secretion; and the history and course of the affection.

Prognosis.—The condition sometimes disappears spontaneously. It is readily amenable to treatment.

Treatment.—The tumors may be destroyed by incision, expression of their contents, and cauterization of the cavity with the stick of nitrate of silver. Again, they may be curetted away or snipped off with a pair of curved scissors. Pedunculated growths may be ligated. When the lesions are small, the following ointment may be used:

℞. Ammoniated mercury, ʒ j
Ointment of zinc oxid, ℥ j.

MONK'S-HOOD.—See Aconite.

MONOMANIA.—A form of mania or madness in which a single delusion or form of delusion is especially dwelt upon. See Mania, Paranoia.

MONOPLEGIA.—Paralysis of a single limb or of a single set of muscles. See Paralysis.

MONOTAL.—Guaiacol methylglycholate. It is said to have the action of guaiacol without being irritant or toxic. It is recommended as an analgesic for local application to painful areas of the skin, which readily absorbs it.

MONSEL'S SALT, and SOLUTION.—See Iron.

MONSTROSITY.—A teratism; a fetus or being with an abnormal development or superfluity or deficiency of parts or some vice of conformation. These may be compound or double, single or simple, according as the monster is composed of the malformations of one or more elementary organisms. A table of monstrosities is appended.

TABLE OF MONSTROSITIES.*

According to Geoffroy Saint-Hilaire, Altered by Hirst and Piersol.

HEMITERATA

I. **ANOMALIES OF VOLUME. HEMITERATA.**
- A. Of Stature.
  1. *General diminution*, as in a dwarf—delayed growth.
  2. *General increase*, as in a giant—precocious development.
- B. Of Volume (strictly speaking).
  1. *Local diminution*, affecting—
     (*a*) *Regions*, as a limb.
     (*b*) *Systems*, as undeveloped muscles.
     (*c*) *Organs*, as small breasts, stenosis of canals, etc.
  2. *Local increase*, affecting—
     (*a*) *Regions*, as the head.
     (*b*) *Systems*, as the adipose tissue.
     (*c*) *Organs*, as large breasts in women, lactiferous breasts in men.

II. **ANOMALIES OF FORM.** *Single order*, including—deformed heads; anomalies of shape of the stomach; deformed pelves, etc.

III. **ANOMALIES OF COLOR.**
- A. *Deficiency*, complete, partial, or imperfect albinism.
- B. *Excess*, complete, partial, or imperfect melanism.
- C. *Alteration*, as in unusual color of the iris.

IV. **ANOMALIES OF STRUCTURE.**
- A. *Deficiency in consistency*, as cartilaginous conditions of bones.
- B. *Excess in consistency*, as anomalous ossification.

V. **ANOMALIES OF DISPOSITION.**
- A. By Displacement.
  1. *Of the splanchnic organs*, as anomalous direction of heart or stomach, hernias, exstrophy of the bladder, etc.
  2. *Of the nonsplanchnic organs*, as club-foot, curvature of the spine, misplaced teeth, misplaced blood-vessels, etc
- B. By Change of Connection.
  1. *Anomalous articulations.*
  2. *Anomalous implantations*, as teeth out of line.
  3. *Anomalous attachments*, as of muscles and ligaments.
  4. *Anomalous branches*, as of arteries and nerves.
  5. *Anomalous openings*, as of veins into the left auricle, of the ductus choledochus in an unusual situation, of the vagina into the rectum, of the rectum into the male urethra, of the rectum at the umbilicus, cloaca.

* Reproduced from "Human Monstrosities," by Barton Cooke Hirst, M. D., and George A. Piersol. M. D., Philadelphia: Lea Brothers and Co., 1892.

C. In Continuity.

1. *Anomalous imperforations*, as of rectum, vulva, vagina, mouth, esophagus.
2. *Anomalous union of organs*, as of kidneys, testicles, digits, teeth, ribs; adhesion of the tongue to the palate.

D. By closure, as in complete transverse septum in the vagina.

E. By Disjunction.

1. *Anomalous perforations*, as persistence of foramen ovale, ductus arteriosus, urachus.
2. *Anomalous divisions*, as splits, fissures in various organs, harelip, hypospadias, fissured tongue, cleft palate, fissured cheek.

VI. ANOMALIES OF NUMBER AND EXISTENCE.

1. *By numerical defect*, as absence of muscles, vertebræ, ribs, digits, teeth, a lung, a kidney, the uterus, the bladder, etc.
2. *By numerical excess*, as supernumerary digits, ribs, teeth, breasts, a double uterus.

HETEROTAXIS

I. Splanchnic Inversion.
II. General Inversion.

HERMAPHRODITES*

I. True Hermaphrodites.

(*a*) *Bilateral hermaphrodites.*
(*b*) *Unilateral hermaphrodites.*
(*c*) *Lateral hermaphrodites.*

II. Pseudohermaphrodites, with double sexual formation of the external genitals, but with unisexual development of the reproductive glands (ovaries and testicles).

(*a*) *Male pseudohermaphrodites* (with testicles).
1. *Internal pseudohermaphrodites.* Development of uterus masculinus.
2. *External pseudohermaphrodites.* External genitals approach the female type; the monstrosity presents a feminine appearance and build.
3. *Complete pseudohermaphrodites* (internal and external). Uterus masculinus with tubes; separate efferent canals for bladder and uterus.

(*b*) *Female pseudohermaphrodites* (with ovaries). Persistence of male sexual parts.
1. *Internal hermaphrodites.* Formation of vas deferens and tubes.
2. *External hermaphrodites.* Approach of the external genitals to the male type.
3. *Complete hermaphrodites* (internal and external) Masculine formation of the external genitals and of a part of the sexual tract.

MONSTERS

CLASS I.—SINGLE MONSTERS.

Order I.—Autositic Monsters.

- Genus I,
  - Species 1. *Ectromelus.*
    - Phocomelus
    - Hemimelus
    - Micromelus
    - Ectromelus
  - Species 2.
    - Symelus
    - Uromelus
    - Sirenomelus
- Genus II, Single species, *Celosoma.*
  - Aspalasoma
  - Agenosoma
  - Cyllosoma
  - Schistosoma
  - Pleurosoma
  - Celosoma
- Genus III,
  - Species 1. *Exencephalus.*
    - Notencephalus
    - Proencephalus
    - Podencephalus
    - Hyperencephalus
    - Iniencephalus
    - Exencephalus
  - Species 2. *Pseudencephalus.*
    - Nosencephalus
    - Thlipsencephalus
    - Pseudencephalus
  - Species 3. *Anencephalus.*
    - Derencephalus
    - Anencephalus
- Genus IV,
  - Species 1. *Cyclocephalus.*
    - Ethmocephalus
    - Cebocephalus
    - Rhinocephalus
    - Cyclocephalus
    - Stomocephalus
  - Species 2. *Octocephalus.*
    - Sphenocephalus
    - Octocephalus
    - Endocephalus
    - Opococephalus
    - Triocephalus

Order II.—Omphalositic Monsters.

- Genus I,
  - Species 1. *Paracephalus.*
    - Paracephalus
    - Omacephalus
    - Hemiacephalus
  - Species 2. *Acephalus.*
    - Acephalus
    - Peracephalus
    - Mylacephalus
  - Species 3. *Asomata.*

Genus II, Single species, *Anideus.*

CLASS II.—COMPOSITE MONSTERS.

Order I.—Double Autositic Monsters.*

A. *Terata katadidyma.*
Genus I, Diprosopus
Genus II, Dicephalus
Genus III, Ischiopagus
Genus IV, Pygopagus

B. *Terata anadidyma.*
Genus I, Dipygus
Genus II, Syncephalus
Genus III, Craniopagus

C. *Terata anakatadidyma.*
Genus I, Prosopothoracopagus
Genus II, Omphalopagus
Genus III, Rhachipagus

Order II.—Double Parasitic Monsters.

- Genus I,
  - Species 1. *Heterotypus.*
    - Heteropagus
    - Heterodelphus
    - Heterodymus
    - Hetertoypus
    - Heteromorphus
  - Species 2. *Hcteralius.* Epicomus
- Genus II,
  - Species 1. *Polygnathus.*
    - Epignathus
    - Hypognathus
    - Paragnathus
    - Augnathus
  - Species 2. *Polymelus.*
    - Pygomelus
    - Gastromelus
    - Notomelus
    - Cephalomelus
    - Melomelus
- Genus III, *Endocyma.....*
  - Dermocyma
  - Endocyma

Order III.—Triple Monsters.

* Kiebs' classification of hermaphrodites, as given by Ahlfeld, is substituted for that of Geoffroy Saint-Hilaire.

* The third order of Geoffroy Saint-Hilaire, single parasitic monsters, under which name he describes dermoid cysts, is omitted. Forster's classification is substituted, with slight modification, for that of Geoffroy Saint-Hilaire.

MORBILLI.—See MEASLES.

MORPHEA.—Circumscribed scleroderma; Addison's keloid; the most common form of scleroderma, usually occurring in young female adults. Its usual seats are about the breasts and the face and neck, and often it follows the course of the nerve distribution. It occurs in the form of patches—rounded, ovoid, or irregular in outline; small or large, soft or firm, smooth or shining, pale yellowish or brownish in color. The lesions are, as a rule, asymmetric. The course of the disease is chronic; it may also manifest itself in the form of atrophic, pit-like depressions in the skin, and as lines, streaks, and telangiectases.

MORPHIN.—$C_{17}H_{19}NO_3$. The name of the principal alkaloid of opium, to which the properties of that drug are chiefly due. It is an anodyne, hypnotic, and narcotic. One-fourth of a grain corresponds in activity with 1 grain of opium of average strength. See OPIUM.

Preparations.—**M. Acetas,** soluble in water. Dose, 1/8 to 1/2 grain. **M. Hydrochlorid** occurs in silky crystals, soluble in water. Dose, 1/8 to 1/2 grain. **M., Pulv., Comp.,** Tully's powder, contains morphin sulphate 1 1/2, camphor, 32, licorice 33, and calcium carbonate, 33 1/2 parts. Dose, 5 to 15 grains. **M. Sulphas,** acicular crystals, soluble in hot water. Dose, 1/8 to 1/2 grain.

MORRHUÆ OLEUM.—See COD-LIVER OIL.

MORTALITY.—See DEATH-RATE; LIFE (Expectation).

MORTON'S DISEASE.—See METATARSALGIA.

MORVAN'S DISEASE (Analgic Panaritium).—A disease characterized by disorders of sensations of pain, temperature and touch, and painless felons. Probably this disease is identical with syringomyelia in most instances. In some cases it is leprosy.

MOSCHUS.—See MUSK.

MOSQUITOS.—There are three varieties which are of medical interest, Culex, Stegomyia, and Anopheles. The following table (by Jackson) will be found helpful:

	Culex.	Stegomyia.	Anopheles.
Diseases conveyed.	Mostly nonpathogenic for man but may convey filarial diseases.	Stegomyia fasciata conveys yellow fever in man.	Conveys malarial disease. Conveys filarial disease in man.
Breeds..	In and about houses, gardens, back yards, old flower pots, or tins, vessels, tubs, cisterns, barrels, gutters, drains. "Home bred."	Resembles Culex.	Puddle breeding—shallow, small pools, in rock or soil, also at margins of lakes and rivers, quiet bays, ponds, in rice fields and water covering submerged grass. Less "home bred."
Bites....	By day or night—at twilight. Females only.	Often bites by day. Females only.	Nocturnal chiefly. Females only.
Wings...	Rarely spotted...	Never spotted..	Usually spotted. There are a few exceptions.
Larval motility.	Larvæ float with heads downward. When disturbed wriggle to bottom of vessel.	Resemble Culex.	Float at surface of water like sticks and have a backward, skating motion.
Resting posture.	"Hunch-backed." Axis of head and proboscis forms an obtuse angle with body.	Resembles Culex.	Axis of head, proboscis and body in same line. Appears as if standing on its head. Some exceptions to this rule.
Eggs....	Deposited in ellipse-shaped masses, convex below, concave above (boat shaped). Eggs arranged in rows, perpendicular and adherent, have one pointed end. Color dirty white. 200 to 400 in a batch.	Eggs are more oval and are not deposited in rafts or masses. Float singly upon their sides, or sink, hatching submerged.	Deposited in masses of 40 to 100 eggs, not adherent, each egg floating on its side, and regularly elliptic in outline, at middle of each side appears a clasping wrinkled membrane. Dark in color.
Singing tone	High pitched.....	Resembles Culex.	Low pitched.
Bodies..	Dull gray in color.	Body and legs covered with black scales and white markings in spots or lines. S. Fasciata has transverse striations on ventral aspect of body.	Dark gray or brown.

Destruction.—The most rational method of procedure is to aim at the extermination of these insects by destroying all larvæ through drainage, ditching and leveling of their breeding places and especially by covering these places with kerosene. The adult insects may be killed by disinfection (especially with sulphurous acid) of rooms and clothing, etc., in which they lurk. See DISINFECTION.

To Keep Mosquitos Away.—Howard recommends the following to keep mosquitos from one while asleep:

℞. Oil of citronella,
Spirit of camphor, } each, ℥i
Oil of cedar, ℥ss.

Mix and apply a few drops on pillow and on a towel near the head of the bed.

Mosquitos do not like the smell of: Spirit of camphor, oil of peppermint, oil of pennyroyal, oil of lavender, oil of hedeoma, oil of erigeron, cade oil.

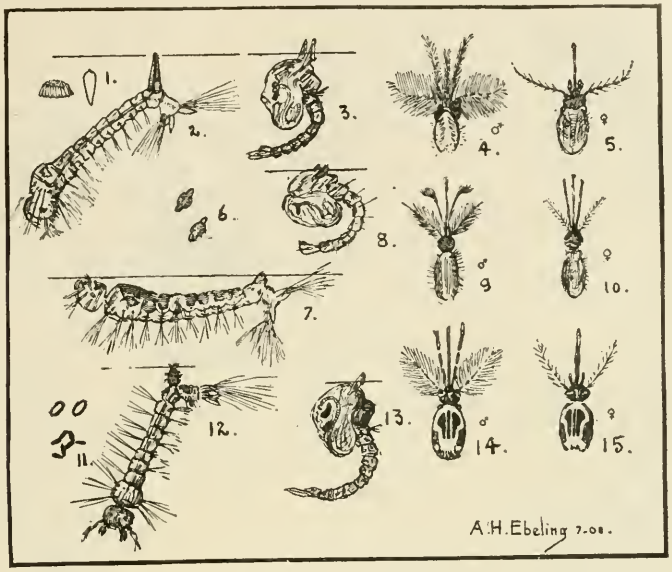
Another preparation is:

℞. Oil of lavender, Alcohol, Castor oil. } equal parts.

Mix and apply on face and hands and sprinkle a few drops on a towel hung at the head of the bed.

For Mosquito Bites.—Apply plain soap to the bitten places; other remedies used are: alcohol, ammonia, bichlorid of mercury, calcium chlorid, glycerin, indigo, ichthyol, potassium hydroxid (10 percent solution), potassium permanganate, phenol, naphthalin, salicylic acid.

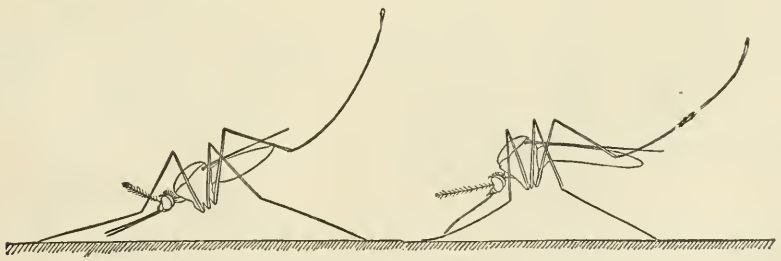
See Filariasis, Malarial Fevers, Yellow Fever.



Metamorphosis of Mosquitos

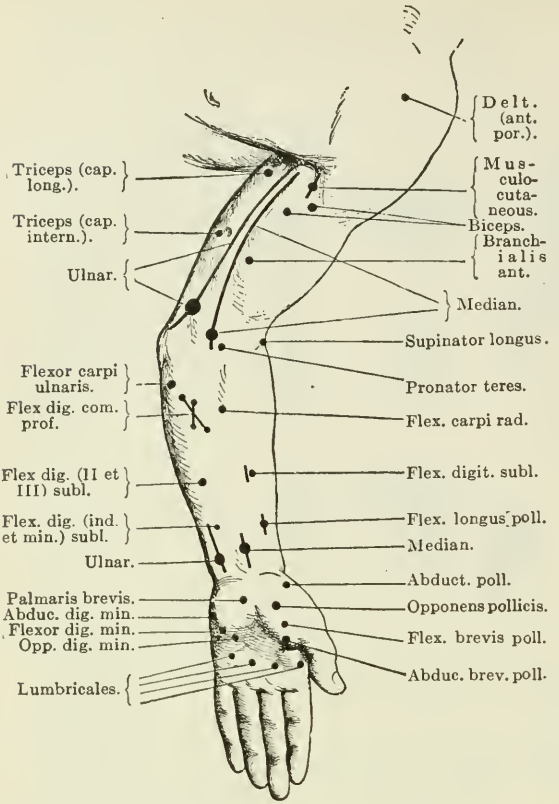
1, 2, 3, 4 and 5. Eggs, larva, pupa and heads of male and female Culex; 6, 7, 8, 9 and 10, eggs, larva, pupa and heads of male and female Anopheles, 11, 12, 13, 14, and 15, eggs larva, pupa and heads of male and female Stegomyia.—(*Stitt.*)

MOTOR POINTS.—The points on the surface of the body where the various branches of the motor nerves supplying the muscles may be affected by electricity. See Electricity, Degeneration (Reaction), Muscles, etc. The accompanying illustrations show the principal motor points:

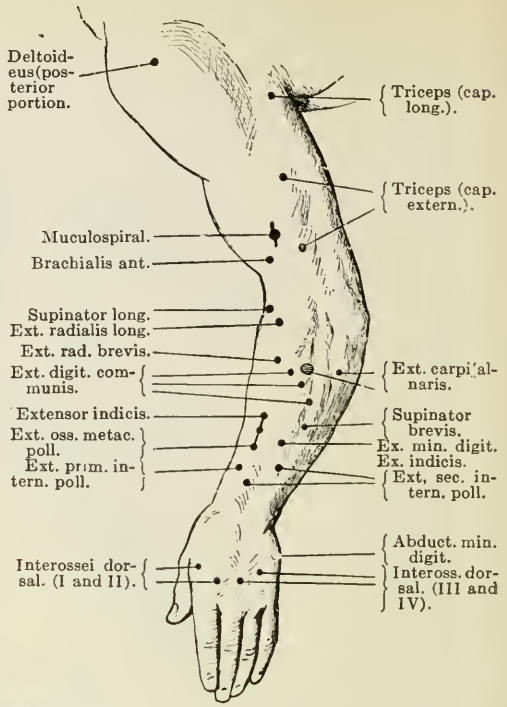


Anopheles. Culex.

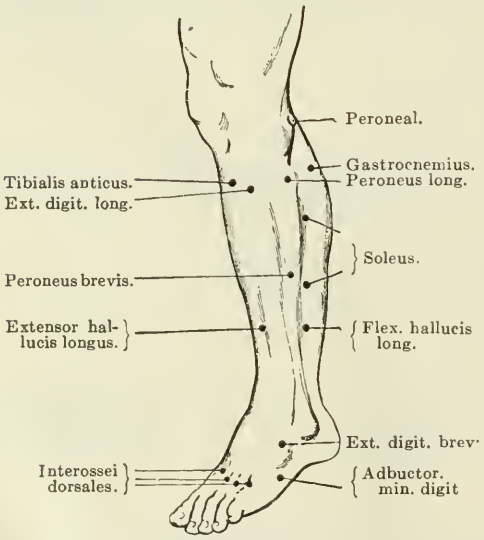
Resting Positions of Anopheles and Culex Insects.—(*Stitt.*)



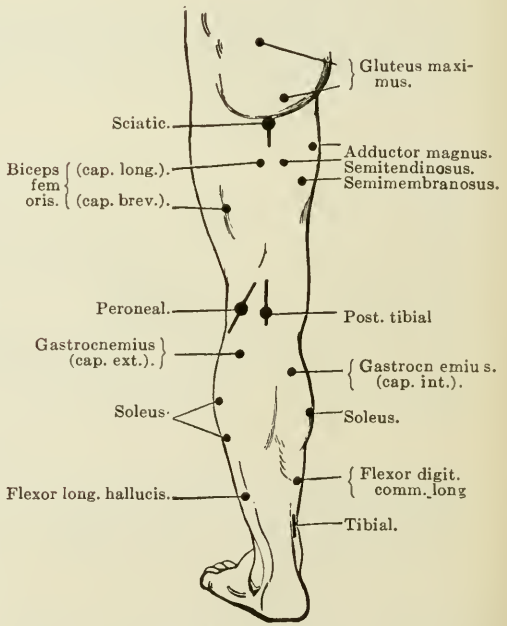
Motor Points of Palmar Aspect of Left Arm.



Motor Points of Dorsal Aspect of Left Arm.



Motor Points of Outer Aspect of Left Leg.

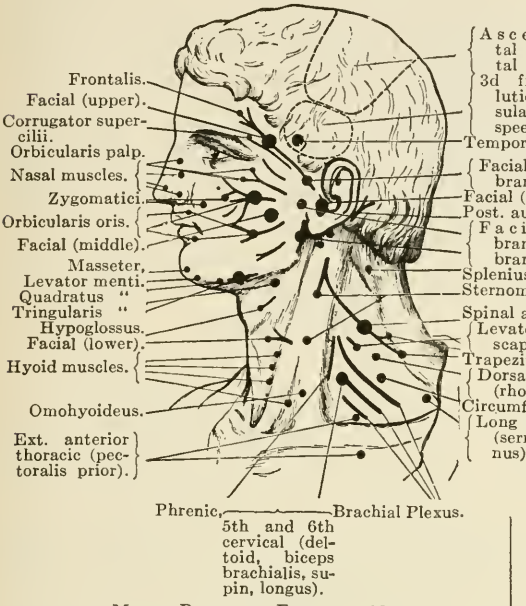


Motor Points of Posterior Aspect of Left Thigh and Leg.

MOUNTAIN SICKNESS.—A condition resulting from excessive exertion at high altitudes characterized by rapid pulse, dyspnea, epistaxis, slight rise of temperature and intense fatigue on exertion.

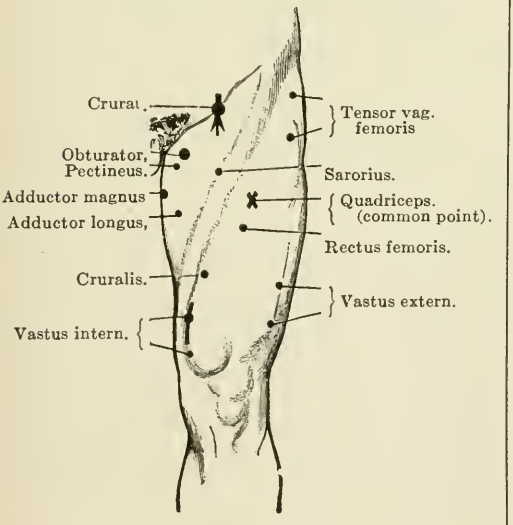
MOUNTING.—See Pathologic Technic.

MOUTH, Diseases.—See Stomatitis.



Motor Points of Face and Neck.

MUCOUS PATCHES.—These are papules deprived of epithelium, a frequent lesion of acquired secondary and of inherited syphilis. They are associated with papular eruptions in early secondary syphilis. They are situated usually on mucous membranes, or on thin and moist skin, are gray in color, are circular or oval, moist, and excrete an offensive and virulent discharge, which is highly contagious. They appear as areas of congestion, swelling, and abrasion of the epidermis upon the lips, palate, gum, tongue, cheeks, vagina, vulva, scrotum, anus, and under the prepuce, and are often accompanied by some fissuring and ulceration of the adjacent parts.



Motor Points of Anterior Aspect of Left Thigh.

The treatment requires scrupulous attention to cleanliness of the affected region, applications of solid silver nitrate or copper sulphate, and frequent dusting with calomel powder. They may be touched with blue stone every day, at the same time employing an astringent mouth-wash. If the areas proliferate, they should be excised or burned. Growing papules may be cauterized with chromic acid (1:5), or nitric or carbolic acids may be used as caustics. A solution of zinc chlorid, 10 grains to the ounce, makes a good astringent dressing for after-treatment. General treatment must be carried out at the same time. See Syphilis.

A mouth-wash:

℞. Boroglycerid, ℥ ss
Water, ℥ viij.

Use as a mouth-wash several times daily.

MULTIPLE IMPREGNATION.—See Pregnancy (Multiple).

MULTIPLE NEURITIS.—See Neuritis (Multiple).

MULTIPLE SEROSITIS.—An extensive inflammation of serous membrane with primary seat in the pericardium, peritoneum or pleura, characterized by ascites and sometimes edema of the extremities. It is probably due to an organism of low virulence. The pathology and symptoms vary with the seat of invasion. If perihepatitis is primary, Glisson's capsule has the appearance of icing.

Associated with the ascites may be found pleurisy and pericarditis. The affection develops slowly and insidiously. The patient gradually loses strength and death ultimately ensues from exhaustion. Treatment is symptomatic.

MUMPS (Epidemic Parotitis).—An acute contagious disease, manifested locally by swelling and inflammation of the parotid and, rarely, of the other salivary glands.

Etiology.—While probably of microbic origin, the specific organism has not been established.

Mumps is highly contagious, and is usually communicated by the breath or exhalations, but may be carried by a third person or by fomites. Those between the ages of 10 and 14 are the most susceptible. Sporadic cases are sometimes observed. It is most likely to be communicated during the beginning of the attack, but possibly while the febrile symptoms remain. One attack usually gives immunity, but if only one of the parotids has been affected during the first attack, the other may be involved subsequently.

Pathology.—Parotitis begins as a catarrhal in-

flammation of the ducts, involving later the periglandular connective tissue. The inflammation is seldom of such a nature as to cause suppuration.

Symptoms.—The period of incubation is 10 to 20 days; about 14 days, usually. The invasion is marked by languor and fever (101° to 103° F.), with perhaps headache and vomiting. The patient complains of pain at the angle of the jaw, which is greatly increased on swallowing an acid, such as vinegar. With these symptoms is noticed a swelling of the parotid gland on one side, the one on the opposite side usually soon becoming also involved. Occasionally but one of the glands is affected, and in other cases both may show the swelling at the same time. The swelling increases gradually until the third to sixth day, and produces marked disfigurement, filling the depression beneath the ear and extending to the cheek and neck. The most prominent point is just below the lobe of the ear, causing it to be pressed outward. The salivary glands are usually also involved, and the mouth, as a rule, is dry, although in some cases there is marked salivation. When the swelling has reached its height, the pressure on the adjacent tissues causes a disagreeable feeling of tension; chewing, swallowing, and even speaking are painful and difficult. Ringing in the ears and earache are quite common. As a rule, the patient is not seriously ill, but in some cases the fever is high, and there may be nervous symptoms, such as headache or delirium.

The duration of the attack is about a week, after which the swelling subsides, and by the tenth or twelfth day entirely disappears.

Complications and Sequels.—Mumps usually runs a mild course, without any serious symptoms, but occasionally complications arise which add greatly to the severity of the disease. The most common complications are orchitis in the male, and, much less frequently, mastitis, ovaritis, or vulvovaginitis in the female. These inflammations usually occur in those who have reached puberty, seldom being seen in children, and usually do not appear until the swelling in the glands of the neck has subsided. These complications lengthen the course of the attack and increase the constitutional symptoms, but in most cases recovery without serious trouble occurs.

Among the less common complications and sequels are otitis media and deafness, meningitis, arthritis, and albuminuria.

Prognosis.—In the great proportion of cases mumps is a mild disease, recovery taking place in a few days.

Diagnosis.—Parotitis is most likely to be confounded with acute swelling of the cervical lymph-glands. In a parotid swelling the lobe of the ear is near the center of the enlargement, while that of a lymph-node is below the ear and behind the jaw, never extending upon the face. The throat symptoms in acute tonsillitis, diphtheria, or scarlet fever would prevent the swollen neck in these diseases from being mistaken for mumps.

Treatment.—Cases of mumps occurring in schools or institutions and in private practice, when there are susceptible persons in the family, should be quarantined for 3 weeks. The patient should be confined to one room, and when the symptoms are at all severe, should be in bed during the disease, as the danger of complications is much increased when the patient is allowed to run about. The diet should be restricted to milk and light broths. The bowels should be acted upon by small doses of calomel (1/12 to 1/6 grain every 2 hours), after which the following mixture may be given:

℞. Antimony and potassium tartrate, gr. j
Magnesium sulphate, ʒ iv
Spirit of nitrous ether, ʒ iij
Syrup, ʒ j
Water, q. s. ʒ iv.

A teaspoonful every 3 or 4 hours.

For the pain, restlessness, or nervous symptoms, 1 to 3 grains of phenacetin should be given every 3 or 4 hours. The nose and mouth should be sprayed and washed 3 or 4 times a day with a weak Dobell's solution or with any alkaline mouth-wash. Ichthyol ointment (10 percent) or belladonna ointment should be applied to the gland if it is painful, and it should be supported by a bandage and absorbent cotton. For the anemia which quite often follows an attack of mumps, there should be given iron, codliver oil, etc. For the treatment of orchitis, see TESTICLE.

MURMURS, CARDIAC.—Any one of those adventitious sounds produced by the abnormal passage of blood through the cavities and orifices of the heart or by perverted cardiac action. The names given to these murmurs correspond with the period of the cardiac cycle in which they occur. A murmur that occurs in the period of auricular systole is termed presystolic or auricular systolic; one that occurs in the period of ventricular systole, systolic; one that occurs during the diastole of the ventricles, diastolic; and should the murmur immediately follow the first or second sound, postsystolic or postdiastolic respectively. In relation to their seat of generation cardiac murmurs are designated mitral, aortic, tricuspid, and pulmonary. All murmurs should be timed by the carotid pulse, not by their relation to the apex-beat. Murmurs are most frequently caused by some change in one of the cardiac valves or orifices, allowing of a reflux of the blood or obstructing its onward progress. See HEART-DISEASE (Organic).

TABLE OF ORGANIC ENDOCARDIAL MURMURS.

Name, in Order of Frequency.	Time.	Site of Maximum Intensity.	Line of Conduction.	Direct or Indirect.	Basic or Apical.	Lesion.	Quality.
Mitral regurgitant.	Systolic.	Center of mitral area, above and to left of apex.	At sixth rib opposite apex, a line drawn from the anterior fold of axilla to lower angle of left scapula.	Indirect mitral.	Apical.	Mitral insufficiency or incompetence.	Variable; usually soft, blowing, bellows: may be distinctly musical.
Aortic obstructive.	Systolic.	Midsternum or to right of it, opposite third rib or second interspace.	Toward top of sternum, and along aorta and its large branches.	Direct aortic.	Basic...	Aortic obstruction or constriction.	Usually loud and harsh. Harshness is one of its distinguishing characteristics.
Aortic regurgitant.	Diastolic.	Midsternum opposite upper border of cartilage of third rib.	Down sternum to ensiform cartilage.	Indirect. aortic.	Basic...	Aortic insufficiency or incompetence.	Soft, blowing, sometimes rough, frequently musical. It has the greatest area of diffusion of all the cardiac murmurs.
Mitral obstructive.	Presystolic.	Over mitral area around the apex.	Usually not transmitted.	Direct mitral.	Apical..	Mitral obstruction or constriction.	Generally low-pitched, rough, churning, grinding, or blubbering. Subject to great variation of pitch and quality.
Tricuspid regurgitant.	Systolic...	Midsternum just above the ensiform cartilage.	Toward the epigastrium.	Indirect tricuspid.	Apical..	Tricuspid insufficiency or incompetence.	Low-pitched, superficial, blowing, soft, faint.
Tricuspid obstructive.	Presystolic.	Midsternum opposite the cartilage of fourth rib.	Not transmitted...	Direct-tricuspid.	Apical..	Tricuspid obstruction or constriction.	Undetermined.
Pulmonary obstructive.	Systolic...	Second interspace to the left of sternum or at the level of third rib.	Upward a short distance and to left of sternum, stopping abruptly.	Direct pulmonary.	Basic...	Pulmonary obstruction or constriction.	Often harsh and audible over the whole precordia; may be very faint; at times bellows.
Pulmonary regurgitant.	Diastolic...	Second left interspace.	Down left edge of sternum to ensiform cartilage.	Indirect pulmonary.	Basic...	Pulmonary insufficiency or incompetence.	Soft and blowing.

MUSCÆ VOLITANTES.—Strings of nucleated rings or dots which float before the eye, and in some conditions, such as high myopia, are so numerous that they cannot be ignored, and cause considerable disturbance of vision. The origin of muscæ is not exactly understood. Examination of the muscæ is of interest, and they can be best studied by lying on the back and looking at a bright cloud in the sky. By what is called **ocular ballottement**—turning the eye downward and arresting the movement very sharply and suddenly—one may get a rebound of muscæ from the bottom of the chamber up to the line of visual perception. While probably of no pathologic import, many patients drift from one oculist to another in the hope of relief. In such a case any existing ametropia or muscular imbalance should be corrected, and strict hygiene of the eyes advised. Very often these patients are sufferers from excessive uric acid formation, and are much relieved by a continued course of salines, such as phosphate of sodium or other antiuric-acid remedies. The diet should be carefully regulated and outdoor exercise insisted upon.

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Abductor hallucis....	Outer head of os calcis, plantar fascia, intermuscular septum; inner head, internal annular ligament, and tendon of tibialis posticus.	Inner portion of lower surface of base of great toe and inner side of internal sesamoid bone.	Internal plantar division of posterior tibial nerve.	Flexes and abducts first phalanx of great toe.
Abductor longus pollicis.	See *Extensor ossis metacarpi pollicis.*			
Abductor minimi digiti manus.	Pisiform bone.....	First phalanx of the little finger.	Ulnar.....	Abducts little finger.
Abductor minimi digiti pedis.	Outer tuberosity of the os calcis and plantar fascia.	First phalanx of the little toe.	External plantar.....	Abducts little toe.
Abductor ossis metatarsi quinti.	Outer tubercle of calcaneum.	Tuberosity of base of 5th metatarsal bone.	External plantar.....	.Abducts little toe.
Abductor pollicis manus.	Trapezium, scaphoid, annular ligament, palmar fascia.	First phalanx of thumb.	Median.....	Abducts and flexes first phalanx of thumb.
Abductor pollicis pedis.	Inner tuberosity of the os calcis.	First phalanx of great toe.	Internal plantar.....	Abducts great toe.
Accelerator urinæ....	Central tendon of perineum and median raphe.	Bulb, spongy and cavernous parts of penis.	Perineal.....	Ejects urine.
Adductor brevis.....	Ramus of pubes.....	Upper part of the linea aspera of femur.	Obturator.....	Adducts, rotates externally, and flexes thigh.
Adductor hallucis....	Tarsal ends of the three middle metatarsal bones.	Base of the first phalanx of great toe.	External plantar.....	Adducts great toe.
Adductor longus.....	Front of pubes.....	Middle of linea aspera of femur.	Obturator.....	Adducts, rotates outward, and flexes thigh.
Adductor magnus....	Rami of pubes and ischium.	All of the linea aspera of femur.	Obturator and great sciatic.	Adducts thigh and rotates it outward.
Adductor minimus...	A name given to the upper portion of the adductor magnus.			
Adductor pollicis.....	Third metacarpal.....	First phalanx of thumb..	Ulnar.....	Draws thumb to median line.
Anconeus.....	Back of external condyle of humerus.	Olecranon process and shaft of ulna.	Musculospiral.....	Extends forearm.
Attollens aurem.....	Occipitofrontalis aponeurosis.	Pinna.....	Temporal branch of facial.	Elevates pinna.
Attrahens aurem.....	Lateral cranial aponeurosis.	Helix.....	Facial.....	Advances pinna.
Azygos uvulæ.....	Posterior nasal spine of palate bone.	Uvula.....	Facial through sphenopalatine ganglion.	Raises uvula.
Biceps.....	1. Long—Glenoid cavity. 2. Short—Coracoid process.	Tuberosity of radius....	Musculocutaneous.....	Flexes and supinates forearm.
Biceps femoris.....	1. Ischial tuberosity. 2. Linea aspera.	Head of fibula and outer tuberosity of head of fibula.	Great sciatic and external popliteal.	Flexes and rotates leg outward.
Biventer cervicis.....	Transverse processes, 2–4 upper dorsal vertebræ.	Superior curved line of occipital bone.	(Portion of complexus.)	Retracts and rotates head.
Brachialis anticus....	Lower half of the shaft of humerus.	Coronoid process of ulna.	Musculocutaneous, musculospiral.	Flexes forearm.
Brachioradialis.....	See *Supinator longus.*			

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Buccinator	Alveolar process of maxillary bones and pterygomaxillary ligament.	Orbicularis oris	Facial, buccal branch.	Compresses cheeks, retracts angle of mouth.
Bulbocavernous	See *Accelerator urinæ*.			
Cervicalis ascendens..	Angles of five upper ribs...	Transverse processes of 4th, 5th, and 6th cervical vertebræ.	Branches of cervical...	Keeps head erect.
Ciliary	*Longitudinal* portion (Brücke's m.), junction of cornea and sclera: *circular* portion (Müller's m.), fibers form a circle.	Outer layers of choroid..	Ciliary	The muscle of visual accommodation.
Coccygeus	Ischial spine	Coccyx, sacrum, and sacrococcygeal ligament.	Sacral	Supports coccyx, and closes pelvic outlet.
Complexus	Transverse processes 7th cervical and 6th upper dorsal, and articular processes of 3d to 6th cervical.	Occipital bone	Suboccipital, great occipital, and branches of cervical.	Retracts and rotates head.
Compressor narium...	Nasal aponeurosis	Fellow muscle and canine fossa.	Facial	Dilates nostril.
Compressor narium minor.	Alar cartilage	Skin at end of nose	Facial	Dilates nostril.
Compressor urethræ..	Ramus of pubes	Fellow muscle	Perineal	Compresses membranous urethra.
Compressor vaginæ....	The analogue of the two bulbocavernosi of the male.		Perineal	Compressor of vagina.
Constrictor of pharynx (inferior).	Cricoid and thyroid cartilages.	Pharyngeal raphe	Glossopharyngeal, pharyngeal plexus and external laryngeal.	Contracts caliber of pharynx.
Constrictor of pharynx (middle).	Cornua of hyoid and stylohyoid ligament.	Pharyngeal raphe	Glossopharyngeal and pharyngeal plexus.	Contracts caliber of pharynx.
Constrictor of pharynx (superior).	Internal pterygoid plate, pterygomax. lig., jaw and side of tongue.	Pharyngeal raphe	Glossopharyngeal and pharyngeal plexus.	Contracts caliber of pharynx.
Coracobrachialis	Coracoid process of scapula.	Inner surface of shaft of humerus.	Musculocutaneous	Adducts and flexes arm.
Corrugator supercilii..	Superciliary ridge of frontal bone.	Orbicularis palpebrarum.	Facial	Draws eyebrow downward and inward.
Cremaster	Upper and deep surface of middle of Poupart's ligament.	Spine and crest of pubic bone and fascia propria.	Genital branch of genitocrural.	Elevates testicle.
Crureus	See *Vastus internus*.			
Deltoid	Clavicle, acromion, and spine of scapula.	Shaft of humerus	Circumflex	Abducts humerus.
Depressor alæ nasi...	Incisive fossa of superior maxillary bone.	Septum and ala of nose...	Facial, buccal branch.	Contracts nostril.
Depressor anguli oris..	External oblique line of inferior maxillary bone.	Angle of mouth	Facial, supramaxillary branch.	Depresses angle of mouth.
Depressor labii inferioris.	External oblique line of the inferior maxillary bone.	Lower lip	Facial, supramaxillary branch.	Depresses lip.
Depressor urethræ....	Ramus of ischium near deep transversus perinei.	Fibers of constrictor vaginæ muscle.		

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Detrusor urinæ.....	Front of pubes.....	Prostate (in male), vagina (in female).	Sympathetic.....	Compresses bladder.
Diaphragm.....	Ensiform cart, 6 or 7 lower ribs, ligamenta arcuata, bodies of lumbar vertebræ.	Central tendon.....	Phrenic and sympathetic.	Respiration and expulsion.
Digastric (anterior belly).	Inner surface of inferior maxillary bone, near symphysis.	Hyoid bone.....	Inferior dental.....	Elevates hyoid and tongue.
Digastric (posterior belly).	Digastric groove of mastoid process.	Hyoid bone.....	Facial.....	Elevates hyoid and tongue.
Dilator naris anterioris.	Alar cartilage.....	Border of ala of nose...	Facial, infraorbital branch.	Dilates nostril.
Dilator naris posterioris.	Nasal notch of superior maxillary bone.	Skin at margin of nostril.	Facial, infraorbital branch.	Dilates nostril.
Dorsal interossei, 4...	Sides of metacarpal bones.	Bases of corresponding phalanges.	Ulnar.....	Abduct fingers from median line.
Dorsal interossei, 4...	Sides of metatarsal bones..	Base of first phalanx of corresponding toe.	External plantar.....	Abduct toes.
Erector clitoridis.....	Tuberosity of ischium. ...	Each side of crus of clitoris.	.....	Erects clitoris.
Erector penis.....	Ischial tuberosity, crus penis, and pubic ramus.	Tunica albuginea of corpus cavernosum.	Perineal	To maintain erection.
Erector spinæ.....	Iliac crest, back of sacrum, lumbar, and three lower dorsal spines.	Divides into sacrolumbalis, longissimus dorsi, and spinalis dorsi.	Lumbar nerves, posterior division.	Extension of lumbar spines on pelvis.
Extensor brevis digitorum pedis.	Os calcis, externally.....	First phalanx of great toe and tendons of extensor longus.	Anterior tibial.....	Extends toes.
Extensor brevis hallucis.	A name applied to that portion of the extensor brevis digitorum that goes to the great toe.			
Extensor brevis pollicis.	See *Extensor primi internodii pollicis.*			
Extensor carpi radialis brevior.	External condyloid ridge of humerus.	Base second and third metacarpal.	Posterior interosseous.	Extends wrist.
Extensor carpi radialis longior.	Lower ⅓ external condyloid ridge of humerus.	Base of second metacarpal.	Musculospiral.....	Extends wrist.
Extensor carpi ulnaris.	1*st head*, external condyle of humerus. 2*d head*, posterior border of ulna.	Base of fifth metacarpal.	Posterior interosseous.	Extends wrist.
Extensor coccygis....	Last bone of sacrum or first of coccyx.	Lower part of coccyx...	Sacral branches.....	Extends coccyx.
Extensor communis digitorum.	External condyle of humerus.	All of the second and third phalanges.	Posterior interosseous.	Extends fingers.
Extensor indicis.....	Back of ulna.	Second and third phalanges of index finger.	Posterior interosseous.	Extends index.
Extensor longus digitorum pedis.	Outer tuberosity of tibia and shaft of fibula.	Second and third phalanges of toes.	Anterior tibial.....	Extends toes.
Extensor longus pollicis.	See *Extensor secundi internodii pollicis.*			
Extensor minimi digiti.	External condyle of humerus.	Second and third phalanges of little finger.	Posterior interosseous.	Extensor of little finger.

MUSCLES, TABLE OF PRINCIPAL

Name.	Origin.	Insertion.	Innervation.	Function.
Extensor ossis metacarpi pollicis.	Back of radius and ulna and interosseous membrane.	Base of metacarpal of thumb and fascia.	Posterior interosseous.	Extends thumb.
Extensor primi internodii pollicis.	Back of radius.....	Base of first phalanx of thumb.	Posterior interosseous.	Extends thumb.
Extensor proprius digiti minimi.	Lower part of ulna, or posterior ligament of wrist-joint.	Base of first phalanx of little finger.		
Extensor proprius hallucis.	Middle of fibula.....	Base of last phalanx of great toe.	Anterior tibial.....	Extends great toe.
Extensor secundi internodii pollicis.	Back of ulna.....	Base of last phalanx of thumb.	Posterior interosseous.	Extends thumb.
Flexor accessorius digitorum pedis (2 *heads*).	1. Inner; 2. Outer surface of os calcis.	Tendon of flexor longus digitorum.	External plantar.....	Accessory flexor of toes.
Flexor accessorius longus digitorum pedis.	Shaft of tibia or fibula ...	Tubercle of os calcis, and joins tendon of long flexor.	External plantar.....	Assists in flexing toes.
Flexor brevis digitorum pedis.	Inner tuberosity of os calcis and plantar fascia.	Second phalanges of the lesser toes.	Internal plantar.....	Flexes lesser toes.
Flexor brevis hallucis.	Under surface of cuboid, plantar ligaments, and external cuneiform.	Base of first phalanx of great toe.	Internal plantar.....	Flexes and slightly adducts first phalanx of great toe.
Flexor brevis minimi digiti manus.	Unciform bone and annular ligament.	First phalanx of little finger.	Ulnar.....	Flexes little finger.
Flexor brevis minimi digiti pedis.	Base of fifth metatarsal...	Base of first phalanx of little toe.	External plantar.....	Flexes little toe.
Flexor brevis pollicis manus.	2 heads—*outer:* lower border of anterior annular ligament; ridge of trapezium; *inner;* os magnum, and bases of first, second, and third metacarpal bones.	Base of first phalanx of thumb.	*Outer head*—median, palmar branch. *Inner head*—deep ulnar.	Flexes metacarpal bone of thumb.
Flexor brevis pollicis pedis.	See *Flexor brevis hallucis.*			
Flexor carpi radialis...	Internal condyle of humerus.	Metacarpal bone of index finger.	Median.....	Flexes wrist.
Flexor carpi ulnaris (2 *heads*).	1. Internal condyle. 2. Olecranon and ulna.	5th metacarpal, annular lig. and pisiform bone.	Ulnar.....	Flexes wrist.
Flexor longus digitorum pedis.	Shaft of tibia.....	Last phalanges of toes...	Posterior tibial.....	Flexes phalanges and extends ankle.
Flexor longus hallucis.	Lower two-thirds of shaft of fibula.	Last phalanx of great toe.	Posterior tibial.....	Flexes great toe.
Flexor longus pollicis..	Shaft of radius and coronoid process of ulna.	Last phalanx of thumb.	Anterior interosseous.	Flexes the thumb.
Flexor profundus digitorum.	Shaft of ulna.....	Last phalanges by four tendons.	Ulnar and anterior interosseous.	Flexes the phalanges.
Flexor sublimis digitorum (3 *heads*).	1. Inner condyle. 2. Coronoid process. 3. Oblique line of radius.	Second phalanges by four tendons.	Median.....	Flexes second phalanges.
Gastrocnemius (2 *heads.*)	Condyles of femur.....	Os calcis by tendo Achillis.	Internal popliteal....	Extends foot.
Gemellus inferior....	Tuberosity of ischium and lesser sacro-sciatic notch.	Great trochanter.....	Sacral.....	External rotator of thigh.

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Gemellus superior....	Ischial spine and lesser sacro-sciatic notch.	Great trochanter.....	Sacral.....	External rotator of thigh.
Geniohyoglossus.....	Superior genial tubercle of inferior maxillary bone.	Hyoid and inferior surface of tongue.	Hypoglossal.....	Retracts and protrudes tongue.
Geniohyoid.....	Inferior genial tubercle of inferior maxillary bone.	Body of hyoid.....	Hypoglossal.....	Elevates and advances hyoid.
Gluteus maximus....	Sup. curved iliac line and crest, sacrum, and coccyx.	Fascia and femur below great trochanter.	Inferior gluteal and sacral plexus.	Extends, abducts and rotates thigh outward,
Gluteus medius.....	Ilium between superior and middle curved lines.	Oblique line of great trochanter.	Superior gluteal.....	Rotates, abducts, and advances thigh.
Gluteus minimus.....	Ilium between middle and inferior curved lines.	Great trochanter.....	Superior gluteal.....	Rotates, abducts, and draws thigh forward.
Gracilis.....	Rami of pubes and ischium.	Tibia, upper and inner part.	Obturator.....	Flexes and abducts leg.
Gubernaculum testis..	See *Cremaster.*			
Hyoglossus.....	Cornua of hyoid.....	Side of tongue.....	Hypoglossal.....	Depresses side of tongue and retracts tongue.
Iliacus.....	Iliac fossa, crest, base of sacrum.	Lesser trochanter, upper part shaft femur.	Anterior crural.....	Flexes and rotates femur outward.
Iliocostal.....	See *Sacrolumbar.*			
Iliopsoas.....	The iliacus and psoas considered as one muscle.			
Infracostals, 10.....	Inner surface of ribs.....	Inner surface of two or three ribs above.	Intercostals.....	Expiration, by depressing ribs.
Infraspinatus.....	Infraspinous fossa.....	Great tuberosity of humerus.	Suprascapular.....	Rotates humerus outward.
Intercostals, external, 11.	Outer lip of inferior costal border.	Superior border of ribs above.	Intercostal.....	Raise ribs in inspiration.
Intercostals, internal, 11.	Inner lip of inferior costal border.	Superior border of ribs below.	Intercostal.....	Depress ribs in expiration.
Interossei of foot, dorsal (4).	Adjacent surfaces of metatarsal bones.	Bases of first phalanges.	External plantar.....	Flex first phalanges and extend 2d and 3d, also abduct 2d, 3d, and 4th toes.
Interossei of foot, plantar (3).	Inner lower surface of 3 outer metatarsal bones.	Bases of first phalanges of three outer toes.	External plantar.....	Abduct first phalanges of three outer toes.
Interossei of hand, dorsal (4).	Five metacarpal bones....	Sides of aponeurosis of extensor communis and adjacent parts of first phalanges.	Ulnar.....	Abduct index, middle, and ring fingers, aid in flexing first phalanges and extending second and third.
Interossei of hand, palmar (3).	Sides of metacarpal bones.	Aponeurosis of extensor tendons, adjacent part of first phalanges.	Ulnar.....	Adduct index, ring, and little fingers, aid in flexing first phalanges and in extending second and third.
Interspinales.....	Upper surface of spines of vertebræ, near tip.	Posterior part of lower surface of spine above.	Internal divisions of posterior branches of spinal nerves.	Extend the vertebra next above.
Intertransversales....	Between transverse proc. of contiguous vertebræ.	.....	Spinal nerves.....	Flex laterally the spinal column.
Ischiocavernosus.....	See *Erector penis.*			

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Latissimus dorsi.....	Spines of 6 lower dorsal and lumbar and sacral vertebræ, crest of ilium, and 3 or 4 lower ribs.	Bicipital groove of humerus.	Long subscapular....	Drawa arm backward and downward and rotates it inward.
Levator anguli oris...	Canine fossa of superior maxillary bone.	Angle of mouth.....	Facial, infraorbital branch.	Elevates angle of mouth.
Levator anguli scapulæ.	Transverse processes of four upper cervical vertebræ.	Posterior border of scapula.	Fifth cervical and cervical plexus.	Elevates upper angle of scapula.
Levator ani.....	Posterior portion of body and ramus of pubes, pelvic fascia, ischial spine.	Rectum, coccyx, and fibrous raphe.	Sacral and perineal...	Supports rectum and vagina.
Levator labii inferioris.	Incisive fossa of inferior maxillary bone.	Skin of lower lip.....	Facial, supramaxillary branch.	Elevates lower lip.
Levator labii superioris.	Lower margin of orbit....	Upper lip.....	Facial, infraorbital branch.	Elevates upper lip.
Levator labii superioris alæque nasi.	Nasal process of superior maxillary bone.	Alar cartilage and upper lip.	Facial, infraorbital branch.	Elevates upper lip, dilates nostril.
Levator menti.....	See *Levator labii inferioris.*			
Levator palati.....	Petrous portion of temporal bone.	Soft palate.....	Sphenopalatine ganglion (facial).	Elevates soft palate.
Levator palpebræ superioris.	Lesser wing of sphenoid...	Upper tarsal cartilage..	Third.....	Lifts upper lid.
Levatores costarum, 12.	Transverse processes of last cervical and dorsal vertebræ.	Each to the rib below..	Intercostal.....	Raise ribs.
Lingualis.....	Under surface of tongue..	.....	Chorda tympani and hypoglossal.....	Elevates middle of tongue.
Longissimus dorsi....	Erector spinæ.....	Transverse process of lumbar and dorsal vertebræ and 7th to 11th ribs.	Branches of lumbar and dorsal.	Erects spine and bends trunk backward.
Longus colli— 1. Superior oblique portion. 2. Inferior oblique portion. 3. Vertical portion..	Transverse processes 3d to 5th cervical. Bodies of 1st to 3d dorsal. Bodies of three dorsal and two cervical.	Anterior tubercle of atlas. Transverse processes 5th to 6th cervical. Bodies of 2d to 4th cervical.	Lower cervical.....	Flexes cervical vertebræ.
Lumbricales, 4, of foot.	Tendons of flexor longus digitorum.	First phalanges of the lesser toes.	Internal and external plantar.	Accessory flexors.
Lumbricales, 4, of hand.	Tendons of flexor profundus digitorum.	Tendons of common extensor.	Median and ulnar....	Flex first phalanges.
Masseter.....	Zygomatic arch.....	Angle and ramus of jaw.	Inferior maxillary....	Muscle of mastication.
Multifidus spinæ.....	Sacrum, iliac spine, articular processes lumbar and cervical vertebræ, and transverse proc. of dorsal and 7th cervical.	Laminæ and spines from last lumbar to second cervical vertebræ.	Posterior spinal branches.	Erects and rotates spinal column.
Mylohyoid.....	Mylohyoid ridge of inferior maxillary bone.	Body of hyoid and raphe.	Inferior dental.....	Elevates and advances hyoid. Forms the floor of the mouth.
Nasolabialis.....	Nasal septum.....	Upper lip.		
Obliquus capitis inferior.	Spinous process of axis....	Transverse process of atlas.	Suboccipital and great occipital.	Rotates altas and cranium.
Obliquus capitis superior.	Transverse process of atlas.	Occipital bone.....	Suboccipital and great occipital.	Draws head backward.

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Obliquus externus....	Eight lower ribs.....	Middle line, iliac crest, Poupart's ligament.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera and flexes thorax.
Obliquus inferior.....	Orbital plate of superior maxillary bone.	Sclerotic.....	Third cranial.....	Rotates eyeball upward and outward.
Obliquus internus....	Lumbar fascia, iliac crest, Poupart's ligament.	Three lower ribs, linea alba, pubic crest, pectineal line.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera, flexes thorax, and assists in expiration.
Obliquus superior....	Above optic foramen, through pulley.	Sclerotic.....	Fourth cranial.....	Rotates eyeball downward and inward.
Obturator externus...	Obturator foramen and membrane.	Digital fossa, base of great trochanter.	Obturator.....	External rotator of thigh.
Obturator internus...	Obturator foramen and membrane.	Great trochanter.....	Sacral.....	External rotator of thigh.
Occipitofrontalis.....	Superior curved line of occiput and angular process of frontal.	Aponeurosis.....	Posterior auricular, small occipital, facial.	Moves scalp. Facial expression.
Omohyoid.....	Upper border of scapula..	Body of hyoid.....	Descendens and communicans noni (hypoglossi).	Depresses and retracts hyoid.
Opponens minimi digiti.	Unciform bone.....	Fifth metacarpal.....	Ulnar.....	Flexes little finger.
Opponens pollicis....	Trapezium, anterior annular ligament.	Metacarpal bone of thumb.	Median, palmar division.	Flexes thumb.
Orbicularis oris.....	Nasal septum and canine fossa of inferior maxilla, by accessory fibers.	Forms lips and sphincter of mouth.	Facial, buccal and supramaxillary branches.	Closes mouth.
Orbicularis palpebrarum.	Mesal margin of orbit....	Lateral margin of orbit.	Facial.....	Closes eyelids.
Palatoglossus.....	Soft palate.....	Side and dorsum of tongue.	Sphenopalatine ganglion.	Constricts the fauces.
Palatopharyngeus....	Soft palate.....	Thyroid cartilage and pharynx.	Sphenopalatine ganglion.	Closes posterior nares.
Palmaris brevis.....	Annular ligament and palmar fascia.	Skin of palm of hand...	Ulnar.....	Corrugates skin of palm.
Palmaris interossei...	Palmar surfaces second, fourth, and fifth metacarpals.	Bases of first phalanges of corresponding fingers.	Ulnar.....	Adductors of fingers.
Palmaris longus.....	Internal condyle of humerus.	Annular ligament and palmar fascia.	Median.....	Makes tense the palmar fascia.
Pectineus.....	Iliopectineal line and pubes.	Femur below lesser trochanter.	Anterior crural, obturator.	Flexes and rotates outward the thigh.
Pectoralis major.....	Clavicle, sternum, and costal cartilages.	External bicipital ridge of humerus.	Anterior thoracic, external and internal.	Draws arm downward and forward.
Pectoralis minor.....	Third, fourth, and fifth ribs.	Coracoid process.....	Anterior thoracic.....	Depresses point of shoulder.
Peroneus brevis.....	Middle third of shaft of fibula, externally.	Base of fifth metatarsal.	Musculocutaneous....	Extends foot.
Peroneus longus.....	Head and shaft of fibula..	First metatarsal of great toe.	Musculocutaneous ...	Extends and everts foot.
Peroneus tertius.....	Lower fourth of fibula....	Fifth metatarsal bone ..	Anterior tibial.....	Flexes tarsus.
Plantaris.....	Outer bifurcation of linea aspera and posterior ligament of knee-joint.	Os calcis by means of the tendo Achillis.	Internal popliteal....	Extends foot.
Plantaris interossei...	Shafts of 3d, 4th, and 5th metatarsal bones.	Bases of first phalanges of corresponding toes.	External plantar.....	Adducts toes.

MUSCLES, TABLE OF PRINCIPAL

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Platysma myoides	Clavicle, acromion, and fascia.	Inferior maxillary bone, angle of mouth.	Facial and superficial cervical.	Wrinkles skin and depresses mouth.
Popliteus	External condyle of femur.	Shaft of tibia above oblique line.	Internal popliteal	Flexes leg.
Pronator quadratus	Lower fourth of ulna	Lower ¼ shaft of radius.	Anterior interosseous	Pronates hand.
Pronator radii teres	Internal condyle and coronoid process.	Outer side of shaft of radius.	Median	Pronates hand.
Psoas magnus	Bodies and transverse processes of last dorsal and all lumbar vertebræ.	Lesser trochanter	Lumbar	Flexes and rotates thigh outward, and flexes trunk on pelvis.
Psoas parvus	Bodies of last dorsal and first lumbar vertebræ.	Iliopectineal eminence and iliac fascia.	Lumbar	Flexes pelvis upon abdomen.
Pterygoid (external)	Two heads: 1. external pterygoid plate of sphenoid bone; 2. great wing.	Neck of condyle	Inferior maxillary	Draws inferior maxillary bone forward.
Pterygoid (internal)	Pterygoid fossa of sphenoid bone.	Inner surface of angle of jaw.	Inferior maxillary	Raises and draws inferior maxilla forward.
Pyramidalis	Pubes	Linea alba	Iliohypogastric	Tenses linea alba.
Pyramidalis nasi	Occipitofrontalis	Compressor naris	Facial nerve, infraorbital branch.	Depresses eyebrow.
Pyriformis	Front of sacrum, through great sciatic foramen.	Great trochanter	Sacral branch	External rotator of thigh.
Quadratus femoris	Tuberosity of the ischium.	Quadrate line of femur.	First sacral and fifth lumbar.	External rotator of thigh
Quadratus lumborum	Crest of ilium, transverse processes of lower three lumbar vertebræ.	Last rib, transverse processes of upper three lumbar vertebræ.	Upper lumbar and twelfth thoracic.	Flexes thorax laterally.
Quadriceps extensor femoris.	Includes the rectus, vastus internus and externus, and crureus muscles. Their common tendon contains the patella.			
Rectus abdominis	Pubic crest and fibrous tissues in front of symphysis.	Cartilages of the fifth to seventh ribs.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera and flexes thorax.
Rectus capitis anticus major.	Transverse processes 3d to 6th cervical vertebræ.	Basilar process	First and second cervical.	Flexes head and slightly rotates it.
Rectus capitus anticus minor.	Transverse process and lateral mass of atlas.	Basilar process of occipital bone.	First cervical	Flexes head.
Rectus capitis lateralis.	Ventral cephalic surface of lateral mass of atlas.	Jugular process of occipital bone.	First cervical	Flexes head laterally.
Rectus capitis posticus major.	Spine of axis	Inferior curved line of occipital bone.	Suboccipital and great occipital.	Rotates head.
Rectus capitis posticus minor.	Dorsal arch of atlas	Below inferior curved line of occipital bone.	Suboccipital and great occipital.	Draws head backward.
Rectus externus	Two heads, outer margin of optic foramen.	Sclera	Sixth cranial	Rotates eyeball outward.
Rectus femoris	Anterior inferior iliac spine, brim acetabulum.	Proximal border of patella.	Anterior crural	Extends leg.
Rectus inferior	Lower margin of optic foramen.	Sclera	Third cranial	Rotates eyeball downward.
Rectus internus	Inner margin of optic foramen.	Sclera	Third cranial	Rotates eyeball inward.
Rectus superior	Upper margin of optic foramen.	Sclera	Third cranial	Rotates eyeball upward.
Retrahens aurem	Mastoid process	Concha	Posterior auricular	Retracts pinna.

MUSCLES, TABLE OF PRINCIPAL

Name.	Origin.	Insertion.	Innervation.	Function.
Rhomboideus major..	Spines of first five thoracic vertebræ.	Root of spine of scapula.	Fifth cervical.....	Elevates and retracts scapula.
Rhomboideus minor..	Spines of seventh cervical and first dorsal vertebræ.	Root of spine of scapula.	Fifth cervical.....	Retracts and elevates scapula.
Risorius.....	Fascia over masseter.....	Angle of mouth.....	Facial, buccal branch.	Draws angle laterally.
Rotatores spinæ.....	Transverse processes of from second to twelfth thoracic vertebræ.	Lamina of next vertebra above.	Dorsal branches.....	Rotate spinal column.
Sacrolumbalis.....	Erector spinæ.....	Angle of six lower ribs.	Branches of dorsal...	Erects spine and bends trunk backward.
Sartorius.....	Anterior superior spine of ilium.	Upper internal portion of shaft of tibia.	Anterior crural.....	Flexes and crosses legs.
Scalenus anticus.....	Scalene tubercle on first rib.	Transverse processes 3d to 6th cervical vertebræ.	Lower cervical.....	Flexes neck laterally.
Scalenus medius.....	First rib.....	Transverse processes of six lower cervical vertebræ.	Lower cervical.....	Flexes neck laterally.
Scalenus posticus....	Second rib.....	Transverse processes of three lower cervical vertebræ.	Lower cervical.....	Bends neck laterally.
Semimembranosus...	Tuberosity of ischium....	Inner tuberosity of tibia	Great sciatic.....	Flexes leg and rotates it inward.
Semispinalis coli.....	Transverse processes four upper dorsal and articular processes four lower cervical vertebræ.	Spines of second to fifth cervical vertebræ.	Cervical branches....	Erects spinal column.
Semispinalis dorsi....	Transverse processes 6th to 10th dorsal vertebræ.	Spines last two cervical and first four thoracic.	Branches of dorsal...	Erects spinal column.
Semitendinosus.....	Tuberosity of ischium....	Upper and inner surface of tibia.	Great sciatic.....	Flexes leg on thigh.
Serratus magnus.....	Eight upper ribs.....	Inner margin of dorsal border of scapula.	Posterior thoracic....	Elevates ribs in inspiration.
Serratus posticus inferior.	Spines of last two thoracic and first three lumbar.	Four lower ribs.....	Tenth and eleventh intercostal.	Depresses ribs in expiration.
Serratus posticus superior.	Spines of seventh cervical and first two thoracic vertebræ.	Second, third, fourth, and fifth ribs.	Second and third intercostal.	Raises ribs in inspiration.
Soleus.....	Shaft of fibula, oblique line of tibia.	Os calcis by tendo Achillis.	Internal popliteal and posterior tibial.	Extends foot.
Sphincter ani, external.	Tip of coccyx.....	Tendinous center of perineum.	Perineal, pudic, and fourth sacral.	Closes anus.
Sphincter ani, internal.	A thickening of the circular fibers of the intestine one inch avove the anus.	.....	Hemorrhoidal nerves.	Constricts rectum.
Sphincter vaginæ....	Central tendon of perineum.	Corpora cavernosa of clitoris.	Homologue of accelerator urinæ in male.	
Sphincter vesicæ internus.	Near the urethral orifice of the bladder.	.....	Vesical nerves.....	Constricts internal orifice of urethra.
Spinalis cervicis (*normal, but inconstant*).	Spines 5th, 6th, and 7th cervical and first two thoracic vertebræ.	Spine of axis, sometimes spines of 3d and 4th cervical vertebræ.		
Spinilis colli.....	Spines of fifth and sixth cervical vertebræ.	Spine of axis, or third and fourth cervical spines.	Cervical branches....	Steadies neck.
Spinalis dorsi.....	Last two thoracic and first two lumbar spines.	Remaining thoracic spines.	Dorsal branches.....	Erects spinal column.

MUSCLES, TABLE OF PRINCIPAL

Name.	Origin.	Insertion.	Innervation.	Function.
Splenius capitis.....	Lower two-thirds ligamentum nuchæ, spines of seventh cervical and first two thoracic vertebræ.	Outer third of middle oblique line of occiput and outer surface of mastoid process.	Middle cervical, posterior branches.	Extends head and neck and rotates and flexes laterally.
Splenius colli.....	Spines of third to sixth thoracic vertebræ.	Dorsal tubercles of transverse processes of upper three or four cervical vertebræ.	Posterior divisions of lower cervical.	Extends, flexes laterally, and rotates neck.
Stapedius.....	Interior of pyramid.....	Neck of stapes.....	Facial.....	Depresses base of stapes.
Sternocleidomastoid.	Two heads, sternum and clavicle.	Mastoid process and outer half of superior oblique line of occiput.	Spinal accessory and cervical plexus.	Depresses and rotates head.
Sternohyoid.....	Sternum and clavicle.....	Hyoid bone.....	Descending and communicating branches of the hypoglossal.	Depresses hyoid.
Sternothyroid.....	Sternum and cartilage of first rib.	Side of thyroid cartilage.	Descendens and communicans hypoglossi.	Depresses larynx.
Styloglossus.....	Styloid process.....	Side of tongue.....	Hypoglossal.....	Elevates and retracts tongue.
Stylohyoid.....	Styloid process.....	Body of hyoid.....	Facial.....	Draws hyoid upward and backward.
Stylopharyngeus.....	Styloid process.....	Thyroid cartilage.....	Glossopharyngeal, and pharyngeal plexus.	Elevates pharynx.
Subanconeus.....	Humerus above olecranon fossa.	Posterior ligament of elbow.	Musculospiral.	Tensor of ligament.
Subclavius.....	Cartilage of first rib.....	Inferior surface of clavicle.	Fifth and sixth cervical.	Draws clavicle downward.
Subcrureus.....	Anterior distal part of femur.	Synovial sac behind patella.	Anterior crural.....	Draws sac up.
Subscapularis.....	Subscapular fossa.....	Humerus, lesser tuberosity, and shaft.	Subscapular.....	Chief internal rotator of humerus.
Supinator longus.....	External condylcid ridge of humerus.	Styloid process of radius.	Musculospiral.....	Flexes forearm.
Supinator radii brevis.	External condyle of humerus, oblique line of ulna.	Neck of radius and its bicipital tuberosity.	Posterior interosseous.	Supinates hand.
Supraspinales.....	Lie on spinous processes in cervical region.			
Supraspinatus.....	Supraspinous fossa.....	Great tuberosity of humerus.	Suprascapular.....	Supports shoulder-joint, raises arm.
Temporal.....	Temporal fossa and fascia.	Coronoid process of mandible.	Inferior maxillary....	Closes mandible.
Tensor palati.....	Scaphoid fossa and alar spine of sphenoid.	About hamular process into soft palate.	Otic ganglion.....	Renders palate tense.
Tensor tarsi.....	Crest of lacrimal bone....	Tarsal cartilages.....	Facial, infraorbital branch.	Compresses puncta and lacrimal sac.
Tensor tympani.....	Temporal bone, Eustachian tube and canal, sphenoid bone.	Handle of malleus.....	Otic ganglion.....	Renders tense the membrana tympani.
Tensor vaginæ femoris.	Iliac crest and anterior superior spinous process.	Fascia lata.....	Superior gluteal.....	Tensor of fascia.
Teres major.....	Inferior angle of scapula..	Internal bicipital ridge of humerus.	Subscapular.....	Draws arm downward and backward.

MUSCLES, TABLE OF PRINCIPAL

Name.	Origin.	Insertion.	Innervation.	Function.
Teres minor.....	Axillary border of scapula.	Great tuberosity of humerus.	Circumflex.....	Rotates humerus outward and adducts it.
Thyrohyoid.....	Side of thyroid cartilage...	Body and greater cornu of hyoid bone.	Hypoglossal.....	Elevates larynx.
Tibialis anticus.....	Outer tuberosity and upper part of shaft of tibia.	Internal cuneiform and first metatarsal bone.	Anterior tibial.....	Flexes tarsus and elevates inner border of foot.
Tibialis posticus.....	Shaft of fibula and tibia, interosseous membrane.	Tuberosity of scaphoid, internal cuneiform, and bases of second to fourth metatarsal.	Posterior tibial.....	Extends tarsus and inverts foot.
Trachelomastoid.....	Transverse processes of 3d to 6th thoracic, and articular processes of last 3 or 4 cervical vertebræ.	Mastoid process.....	Branches of cervical..	Steadies head.
Transversalis abdominis.	Poupart's ligament, iliac crest, lower six ribs, lumbar vertebræ.	Linea alba, pubic crest, pectineal line.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera and flexes thorax.
Transversalis colli....	Transverse processes of third to sixth thoracic vertebræ.	Transverse processes of five lower cervical vertebræ.	Cervical branches....	Keeps neck erect.
Transversus pedis....	Head 5th metatarsal and plantar ligaments of metatarsophalangeal joints.	First phalanx of great toe.	External plantar.....	Adducts great toe.
Transversus perinei...	Ramus of ischium.....	Central tendon.....	Perineal.....	Tensor of central tendon.
Transversus perinei, deep.	See *Compressor urethræ*.			
Trapezius.....	Superior curved line of occipital bone, spinous processes of last cervical and all the dorsal vertebræ.	Clavicle and spine of scapula, and acromion.	Spinal accessory and cervical plexus.	Draws head backward.
Triangularis sterni...	Ensiform cartilage, costal cartilages of 3 or 4 lower true ribs, and sternum.	Border of inner surfaces 2d, 3d, 4th, and 5th costal cartilages.	Intercostal.....	Expiration.
Triceps (3 *heads*) extensor cubiti.....	*External* and *internal* near musculospiral groove, shaft of humerus; *middle* or *long*, lower margin of glenoid cavity.	Olecranon process of ulna.	Musculospiral.....	Extends forearm.
Vastus externus.....	Anterior border great trochanter and linea aspera.	Tuberosity of tibia.....	Anterior crural.....	Extends leg.....
Vastus internus and crureus.	Inner lip of linea aspera of femur.	Tuberosity of tibia.....	Anterior crural.....	Extends leg.
Zygomaticus major et minor.	Malar bone.....	Angle of mouth.....	Facial, infraorbital branch.	Elevates lip outward.

MUSCLES GROUPED ACCORDING TO FUNCTIONS*

[The exact functions of many of the muscles have not yet been decisively determined. Anatomical studies, the construction of mechanical models, the electrical stimulation of the musculature, and observation of the muscular activities of normal individuals and of individuals in whom given muscles or sets of muscles are absent or paralyzed, have all proved valuable methods of investigation, but each method has its drawbacks, and knowledge of the part actually played by individual muscles in the normal activities of the body is as yet merely approximate. Owing to the influence of gravity, the relations of other muscles to the skeleton, and similar factors, a given muscle may perform functions which would not be deduced from a simple study of the relations of the muscle to the skeleton. Thus the iliacus serves to flex not only the hip, but also the knee, and the hamstring muscles may flex the hip while flexing the knee. The functions ascribed to various muscles in the following tables, although an attempt has been made to base them upon the more recent work on the action of the muscles, must be taken to be merely approximately correct.]

* From Dr. Charles R. Bardeen's article in Morris' Anatomy.

1. Facial muscles.
These serve essentially to contract the various visceral orifices of the head or to retract the tissue surrounding them.
Ear.
Retractors: Attrahens aurem, attollens aurem, and retrahens aurem.
Orbit.
(*a*) *Retractor:* Occipitofrontalis. The levator palpebræ superioris, innervated by the third cranial nerve, serves to raise the upper lid of the eye.
(*b*) *Contractors:* Orbicularis palpebrarum, corrugator supercilii and pyramidalis nasi.
Nasal orifice.
(*a*) *Dilators:* Levator labii superioris alæque nasi, transverse portion of the compressor naris, and the dilatores naris.
(*b*) *Contractors:* Compressor naris and the depressor alæ nasi.
Oral orifice.
(*a*) *Retractors:*
Upward: Zygomaticus major and minor, levator labii superioris, levator labii superioris alæque nasi.
Lateralward: Zygomaticus major, levator anguli oris, risorius, platysma myoides, depressor anguli oris, buccinator.
Downward: Depressor anguli oris, depressor labii inferioris, platysma myoides.
(*b*) *Contractors:* Orbicularis oris.
(*c*) *Protractors of the lips:* Part of the orbicularis oris, levator menti.
Muscles acting on the eyeball.
To adduct the pupil: Internal rectus.
To abduct the pupil: External rectus.
To rotate the pupil upward: Superior rectus, in association with the inferior oblique.
To rotate the pupil downward: Inferior rectus, in association with the superior oblique.

3 Muscles acting on the lower jaw.
(*a*) *To raise it:* Masseter, temporal, internal pterygoid.
(*b*) *To lower it:* External pterygoid, digastric, mylohyoid, geniohyoid, and the infrahyoid muscles. The weight of the jaw also plays a part in this movement.
(*c*) *To protract it:* External pterygoid and internal pterygoid.
(*d*) *To retract it:* The inferior dorsal portion of the temporal, the digastric, mylohyoid, and geniohyoid.
(*e*) *To produce lateral movements:* The external pterygoid acting on one side carries the jaw toward the opposite side. The masseter draws it slightly toward the side on which the muscle lies. This action of the masseter is overcome by the internal pterygoid (Riegner).
Muscles acting on the hyoid bone.
(*a*) *To elevate it:* Digastric, stylohyoid, styloglossus, mylohyoid, geniohyoid, genioglossus, hyoglossus, and the middle constrictor of the pharynx.
(*b*) *To depress it:* Thyrohyoid, sternohyoid, omohyoid, sternothyroid.
(*c*) *To protract it:* Genioglossus (inferior portion), geniohyoid, anterior belly of digastric, and the mylohyoid.
(*d*) *To retract it:* Posterior belly of digastric, stylohyoid, and the middle constrictor of the pharynx.

5. Muscles acting on the larynx.
(*a*) *To elevate it:* Thyrohyoid, stylopharyngeus, palatopharyngeus, the inferior constrictor of the pharynx, and the elevators of the hyoid bone.
(*b*) *To depress it:* Sternothyroid, sternohyoid, and omohyoid.
(*c*) *To approximate the vocal cords:* Lateral cricoarytenoid, posterior cricoarytenoid (in conjunction with the preceding muscle); internal thyroarytenoid, external thyroarytenoid; transverse arytenoid.
(*d*) *To make the vocal cord tense:* Cricothyroid, lateral cricoarytenoid, posterior cricoarytenoid, transverse arytenoid.
(*e*) *To widen the rima glottidis:* Posterior cricoarytenoid.
(*f*) *To relax the vocal cord:* External thyroarytenoid, internal thyroarytenoid.

6. Muscles acting on the tongue.
(*a*) *To elevate it:* Styloglossus (especially along the sides), palatoglossus, glossopharyngeus, and the elevators of the hyoid bone.
(*b*) *To depress it:* Genioglossus (in the center), hyoglossus (at the sides), chondroglossus, and the depressors of the hyoid bone.
(*c*) *To protrude it:* Genioglossus (middle and inferior portions).
(*d*) *To retract it:* Genioglossus (anterior portion), styloglossus, chondroglossus.
(*e*) *To shorten it and make it bulge upward:* Superior and inferior lingual.
(*f*) *To narrow it and make it bulge upward:* Transverse lingual.
(*g*) *To flatten it:* Vertical lingual.
When the muscles work symmetrically, these movements are symmetrical; when they do not work symmetrically, the tongue is moved from side to side, rotated, etc.

7. Muscles acting on the palate and pharynx.
(*a*) *To narrow the pharyngeal opening of the Eustachian tube:* Levator palati.
(*b*) *To widen the isthmus of the Eustachian tube:* Levator palati.
(*c*) *To open the tube:* Tensor palati.
(*d*) *To raise and shorten the uvula:* Azygos uvulæ.
(*e*) *To depress the soft palate:* Palatoglossus, palatopharyngeus.
(*f*) *To make tense the soft palate:* Tensor palati.
(*g*) *To lift the soft palate:* Levator palati.
(*h*) *To approximate the anterior pillars of the fauces:* Palatoglossus.
(*i*) *To approximate the posterior pillars of the fauces:* Palatopharyngeus, superior constrictor of the pharynx.
(*j*) *To constrict the pharynx:* Superior, middle, and inferior constrictors.
(*k*) *To widen the pharynx:* Stylopharyngeus and the muscles which protract the hyoid bone.
(*l*) *To elevate the pharynx:* Stylopharyngeus, palatopharyngeus.

8. Muscles acting on the head.
(*a*) *To flex it:* The supra- and infrahyoid muscles (except the posterior belly of the digastric), rectus capitis anticus major and minor.
(*b*) *To extend it:* Sternocleidomastoid, trapezius, splenius capitis, trachelomastoid, complexus, obliquus capitis superior, rectus capitis posticus major and minor, and the posterior belly of the digastric.
(*c*) *To bend it laterally:* Sternocleidomastoid, rectus capitis lateralis, splenius capitis, trachelomastoid, complexus, obliquus capitis superior.
(*d*) *To rotate it:* Sternocleidomastoid, trapezius, splenius capitis, trachelomastoid, complexus, obliquus capitis superior and inferior, rectus capitis posticus major and minor.

9. Muscles acting on the spinal column.
(*a*) *To flex it:* Sternocleidomastoid, longus colli, rectus capitis anticus major, psoas major and minor, scaleni, rectus abdominis, obliquus abdominis externus and internus, levator ani, coccygeus and sphincter ani.
(*b*) *To extend it:* Splenius capitis, splenius colli, erector spinæ, semispinalis dorsi, semispinalis colli, complexus, multifidus spinæ, rotatores, interspinales, levatores costarum, quadratus lumborum.
(*c*) *To bend it laterally and rotate it:* Sternocleidomastoid, scaleni, longus colli, trapezius, levator anguli scapulæ, splenius capitis and colli, semispinalis dorsi, semispinalis colli, complexus, multifidus spinæ, rotatores, intertransversales, levatores costarum, psoas major and minor, quadratus lumborum, obliquus abdominis externus and internus, and rectus abdominis.

10. Muscles of respiration.
Quiet inspiration: The internal intercostals, anterior portion of internal intercostals, diaphragm.
Enforced inspiration: In addition to the muscles mentioned above, the scaleni, sternocleidomastoid, serratus posticus superior and inferior, rhomboids, serratus anticus, latissimus dorsi, pectoralis major and minor, and the extensors of the spinal column.

Quiet expiration: Posterior part of internal intercostals, subcostals, and triangularis sterni.

Enforced expiration: In addition to the muscles mentioned above, the abdominal muscles, sacrolumbalis, and the quadratus lumborum.

The chief muscles of respiration are the intercostals; the diaphragm plays a minor part (Fick).

11. Muscles acting on the abdomen.
    (*a*) *Constriction of the abdominal cavity:* Obliquus abdominis externus and internus, the transversalis and rectus abdominis, and the diaphragm, levator ani, and coccygeus.
    (*b*) *Reduction of pressure in the abdominal cavity:* The muscles of inspiration, with the exception of the diaphragm, serve to lessen the compression of the abdominal viscera.
12. Action of the muscles of the perineal region.
    (*a*) *To close anal canal:* Sphincter ani externus.
    (*b*) *To constrict the anal portion of the rectum;* Levator ani (pubococcygeal portion).
    (*c*) *To constrict the bulbus urethræ and the corpus cavernosum urethræ* (corpus spongiosum): Bulbocavernosus.
    (*d*) *To elevate the prostate gland:* Levator ani.
    (*e*) *To constrict the vagina:* Bulbocavernosus, levator ani (pubococcygeal portion).
    (*f*) *To cause erection of penis and clitoris:* Ischiocavernosus, bulbocavernosus, and compressor urethræ.
    (*g*) *To compress the urethra and Cowper's gland:* compressor urethræ and the transversus perinei.
    (*h*) *To support and lift the pelvic floor:* Levator ani, coccygeus, transversus perinei.
13. Muscles acting on the shoulder-girdle.
    The two joints acted upon are the sternoclavicular and the acromioclavicular. The movements produced consist in lifting and lowering the shoulder, carrying it forward and backward, and rotating it.
    (*a*) *Elevation:* Levator anguli scapulæ, trapezius (upper portion), sternocleidomastoid, rhomboidei, serratus magnus (middle portion), omohyoid.
    (*b*) *Depression:* Trapezius (lower portion), pectoralis major (lower portion), pectoralis minor, subclavius, latissimus dorsi. The weight of the limb is likewise a factor.
    (*c*) *Forward movement:* Serratus magnus, pectorales major and minor.
    (*d*) *Backward movement:* Trapezius, rhomboidei, latissimus dorsi.
    (*e*) *Rotation:*
    Associated with abduction of the arm: Serratus magnus (inferior portion), trapezius (superior part), levator anguli scapulæ.
    Associated with adduction of the arm: Rhomboidei, trapezius (inferior part), serratus magnus (upper part), pectoralis major (pectoral portion), latissimus dorsi.
14. Muscles acting on the arm at the shoulder-joint.
    (*a*) *To abduct it:* Deltoid, supraspinatus, biceps (long head). The inferior part of the serratus magnus and the superior part of the trapezius are important in the early stages of abduction of the arm; the clavicular portion of the pectoralis major in supraabduction.
    (*b*) *To adduct it:* Pectoralis major, latissimus dorsi, teres major, coracobrachialis, triceps (long head). To these should be added the weight of the limb.
    (*c*) *To flex it:* Pectoralis major, deltoid (anterior portion), subscapularis, coracobrachialis, biceps (short head), and the serratus magnus.
    (*d*) *To extend it:* Deltoid (posterior portion), teres major, latissimus dorsi. The upper and middle portions of trapezius, and the levator anguli scapulæ play an important part in extension of the arm.
    (*e*) *To rotate it outward:* Infraspinatus, teres minor, and possibly the posterior portion of the deltoid.
    (*f*) *To rotate it inward:* Subscapularis, deltoid (anterior fibers), teres major, latissimus dorsi, and pectoralis major.
15. Muscles acting on the forearm at the elbow-joint (arranged in order of force exerted according to W. Grohmann).
    (*a*) *Flexion at elbow:*
    Forearm supinated: Brachialis, long head of biceps, supinator longus, short head of biceps, extensor carpi radialis longus, pronator radii teres, flexor carpi radialis, extensor carpi radialis brevis, palmaris longus.
    Forearm in mid-position or pronated: Brachialis anticus, supinator longus, long head of biceps, short head of biceps, extensor carpi radialis longus, pronator radii teres, flexor carpi radialis, extensor carpi radialis brevis, palmaris longus.
    (*b*) *Extension at elbow:* Triceps, anconeus.
    (*c*) *Pronation of forearm:*
    Forearm extended; Pronator radii teres, flexor carpi radialis, pronator quadratus, palmaris longus.
    Forearm at right angles: Pronator radii teres, supinator longus, flexor carpi radialis, pronator quadratus, extensor carpi radialis longus, palmaris longus.
    Forearm flexed: Pronator radii teres, supinator longus, flexor carpi radialis, pronator quadratus, extensor carpi radialis longus, palmaris longus.
    (*d*) *Supination:*
    Forearm extended: Supinator longus, short head of biceps, long head of biceps, supinator brevis extensor carpi radialis longus, extensor ossis metacarpi pollicis, extensor primi internodii, extensor secundi internodii pollicis, extensor indicis.
    Forearm at right angles; Short head of biceps, long head of biceps, supinator brevis, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, supinator longus (in pronation), extensor secundi internodii pollicis, extensor indicis.
    Forearm flexed; Short head of biceps, long head of biceps, supinator brevis, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, extensor secundi internodii pollicis, extensor indicis.
16. Muscles acting on the hand at the wrist.
    (*a*) *To flex it:* Flexor carpi radialis, palmaris longus, flexor carpi ulnaris, long flexors of the thumb and fingers, extensor ossis metacarpi pollicis.
    (*b*) *To extend it:* Extensor carpi radialis longus and brevis, extensor carpi ulnaris, and the extensors of the thumb and fingers.
    (*c*) *To adduct it:* Extensor carpi radialis brevis and longus, extensor ossis metacarpis pollicis, extensor primi internodii pollicis, flexor carpi radialis.
    (*d*) *To abduct it:* Flexor carpi ulnaris, extensor carpi ulnaris.
17. Muscles acting on the fingers.
    (*a*) *To flex all the joints:* Flexor profundus digitorum; all but the last: flexor sublimis digitorum; the metacarpophalangeal joint only: flexor brevis minimi digiti, the lumbricales, and interossei.
    (*b*) *To extend the fingers*; Extensor communis digitorum, extensor indicis, extensor minimi digiti; to extend the two interphalangeal joints: the lumbricales, interossei, and frequently the flexor brevis minimi digiti.
    (*c*) *To abduct from the axis passing through the center of the middle finger:* Dorsal interossei, first two lumbricals, abductor minimi digiti.
    (*d*) *To adduct toward this axis:* Palmar interossei, last two lumbricals, opponens and flexor minimi digiti.
18. Muscles acting on the thumb.
    (*a*) *To flex all joints:* Flexor longus pollicis; the carpometacarpal and metacarpophalangeal joints: flexor brevis, the adductors, abductor brevis; the carpometacarpal joints: opponens pollicis, extensor ossis metacarpi pollicis.
    (*b*) *To extend all joints:* Extensor longus pollicis; the carpometacarpal and metacarpophalangeal joints: extensor brevis pollicis.
    (*c*) *To adduct:* The adductor, flexor brevis, opponens, first dorsal interosseous, extensor longus.
    (*d*) *To abduct:* The long and short abductors, the extensor brevis.
19. Muscles acting on the pelvis.
    (*a*) *To flex it:* Rectus abdominis, obliquus abdominis externus and internus, psoas major and minor.
    (*b*) *To extend it:* Erector spinæ and multifidus spinæ.
    (*c*) *To bend it laterally and rotate it:* Abdominal muscles, quadratus lumborum, and psoas muscles acting on one side.

20. Muscles acting on the thigh at the hip-joint.
    (a) *To flex it:* Iliopsoas, sartorius, rectus femoris, pectineus, gracilis, adductor longus and brevis, tensor vaginæ femoris.
    (b) *To extend it:* Gluteus maximus, biceps, semitendinosus, semimembranosus, adductor magnus.
    (c) *To adduct it:* Gracilis, pectineus, adductor longus, brevis, and magnus, gluteus maximus (lower portion), quadratus femoris, obturator externus.
    (d) *To abduct it:* Gluteus medius and minimus, tensor vaginæ femoris, gluteus maximus; and when the hip is flexed, the pyriformis, obturator internus, and gemelli.
    (e) *To rotate it inward:* Tensor vaginæ femoris, gluteus medius (anterior portion), gluteus minimus, illopsoas.
    (f) *To rotate it outward:* Pyriformis, obturator internus and gemelli, obturator externus, quadratus femoris, gluteus maximus, gluteus medius (posterior portion), sartorius, pectineus, adductor longus, brevis, and magnus (superior and middle fasciculi), biceps.
21. Muscles acting on the leg at the knee-joint.
    (a) *To flex it:* Sartorius, gracilis, semitendinosus, semimembranosus, biceps, gastrocnemius, popliteus.
    (b) *To extend it:* Quadriceps femoris (the tensor vaginæ femoris and gluteus maximus through the iliotibial band serve to keep the extended leg fixed).
    (c) *To rotate it inward* (when flexed). Sartorius, gracilis, semitendinosus, semimembranosus, popliteus.
    (d) *To rotate it outward* (when flexed): Biceps.
22. Muscles acting on the foot at the ankle-joint (arranged in order of force exerted, according to R. Fick).
    (a) *To flex it:* Tibialis anticus, extensor longus digitorum, extensor longus hallucis, peroneus tertius.
    (b) *To extend it:* Soleus, gastrocnemius, flexor longus hallucis, peroneus longus, tibialis posticus, flexor longus digitorum, peroneus brevis.
    (c) *To invert the foot at the inferior articulation of the talus* (art. talocalcanea and talocalcaneonavicularis): soleus, gastrocnemius, tibialis posticus, flexor longus hallucis, flexor longus digitorum.
    (d) *To evert the foot at the inferior articulation of the talus:* Peroneus longus, peroneus brevis, extensor longus digitorum, peroneus tertius, extensor longus hallucis, tibialis anticus.
    (e) *To invert the foot at Chopart's* (talonavicularcalcaneocuboid) *joint:* Tibialis anticus, tibialis posticus, flexor longus hallucis, flexor longus digitorum, extensor longus hallucis.
    (f) *To evert the foot at Chopart's joint:* Peroneus longus, peroneus brevis, extensor longus digitorum, peroneus tertius.
23. Muscles acting on the toes (arranged in order of force exerted, according to R. Fick).
    (a) *To flex all the joints:* Flexor longus digitorum, flexor accessorius digitorum, and flexor longus hallucis; the first interphalangeal and the metacarpophalangeal joints of the four lateral toes: flexor brevis digitorum; the metacarpophalangeal joints: the lumbricals, interossei, abductor hallucis, adductor hallucis (oblique head), flexor brevis hallucis, abductor minimi digiti, flexor minimi digiti.
    (b) *To extend all joints:* Extensor longus digitorum, extensor longus hallucis, extensor brevis digitorum, the interphalangeal joints; the lumbricales, and the adductors and abductors of the big and little toes.
    (c) *To abduct from an axis passing through the second toe:* Abductor hallucis, dorsal interossei, abductor minimi digiti, first lumbrical.
    (d) *To adduct toward this axis:* Adductores hallucis, plantar interossei, three more lateral lumbricals.
    (e) *To draw together the ends of the metatarsals:* The transverse head of the adductor of the big toe.

MUSCLES, INFLAMMATION.—See Myositis.

MUSCLES, INJURIES.—**Atrophy** of muscles arises from want of use, from continued pressure, from injury, from interference with the blood supply, from disease of the nerves or their centers, or from lead-poisoning. Treatment must be according to the cause, with the use of galvanism, passive motion, friction, massage, etc.

Contractions of muscles result from injury, from joint-disease, from disease of the nervous system, and from malposition of parts. Sudden or gradual extension, tenotomy, and myotomy, are the means of treatment. Nerve stretching is of value when the contraction is spasmodic.

Dislocation of muscles and tendons is more usually the result of accident, associated with chronic joint-disease, or of fracture than of solitary injury. The long head of the biceps is most often displaced. Early in rheumatoid arthritis of the shoulder-joint the long head of this muscle is displaced, and the tendon absorbed. The muscles of the forearm may be dislocated. In treating a dislocated muscle or tendon reduction is generally easy, but the displacement is likely to recur, since the sheath of the muscle or tendon has been lacerated. The limb should be relaxed to reduce a dislocation of this nature, and the tendon manipulated. A splint should be applied, so that pressure is made on the point of injury, but the muscle is relaxed. If firm adhesion of the tendon does not occur in 4 weeks, operation should be performed, incision made, and the edges of the torn sheath freshened and sewed with chromic catgut or kangaroo tendon. Passive movements may begin at the end of the first week. Fibrous tissue forms when the ends of divided muscles are widely separated, but when the ends are closely approximated, this fibrous tissue becomes filled with muscle-fibers resembling true muscle.

Hernia of muscles is treated by incision and stitching of the fascia covering the muscle.

Hypertrophy of muscle arises from excessive use, and in pseudohypertrophic paralysis the muscle bulk is greatly augmented, but there is less muscle structure and more fat and connective tissue.

Rupture of a muscle may be followed by atrophy. A limited rupture is to be treated as a strain, but when it is extensive and the ends widely separated, it should be incised and sutured with chromic catgut, the skin being sewed with silkworm-gut. Rest, relaxation, and other means of combating inflammation are to be employed.

A strain is the name given to the condition in which there is a small amount of rupture with stretching of the muscle. The deltoid, the hamstring, the calf, the back, the biceps, and the great pectoral muscles are those mostly strained. Strain of the pronator radii teres muscle gives rise to the "lawn-tennis" arm. "Rider's leg" is produced by a strain of the adductors of the thigh. Strain of the psoas magnus muscle may suggest appendicitis, but there is no local tenderness, abdominal rigidity, nor constitutional symptoms.

The treatment of strains consists in relaxation by suitable position, rest by the use of splints, and rest in bed, bandages for compression, and the application of hot water, hot lead-water and laudanum, and of ichthyol. Dover's powder or morphin may be used if the pain is excessive.

Wounds and Contusions.—Contusions of mus-

cles vary in severity and in extent, and may be followed by suppuration, inflammation, or atrophy. Wounds of muscles are open or subcutaneous, longitudinal or transverse. When the wound is transverse, it is best to unite the gaping edges of the muscle by catgut stitches. When the wound is longitudinal, drainage should be provided. Rest by means of splints, proper position, and relaxation are to be obtained, and inflammation combated. Bandaging may prevent much swelling, while the early use of cold limits the spread of inflammation. Lead-water and laudanum are useful. Iodin, blue ointment, ichthyol, and intermittent heat are of value when repair is well advanced. As soon as the acute symptoms subside, massage, passive motion, stimulating liniments, and galvanism, if the reaction of degeneration exists, or faradism, if it does not exist, are to be employed.

MUSCLES, PROGRESSIVE ATROPHY.—**Synonyms.**—Wasting palsy; chronic spinal muscular atrophy; chronic anterior poliomyelitis; Duchenne-Aran's disease.

Definition.—A slowly progressive wasting and atrophy of certain groups of muscles, with symptoms varying in accordance with the variations in the pathologic anatomy.

Etiology.—It is most frequent in males between 25 and 50 years of age, and in many instances is hereditary. A predisposing cause seems to exist in those who habitually use one set of muscles (muscular strain). Exposure to cold and damp, lead-poisoning, syphilis, and injuries to the spinal column are other causes. It follows such acute diseases as diphtheria, measles, acute rheumatism, typhoid and typhus fevers.

Pathologic Anatomy.—The morbid alterations are of two groups—spinal and muscular.

The spinal changes consist in the atrophy and degeneration of the anterior columns, wasting and disappearance of the multipolar ganglion cells of the anterior horns, with hyperplasia of the neuroglia; rarely the hyperplasia extends to the lateral columns (amyotrophic lateral sclerosis); also wasting, atrophy, and degeneration of the anterior nerve-roots.

The muscular changes consist of a progressive wasting of the muscular tissue, with increase of the interstitial connective tissue. The final result is that the muscle is converted into a mere fibrous band with numerous fat-cells, the development of this material taking place outside of the muscular elements and in the newly formed connective tissue.

Symptoms.—The invasion is gradual, the disease having been in progress some weeks or months before the patient is aware of its existence. Wasting usually begins in the hand, the first dorsal interosseous being the first to be attacked, then the muscles of the thenar and hypothenar eminences, then the deltoid, and so on from group to group. Often, however, the extension is very erratic in its course, jumping from one group to another at some distance. In the immense majority of cases the disease is permanently limited to one or a few groups of muscles in the upper, or, more rarely, in the lower, extremities. The only muscles not yet known to be attacked are those of mastication and those that move the eyeball (Roberts).

Fibrillary contraction is an early symptom, continuing more or less marked so long as any muscular fibers remain. It consists of wave-like movements of the muscles, excited automatically by drafts of air or percussion. Coincident with the wasting are loss of power, disorders of sensation, coolness and pallor of the surface. The natural roundness and contour of the body and limbs are changed, the bones standing out in unaccustomed distinctness, giving the individual the appearance of a skeleton clothed in skin. The hand is frequently the seat of a very singular deformity—the "claw-shaped" hand. The electrocontractility is preserved so long as muscular fibers remain.

Diagnosis.—When wasting palsy is fully developed, its diagnosis is a simple matter. In its early stages a doubt may exist, but attention to the history, symptoms, and progress will determine the question.

Syringomyelia often begins with muscular atrophy as a marked symptom, and may be confounded with wasting palsy, the chief points of distinction between which are, the loss of power of perceiving heat, or, often, to distinguish between heat and cold, and the appearance of trophic changes, such as a dusky or purplish hue of the hands, with a uniform thickness resembling myxedema, the development of blebs and ulcers, and changes in the nails. Arthropathies are sometimes met with. See MUSCLES (Progressive Dystrophies).

Prognosis is very unfavorable, although the danger to life is often very remote. The disease may be arrested and remain stationary for years.

Treatment.—Internal medication seems to have no effect on the malady, although if mineral poisoning is suspected, potassium iodid should be used, and if syphilis is suspected, a course of potassium iodid and mercury should be administered. Arsenic, strychnin sulphate, and cod-liver oil, with a generous diet, are among the remedies indicated. If the disease is the result of over-working any set of muscles, these must be allowed a rest. A most effective remedy in wasting palsy is, undoubtedly, galvanism. See MOTOR POINTS.

Massage is a valuable adjuvant to the electric treatment, as are hot sponging and rubbing along the spine.

MUSCLES, PROGRESSIVE DYSTROPHIES.—Progressive muscular dystrophy is a term employed to designate all forms of progressive muscular weakness with atrophy, in which the seat of the lesion is in the muscle itself. The dystrophies are to be distinguished on the one hand from progressive spinal muscular atrophy which is due to a chronic progressive degeneration of the gray matter of the spinal cord, and, on the other hand, from chronic multiple neuritis, in which the lesion is in the nerve-fibers. If the lesion of a disease characterized by progressive muscular weakness and atrophy is located in the gray matter of the spinal cord, it is called *amyotrophy;* if it is located in the nerve, it is called *neural atrophy;* if it is located in the muscle itself, it is called *myopathy.* In any case exhibiting progressive muscular weakness and atrophy

it is the physician's first duty to determine whether he has to deal with an amyotrophy, a myopathy, or a neural atrophy. But it is always well to bear in mind that the large multipolar cell in the anterior horn of the cord, with its axis-cylinder process (neuraxon) and the muscle-fibers to which it is distributed, constitutes a trophic unit, and that a disease process may involve more than one portion of this trophic unit. It may begin in one, and spread to an adjoining portion. Indeed, it is questionable whether disease is ever confined strictly to one of these three portions of the trophic unit. Ordinarily, however, they are chiefly confined to one portion, thus affording a basis of classification. There are cases on record which exhibited the symptomatology of amyotrophy and myopathy, or neural atrophy at the same time, and in which two or all three portions of the trophic unit were involved.

Symptoms.—The progressive muscular dystrophies appear before the age of 18, the majority before the age of 10. They are characterized by muscular weakness, and eventually by great muscular atrophy; but in the earlier stages apparent enlargement of certain muscles—pseudohypertrophy—is frequently seen. There are no mental or sensory symptoms, or these are rare or inconspicuous. Fibrillary twitchings, common in the amyotrophic form of progressive muscular atrophy, are, with rare exceptions, absent. The onset of the muscular weakness is insidious, and the shoulder or pelvic girdle or the legs are first affected. Unlike the spinal type of progressive muscular atrophy, the disease almost never begins with weakness and atrophy of the small muscles of the hand. The dystrophies belong to the so-called family diseases. Commonly two or more members of a family are affected. Boys are much more prone to be affected than girls. The hereditary influence is usually derived from the mother. The knee-jerks and the qualitative electric reactions are unaltered save in the late stages of the disease. The disease progresses until a stage of almost complete helplessness is reached. The weakness and atrophy become extreme, and various forms of club-feet and anteroposterior and lateral curvature of the spine are seen late in the disease.

Types.—The different varieties of the muscular dystrophies have been much written about, but they are really unimportant. These different types depend upon the age at which the disease appears, and the parts first or most affected, and the distribution of the atrophy or hypertrophy. These so-called types are merely varieties of the dystrophies exhibiting superficial differences, and are not in any sense distinct diseases.

The fact that these various types run into or overlap each other, and that different types are seen in the same family, offer strong evidence in support of this view. For example, one of the two brothers shown in the accompanying illustrations represents one type, while the other brother represented another type or a mixture of two types.

The most important types commonly described are these:

1. Pseudomuscular hypertrophy.
2. Juvenile type of Erb.
3. Facioscapulohumeral type of Landouzy-Déjérine.
4. The atrophic form.

Pseudomuscular hypertrophy has, of these various types, been longest, and is best, known. It develops slowly, and begins usually before the eighth year. The first symptom noticed is some clumsiness in walking or running and in going upstairs, due to weakness of the muscles of the calves and of the extensors of the knees. The calf-muscles, although weakened, become hypertrophied. The infraspinati, the glutei, and the extensors of the knee also become hypertrophied. The lower half of the pectoralis major and the latissimus dorsi are wasted early in the disease. This hypertrophy may be very marked or only slight. Weakness of the muscles of the back, and of those which fix the pelvis upon the thighs,

Erb's Type of Progressive Muscular Dystrophy.

produce an anterior curvature of the spine (lordosis) which may become extreme, so that a perpendicular line, touching the spine between the shoulders, and striking the ground, passes 2 or 3 inches behind the sacrum. When the child sits down, this anterior curvature disappears and is replaced by a posterior curvature. The gait becomes more and more waddling as the disease progresses. Great difficulty is experienced in going up-stairs, due especially to the weakness of the extensors of the knees. In rising from the floor the child gets upon his hands and knees, then places one foot upon the floor, then one hand upon the knee, the other hand upon the other knee, and then, by successive movements, climbs up his own thighs in the characteristic fashion first described by Gowers. As the disease progresses, the hypertrophied muscles become atrophied. Contractures frequently occur, due to the overaction of

certain groups of muscles which are no longer opposed by their normal antagonists. Thus various forms of club-foot are produced, especially talipes equinus. Contractures of the legs upon the thighs, and of the thighs upon the abdomen, occur, and may become extreme. Sensation remains normal. As a rule, no mental changes take place. Quantitative, but not qualitative, electric changes occur. The knee-jerks are preserved (never exaggerated) until the disease has made considerable progress. They fade out gradually as the disease progresses.

The Juvenile type of Erb begins with weakness in the shoulder girdle. There is atrophy of the thighs and upper arms, while the forearms, hands, legs, and shoulders preserve their natural contour; indeed, there may be some hypertrophy of the deltoids, the calf-muscles, and the infraspinati. The thin upper arms and the thighs, along with the apparently well-developed forearms, deltoids, and calf-muscles constitute the striking picture which this type of dystrophy presents. This variety of dystrophy is well illustrated by the accompanying illustration. Eventually all the muscles become atrophic. Contractures of the legs and curvature of the spine occur, and the child becomes quite helpless. The later stage of this type of the disease differs little from that of pseudomuscular hypertrophy.

The facioscapulohumeral type of Landouzy-Déjérine usually begins in infancy. The distinguishing feature is the wasting and atrophy of the face-muscles, giving rise to the so-called myopathic facies. The face presents a mask-like appearance, and the lips are protruded and thickened, constituting the "Tapir mouth" (*bouche de tapier*). Neither the ocular muscles nor those of mastication or deglutition are affected. The atrophy extends to the shoulder and arm muscles. The features seen in the preceding type develop. It chiefly differs from the Erb type in that the face is involved and that the onset is at an earlier period of life.

The atrophic type presents the chief features of pseudomuscular hypertrophy, differing from that type mainly in that there is no hypertrophy, or apparent hypertrophy, at any stage of the disease. The muscles of the legs and back are first affected. The gait, according to Bramwell, is not so waddling as that of the pseudohypertrophic form; and he has described it as the "spider-crab" gait. This form is so nearly identical with the so-called Leyden type that the latter need not be described.

Course and Duration.—The dystrophies are essentially chronic in their course, which, however, varies greatly within certain limits. Ordinarily, patients live from 10 to 20 years; but a few cases have run a somewhat rapid course in 3 or 4 years. On the other hand, some patients have lived almost to old age. When the affection begins in early infancy, or the onset is rapid, the probabilities are that it will run a comparatively short course. The disease seems to progress more rapidly after the patient has become so weakened as to be practically helpless.

Etiology.—In about one-half the cases heredity has been traced, usually through the mother. The disease is so distinctly a family one that it must be concluded that its potential possibilities are contained in the germ-plasm. This, of course, implies some defect in one or both of the parents of a patient.

In the majority of cases the disease appears before the age of 10 years. Boys are much more frequently affected than girls; but in the Landouzy-Déjérine type boys and girls suffer about equally.

Pathologic Anatomy.—The primary seat of the disease is in the muscles themselves. The term "primary muscular dystrophy" is meant to carry with it this idea. The anatomic changes are practically the same in the different types. Slight changes have been found in the spinal cord, very different in degree and kind from those found in progressive spinal muscular atrophy of the Duchenne-Aran type. Nevertheless, the view is held by some that the dystrophies are nervous in origin, due to damage to the trophic centers which control the nutrition of the muscles. The primary changes are found in the muscle-fibers. Atrophied and hypertrophied fibers are found, the former predominating. There is proliferation of the nuclei, and vacuolation and segmentation of the fibers. Secondarily, there occurs proliferation of the connective tissue, multiplication of its nuclei, and increase of adipose tissue. The apparent increase in size of the muscles is chiefly due to these fatty and connective-tissue deposits.

Diagnosis.—The dystrophies are not difficult of recognition if the features which characterize them are known. In the following little table the chief diagnostic features which separate them from the spinal form of progressive muscular atrophy, with which they are most apt to be confounded, are enumerated, while those which characterize this last-named affection are placed in a parallel column.

Progressive Muscular Dystrophies.	Progressive Spinal Muscular Atrophy.
1. Usually more than one member of a family affected.	1. More than one member of the family affected very rarely.
2. Onset in childhood.	2. Onset in adult years.
3. Small muscles of hand almost never affected first.	3. Small muscles of hand affected first, as a rule.
4. Fibrillary twitchings rare.	4 Fibrillary twitchings usually present.
5. Enlargement of certain muscles very common.	5. No enlargement of muscles.
6. Qualitative electric reactions absent until late in the disease.	6. Qualitative electric reactions present.
7. Waddling gait and peculiar method of rising from floor.	7. Waddling gait not seen.

When only one member of the family is affected, the diagnosis may be difficult or even impossible; but usually the remaining features which characterize the disease are so plain that the diagnosis is

not difficult even in the absence of this very significant feature. The slow onset, together with the features already named, should serve to distinguish the dystrophies from poliomyelitis. From multiple neuritis they are to be recognized by the absence of pain and tenderness, by the normal electric reactions, the presence of pseudohypertrophy, the age and manner of onset, and the family history. The various types of the dystrophies may be distinguished from each other by the points already enumerated. Sometimes this is easy, at other times difficult. These types overlap or run into each other more or less, and it is sometimes difficult or impossible to distinguish them from each other, nor is it especially important to do so.

Prognosis.—The prognosis is grave. The disease is progressive, and a cure is not to be expected. Patients may live 10 to 20 years. Those in whom the disease begins late in childhood or youth are likely to live longer than those in whom it begins in infancy. Rapidity of progress, of course, points to an earlier termination. After patients have become helpless, the progress of the disease becomes more rapid. The patient is likely to die of an intercurrent malady, such as pneumonia or bronchitis.

Treatment.—Members of dystrophic families should be strongly discouraged from marriage. Careful hygiene, with plenty of outdoor life, should be advised for the brothers and sisters of a dystrophic patient. Not a great deal is to be expected from the drugs, but more from a plan of treatment which includes outdoor life, with careful hygiene and measures calculated to promote the nutrition of the affected muscles, such as electricity, massage, and wisely regulated gymnastics. While a cure cannot be affected, the progress of the disease may, for a time at least, be stayed, or even a distinct improvement may be brought about by conscientious, intelligent, and persistent employment of these measures. Weiner has recently reported a case which was very considerably benefited by a systematic course of gymnastics lasting 2 years. While drugs have no special influence upon the disease itself, they may, from time to time, be indicated by the patient's general condition. In the later stages of the disease, after contractures have occurred, the orthopedic surgeon may, by performing tenotomies, produce very gratifying relief.

The Peroneal or Leg Type of Progressive Muscular Atrophy.—This affection, both in its symptomatology and pathologic anatomy, seems to stand midway between the dystrophies and the spinal form of progressive muscular atrophy. Commonly more than one member of a family is affected. The affection is, therefore, a hereditary or family disease. It begins in later childhood or youth by weakness and atrophy of the muscles of the feet and legs, usually in the former first. The atrophy and paralysis slowly and steadily increase, and after 3 or 4 years, the upper limbs become involved, the small muscles of the hands being usually first affected, and then the muscles of the forearms. The supinator longus escapes, as do the muscles of the shoulder, neck and face. The bird-claw hand seen in the spinal type of progressive muscular atrophy may be produced when the hand atrophy has become extreme. Patients rise from the floor by climbing up their own thighs, as do those affected with progressive muscular dystrophies; but as the disease progresses they become unable to rise from the floor at all; and this may occur before the arms have become appreciably involved, as is the case in the patient represented in the accompanying figure. Contractures of the muscles of the legs occur rather early, and produce talipes equinus or equinovarus. Fibrillary twitchings may occur, and slight sensory disturbances with pains are occasionally present. The powers of coordination are not only unimpaired, but rather increased. The patient may be able to walk long after he is unable to rise from the

The Peroneal or Leg Type of Progressive Muscular Atrophy.

Patient aged 20. The legs are greatly wasted, but the arms are unaffected. A sister aged 25 suffers from the same disease in a more advanced form. Neither can rise from the floor unaided.

floor unaided, and when the slightest push suffices to upset him. The knee-jerks are diminished or lost. The affected muscles exhibit the electric reactions of degeneration. The affection has a tendency to follow acute infectious diseases.

Only a few autopsies have been made. Changes in both the peripheral nerves and spinal cord have been found. Whether the disease is due to a neural atrophy or an amyotrophy, or to both, is not yet positively known. The disease is to be recognized by the family history of the patient, by the mode and time of life of onset, the absent knee-jerks, the changes in the electric reactions of the muscles, the fibrillary twitchings, the presence of

club-feet, and, in the late stages, of the bird-claw hands. The course of the disease is slow, chronic, and progressive. Treatment is to be carried out along the lines laid down in cases of progressive muscular dystrophies and progressive spinal muscular atrophies.

MUSCULAR RHEUMATISM.—See RHEUMATISM (Muscular).

MUSCULAR SENSE.—The sensation by which we are aware of the degree of force exerted by contracting muscles. It differs from (1) pain on firm pressure; (2) pain on tetanic contraction (cramp), and (3) the sense of muscular fatigue. Disorders of this sense are those of hyperesthesia and anesthesia. Diminution is most frequent, with or without loss of voluntary power. Muscular anesthesia rarely requires special treatment. A sudden local loss of muscular sense requires rest and counterirritation, and is usually dependent on a local lesion in the cord. Faradization may be useful in some cases. See LOCOMOTOR ATAXIA.

MUSHROOMS, POISONING.—The most common fungus which gives rise to urgent symptoms of poisoning is the fly-fungus, or *Amanita muscaria*, the active principle of which is muscarin. Several other species of fungi possess poisonous properties. Severe cases resemble in their symptoms the algid stage of cholera; collapse, cyanosis, and muscular contractions preceding a fatal termination.

The stomach should be washed out immediately if a siphon-tube or stomach-pump is obtainable; otherwise an emetic of apomorphin hydrochlorid, gr. 1/8, hypodermically; or of zinc sulphate, 20 grains in water, or mustard, 1/2 of an ounce in tepid water, or other emetic, may be administered. The physiologic antagonist of muscarin, which is atropin, should be given at once in the form of the tincture of belladonna, 20 minims in water, or injected hypodermically as atropin, 1/60 to 1/20 of a grain, and it may be repeated, if necessary. Castor oil is the best purgative, and should be given as soon as possible. When depression exists, stimulants in the form of brandy, ether, or ammonia may be administered. External heat is to be employed, and, for some days after symptoms have disappeared, the patient should remain in bed.

MUSK (Moschus).—The dried secretions from the preputial follicles of the musk-deer of Thibet, having an odor of marked penetrating power. It occurs in irregular, unctuous grains, of reddish-brown color and bitter taste. Its odor is destroyed by drying, but returns again on the addition of moisture. Trituration with camphor or hydrocyanic acid also destroys it. There is a variety known as Chinese musk which is very valuable when in pods or sacs, but all varieties are much adulterated. That sold in shops is impure, and if sold for less than 25 cents a grain, it is probably worthless.

It is a diffusible stimulant and supportive, an antispasmodic and nerve sedative. The dose is 2 to 6 grains, and is not to be employed save to carry a patient past a crisis. Rectal injections in starch-water may be used in low fevers, when the strength of a patient is fast failing, and there are nervous symptoms indicative of great depression. It is also of value in nervous excitement or nervous collapse.

Tincture of Musk, 5 percent. Dose, 20 to 80 minims.

A stimulant in croup:

℞. Musk, gr. iv
Powdered white sugar, ʒ j.
Divide into 6 powders; give 1 powder every hour or half-hour.

MUSSEL POISONING.—The toxic effects in man sometimes resulting from eating mussels, especially the *Mytilus edulis*. See FISH-POISONING, PTOMAIN-POISONING.

MUSTARD (Sinapis).—Official under the two following titles but the pharmacopœial preparations are directed to be made from black mustard only.

Sinapis Alba, *White Mustard*—the seed of *Sinapis alba*. Dose, as emetic, 1 to 3 drams.

White mustard contains *myrosin*, a ferment, and *sinalbin*, a crystalline substance, *sinapin*, an alkaloid, *erucic* or *brassic acid*, and a bland, fixed oil.

Sinapis Nigra, *Black Mustard*—the seed of *brassica nigra*. Dose, as emetic, 1 to 2 drams.

Black mustard contains *myrosin*, a ferment, and *sinigrin* (potassium myronate), *sinapin*, an alkaloid, *erucic*, or *brassic acid*, and a bland, fixed oil.

Sinapis is much used locally in the form of the well-known "mustard plaster."

A mustard plaster is a valuable counterirritant in the treatment of pain in the abdomen or chest. It should be made by mixing mustard flour in varying proportions with ordinary flour, and moistened by warm vinegar or water. Half mustard and half wheat flour will suffice if the skin is tender, but for children one-fourth mustard is strong enough. To make a mustard plaster, place a piece of heavy muslin or linen on a newspaper, over which smear the mustard mass. Over this a thin piece of linen should be placed, to prevent adhesions to the skin and to modify the irritant effect. The edges of a newspaper may be folded to resemble a picture-frame, and the plaster placed within this, giving it a support.

Mustard burns are peculiar in their slowness to heal, and in the fact that they are tender and reddened for days. When the burning is excessive, a piece of lint soaked in lime-water and olive oil, or in olive oil alone, may be used to give relief. Vaselin may be smeared over the burn.

Preparations.—Oleum S. Volatile, a colorless or pale yellow liquid, of pungent, acrid odor and taste and neutral reaction, almost insoluble in water but freely soluble in alcohol and in ether. Dose, 1/8 to 1/4 minim. **Charta S.** *Mustard Paper*, consists of black mustard, the fixed oil removed by percolation with benzin, mixed with solution of rubber and spread on paper. Each square inch should contain about 6 grains of mustard. For local use.

MYALGIA.—See RHEUMATISM (Muscular).

MYASTHENIA GRAVIS.—See PARALYSIS (Asthenic Bulbar).

MYCETOMA (Fungus Disease of India; Madura

Foot).—A tropical disease probably due to the vegetable parasitic fungus of the actinomyces group—streptothrix mycetoma. The seat of the disease is usually strictly localized in the foot, which becomes intensely swollen, deformed, and studded with cysts and sinuses which emit an offensive, oily, seropurulent fluid. Prophylaxis probably consists chiefly in the wearing of shoes. Treatment is solely surgical—amputation should be performed well above the diseased part, though in the early stages it may be sufficient to incise or remove with the curette all the diseased tissue.

MYCOSIS FUNGOIDES (Granuloma Fungoides).—A chronic, malignant, infectious disease, characterized primarily by an eruption of an urticarial, eczematoid, or lichenoid appearance, and later by ulcerating fungoid tumors. In the early or "premycotic" stage the affection begins as an urticarial, erythematous, eczematous, or lichenoid eruption, accompanied by itching and burning. After a duration of some months or years this is followed by flat or slightly elevated plaques of a pinkish-red color.

In the second stage there appear pea-sized to fist-sized, reddish or violaceous, shining tumors, which may develop from the above-described plaques or may spring up independently. They at times develop with remarkable rapidity, and spontaneously disappear just as quickly. More commonly they become an abscess, ulcerate, and present the appearance of a mushroom or fungoid growth. The microscopic appearance strongly resembles that of the round cell and lymphosarcoma. The result is almost invariably fatal.

To relieve the itching quinin and antipyrin have been found of value. Recently radium has been used with success.

MYDRIASIS.—See Pupil.

MYDRIATICS AND CYCLOPLEGICS. Definition.—A mydriatic is an agent which produces dilatation of the pupil. A cycloplegic is an agent which produces paralysis of the ciliary muscle of the eye. In ophthalmology these two terms are usually considered interchangeable, as the ordinary drugs possessing the power of producing mydriasis also produce, in a greater or less degree, cycloplegia.

The mydriatics which have been used in the examination of the eye are atropin, belladonna, homatropin, cocain, hyoscyamin, duboisin, daturin, scopolamin, muscarin, mydrin, euphthalmin, and ephedrin. Atropin and homatropin are the drugs usually employed in refraction, and are those to be recommended, as they have been extensively used and their action and dangers are far better understood than those of the newer substances.

Physiologic Action.—Atropin and homatropin produce mydriasis by paralyzing the sphincter of the pupil and stimulating the dilator at the same time. Cocain affects the dilator of the pupil chiefly, stimulating it. Atropin paralyzes the ciliary muscle completely, and leaves the eye adjusted only for the far-point. Homatropin paralyzes it less completely, but sufficiently for the purposes of refraction, when administered in the manner indicated. Cocain has a very slight paralytic action on the ciliary muscle. As usually administered, the effect of atropin lasts from 10 days to 2 weeks; of homatropin, from 1 to 2 days; of cocain, only a few hours.

Indications in Refraction.—In all first refractions of the eyes of persons under 45 or even 50 years of age, in whom there is no suspicion of glaucoma. No absolute diagnosis of the finer grades of astigmatism can be made without a mydriatic in a person possessing the power of accommodation.

Dangers.—These drugs may precipitate an attack of glaucoma in the eye of a person past middle life, or in whom there is already a tendency to increased intraocular tension. It has been said that if a mydriatic ordinarily applied for purposes of diagnosis produces glaucomatous symptoms, the patient would likely have been the subject of insidious glaucoma later in life anyway, and that the early diagnosis by the mydriatic facilitates treatment.

Mydriatics may also cause general toxic symptoms in susceptible patients. The general symptoms are tickling and dryness in the throat, vomiting, diarrhea, redness of the face, and quick and irregular pulse; even fatal cases have been recorded. If there is any history of idiosyncrasy, the patient should always be instructed to press the finger against the lacrimal sac for 10 minutes after using the drops. This danger may also be averted by using minute or divided drops of the solution. Congestion of the conjunctiva is often a temporary result of the instillation of a mydriatic. The systemic effects of a mydriatic may be combated with a full dose of paregoric.

Administration.—The most effective of this class of drugs, and that most frequently used, is the sulphate of atropin. A solution of 1 grain to 2 drams is ordinarily prescribed; 1 drop of this strength solution is placed in each eye 3 times daily for 2 days prior to the examination. An additional drop is generally applied at the office of the oculist before beginning the examination. For the reason of its prompt action and the short duration of its effect, the hydrobromid of homatropin offers a very efficient and necessary substitute for atropin in office practice. It is, however, a much more expensive drug than the sulphate of atropin. The best solution is a mixture of two-thirds hydrobromid of homatropin, 10 grains to the ounce, and one-third hydrochlorid of cocain, 10 grains to the ounce. A drop of the mixed solution is instilled in each eye every 10 minutes for an hour preceding examination. If it is necessary to have repeated examinations of the eye or to have prolonged mydriasis, atropin should invariably be used. Cocain is useful to dilate the pupil, to facilitate ophthalmoscopic or retinoscopic examination, but is valueless as a cycloplegic. The 4 percent solution is generally used. Sufficient dilatation is usually obtained in from 15 to 30 minutes.

Hyoscyamin, duboisin, daturin, and scopolamin are sometimes used, but investigation has not yet definitely established reason why they should be preferred to the older drugs.

MYELITIS.—An inflammation which affects the substance of the spinal cord, and which may be

limited to the gray or white matter, involving the whole or isolated portions of the cord. When the gray matter alone is inflamed, it is termed central myelitis; when the white matter and the meninges, it is termed cortical myelitis. It may be ascending, descending, or transverse in its extension. The disease is characterized by more or less sudden and complete loss of motion and sensation. In the acute form the symptoms appear suddenly; in the subacute they develop in 2 to 6 weeks, in the chronic a longer time elapses.

Etiology.—It follows spinal meningitis; exposure to cold and damp; injuries to the vertebræ; tumors; caries; prolonged functional activity of the cord; typhus fever; rheumatism; syphilis; puerperal fever; or, during the course of the exanthems, arsenical or mercurial poisoning.

Symptoms.—The severity of the symptoms depends upon the extent and location of the inflammation. The onset is usually sudden, with a chill, fever (103° F.), frequent pulse, with alterations in sensibility and motility: pain in the back, aggravated by touch and by heat and cold, with sensations of formication ("pins and needles"), the limb feeling as if asleep, or else complete anesthesia, associated with severe neuralgic pains. The distinction between anesthesia (insensibility to touch) and analgesia (insensibility to pain) must be clearly determined. There is a sensation of constriction around the body and limbs, as if encircled by a tight cord—"the girdle pains"—and rapidly developing paraplegia, complete in a few hours, with involuntary discharges. The reflex functions are usually abolished, as seen by attempting to cause movement of the limbs by tickling the feet or by striking the patella tendon; rarely are they diminished, very rarely exaggerated. The temperature of the affected limbs is lowered 3 or 4 degrees. Sloughs and bed-sores and muscular atrophy result if the anterior cornua—the trophic centers—are affected. The foregoing symptoms, with rectal and vesical paralysis, are associated with more or less pronounced vomiting, hepatic disorders, irregularity of the heart, dyspnea, dysphagia, apnea, and painful priapism. The urine is markedly alkaline in reaction, finally developing cystitis. Among the late manifestations are shooting pains and spasmodic twitchings or contractions of one or all of the muscles of the paralyzed parts. The electrocontractility is abolished in the paralyzed parts.

Diagnosis.—**Acute spinal meningitis** is distinguished from acute myelitis by severe pains, increased by pressure, with muscular contractions, increased by motion, followed by paralysis much less profound than the paraplegia of myelitis; in spinal meningitis there exists cutaneous and muscular hyperesthesia which is absent in myelitis.

Congestion of the spinal cord is characterized by the mild character and short duration of all the symptoms.

Hemorrhage in the spinal canal is abrupt, with irritative symptoms, slight paralysis, preserved reflexes, and electrocontractility.

The principal diagnostic points of acute myelitis are the "girdle" around the limbs or body, rapid and complete paraplegia, loss of sensation, lowered temperature in the affected parts, early and persistent sloughing (bed-sores), and alkaline urine or cystitis.

Hysteric paraplegia shows no trophic changes, no altered reflexes, slight atrophy, irregular anesthesia and the presence of the stigmata of hysteria.

Lithemic paresthesia, tingling and numbness of fingers and toes, might lead to error if the cerebral symptoms of lithemia are overlooked.

The diagnosis of the location of the lesion is made by a study of the height of the anesthesia, the skin reflexes, and the distribution and extent of the paralysis.

The following table by Morton Prince will be helpful in showing what portion of the cord is involved:

	Lumbar Myelitis.	Dorsal Myelitis.	Cervical Myelitis.
aralysis	Paraplegia....	1. Dorsal, abdominal, and intercostal muscles, according to height of lesion. 2. Leg.	Neck muscles, diaphragm, arms, trunk, and legs.
Sensation.	Pains in legs, or girdle pains around loins; hyperesthetic zone around loins; anesthesia of legs, complete or uneven distribution.	Girdle pain and hyperesthetic zone between ensiform cartilage and pubes.	Hyperesthesia and pains in certain nerve distributions of arms; below this, anesthesia of arms, body, and legs.
Atrophy	Of legs.....	Of dorsal and abdominal (and intercostal muscles, not subject to examination) corresponding to height of lesion; sometimes mild and slow of legs.	Atrophy of neck muscles (rare) or more commonly of arms.
Electrical reaction.	Reaction of degeneration in atrophied muscles; or, in mild cases, quantitative diminution.	R. d. in dorsal and abdominal muscles: slight quantitative changes only in legs when wasted.	R. d. in atrophied muscles.
Bladder..	Incontinence from paralysis of sphincter.	Retention, or intermittent incontinence from reflex action; later from overflow. Cystitis common.	Same as in dorsal myelitis
Bowels...	Incontinence from paralysis of sphincter, disguised by constipation.	Involuntary evacuation from reflex spasm, or constipation.	Same as in dorsal myelitis.
Reflexes, superficial.	Lost.....	Temporary loss, then rapid increase,	Same as in dorsal myelitis.
Reflexes, deep.	Lost.....	Temporary loss, then slow increase.	Same as in dorsal myelitis.
Priapism.	.....	Often present...	Often present.

Prognosis varies according to the location of the lesion and the completeness of the symptoms. If the paralysis is of the ascending variety, death occurs within a few days, from paralysis of the muscles of respiration. If the trophic centers are affected, there occur bed-sores, intense pyelonephritis and cystitis, and changes in the joints, with death from exhaustion in several weeks. Central myelitis, or inflammation of the gray matter, is rapid in its progress, death occurring in a week or two. The morbid process may be arrested and the general health restored, but some spinal symptoms will persist.

Treatment.—Absolute rest is essential to secure even a palliation of the symptoms. Locally, considerable relief follows the use of hot-water bags, or sponges dipped in hot water, and applied along the spine every few hours. The remedies most strongly recommended are digitalis, strychnin, iron, mercury, and the iodids. Electricity is of little value. Cystitis and bed-sores must be guarded against.

MYELOCELE.—See Spina Bifida.

MYELOMA.—The myeloid or giant-celled sarcoma. See Sarcoma, and Bone (Tumors).

MYIASIS.—See Parasites (Animal).

MYOCARDITIS.—See Heart-disease (Organic).

MYOCLONIA.—See Paramyoclonus Multiplex.

MYOMA.—A muscular tumor. Also an affection marked by the growth in the skin of small, sessile, freely movable, isolated, reddish tumors consisting of involuntary muscular fibers. If small and multiple, they are called liomyomata; if there is but a single large tumor, it is called a dartoic myoma; if the tumors contain much fibrous tissue, they are called fibromyomata; if vascular and erectile, angiomyomata; if the lymphatics are involved, lymphangiomyomata. See Tumors.

MYOMECTOMY.—The excision of a uterine fibroid without removal of the uterus. This operation is applicable to certain classes of uterine fibroids. When the tumor is pedunculated and subperitoneal, the pedicle may be ligated in two parts and the tumor removed; if it has no pedicle, the capsule may be incised and the tumor enucleated. The uterine wound should then be closed with interrupted sutures.

The operation of myomectomy is of value when the conditions are favorable, since the patient is cured without removal of the uterus. A dangerous complication of myomectomy is hemorrhage. See Uterus (Fibroma).

MYOPIA (Near-sightedness).—A condition of the eye in which parallel rays of light are brought to a focus in an eye at rest in front of the retina. It is most often dependent on the lengthening of the axial diameter of the eye, and such cases are called true or static myopia. A false or functional myopia is produced by spasm of the ciliary muscle, conic cornea, swelling of the lens in incipient cataract, etc. In such cases the sclera is of usual thickness, and the axis of the eyeball is not lengthened; the change is in the refractive media. See Ametropia.

Etiology.—It is rarely congenital, and, when so, it may be hereditary. An anatomic cause is said to be the peculiar construction of the orbit in certain persons. Devitalization and weakened resistance of the ocular tissues are predisposing causes. Scrofulous children are ready victims to myopia. The early necessity for increased convergence and accommodation by the precocious application of hyperopic eyes of childhood to continuous near-work produces a hyperemia of the ocular tissues, which, if of low resisting power, are stretched, the eye gradually becoming lengthened, and, as a result, myopic. Myopia is often seen in persons of intellectual pursuits requiring excessive near-work, such as students, artists, engravers, etc. However, in the congenital and hereditary types, the patients may be of the most ignorant classes of mere manual laborers. In such cases a low-grade choroiditis is an important etiologic factor. Myopia rarely results from an increased refractive power of the lens in the early stages of cataract in old persons, and to this fact may be possibly attributed the cases of so-called "second sight," in which aged persons find themselves able to read again without their convex lenses. However, their distance-vision becomes markedly decreased The entire eyeball is not necessarily involved in myopia: as, for instance, myopia results from the condition known as conic cornea, the relation between the retina and other media being normal.

An occasional and a curious cause of myopia is a marked decrease in weight of an extremely stout emmetrope or a low degree hyperope. In a like manner there has been noticed considerable decrease of myopia in persons who suddenly and markedly increase in weight.

Disadvantages and Dangers.—The axial diameter being too long, the parallel rays of light falling on the eye focus in front of the retina, and hence only a blurred image of external objects, is received on the rods and cones. In moderate hyperopia a similar defect is overcome by the accommodation, but the myopic eye possesses no mechanism adapted to the correction of the refractive error. There is no way of diminishing the refractive power of the dioptric system, and hence distant objects are always blurred. There is false estimation of size and distance, and altogether the myope is at a decided disadvantage in sports or occupations. However, the myope is still able to see near objects distinctly, and, unfortunately, therein lies his greatest danger. Deprived of many outdoor pleasures, he seeks occupation and amusement within his own limited circle of vision. By holding his book or implements close to his eye, he is able to see distinctly; but in so doing he strains his power of convergence excessively, producing ocular congestion and compression of the eyball; and by bending over he affords a favorable position for the distention of the ocular veins. The coats of the eyeball, already of weakened resistance and put upon the stretch, are further pulled and damaged. The eyeball becomes more and more lengthened, and the myopia increases. With the stretching of the ocular coats the nutrition of the eye is seriously disturbed, and, as a result, the choroid becomes diseased, and this causes associate

retinal changes, defective vision, even with proper glasses, resulting. The nutrition of the vitreous and lens is also seriously damaged. The consequences of such denutrition in the highly myopic eye are serious, and these eyes are liable to cataract, vitreous opacities, and retinal detachment. The danger is, of course, greatest in youth.

Contrary to the popular impression, the myopic eye should be considered as a "sick eye." However, if proper glasses are prescribed and constantly worn and excessive near-work interdicted, a moderate degree of myopia unaccompanied by posterior staphyloma is not liable to progress, but will remain more or less stationary through adult life. This again offers another argument for the early correction of myopia.

Another danger of excessive convergence in a myopic child is divergent squint. The strain in excessive convergence, necessitated by the diminished distance for near-work and extra effort to rotate the elongated eyeballs, may be so great that the effort to converge both eyes is finally relinquished, and one eye diverges.

A final danger of myopia is the liability to accidents on account of the inability to see distant objects clearly.

Progressive or malignant myopia is the serious type in which the ocular coats continue to stretch and become devitalized until they ultimately give way. The bulging occurs at the weakest portion, near the posterior pole, to the temporal side of the disc, and constitutes what is known as **posterior staphyloma.** The destruction of the choroid is accompanied by many conditions which are readily recognized through clear media with the ophthalmoscope. The **myopic crescent** is caused by the absence of the pigment of the stretched choroid and retina, usually at the nasal margin of the disc, allowing the sclerotic to show through as a white crescent. Other white spots indicative of chronic choroiditis may be seen scattered throughout the fundus. Hemorrhages and extravasations sometimes produce retinal detachment. In severe cases the vitreous becomes fluid and the eyeball soft. Vitreous opacity and luxation of the lens may result. With such serious sequels we readily see that the ultimate result of unchecked malignant myopia may be disorganization of the whole eye and total blindness; and in all cases of high myopia, whether progressive or stationary, there are pathologic changes of such import as to produce more or less amblyopia.

Symptoms.—The objective symptoms in the lower grades of myopia are of little importance. In the high degrees the eyeballs may be prominent, and when strongly converged, are seen to be elongated. In such cases the pupils are large and inactive. The myopic crescent and the choroidal condition help in forming the diagnosis.

The most noticeable subjective symptom is the interference with vision. In moderate myopia distant objects cannot be seen distinctly. Myopic children complain that they cannot see the clock across the room or distinguish writing on the blackboard at school, although they are able to read at close range with apparent ease. In extreme cases of myopia or in the progressive type the far-point is so close to the eye as to render the eye virtually useless for distant vision. Scotomata, limitation of the visual field, vitreous opacities, photophobia, photopsia, muscæ, and ocular pains are additional symptoms of the higher degree of myopia.

As a rule, the symptoms of accommodative asthenopia and the remote reflex irritations from eye-strain are not complained of in myopia, as the ciliary muscle is passive rather than active. Its radial fibers are better developed, and are greatly in excess of the circular fibers, the opposite of the condition in hyperopia. However, because of the strain on the convergence, evidences of muscular asthenopia, such as headache, weariness and sense of heat in the eye, and chronic conjunctivitis, may follow.

Diagnosis rests upon the diminished acuteness of distant vision, the ophthalmoscopic examination (refraction and fundus changes), the retinoscopic examination, and the acceptance of and visual improvement by a concave lens. Conic cornea is easily differentiated from myopia by the peculiar protruding appearance of the cornea, the depth of the anterior chamber, and the characteristic retinoscopic reflex. Hyperopia with ciliary spasm simulating myopia is readily differentiated under mydriasis. See Retinoscopy.

Treatment.—Prophylactic measures consist in the careful examination of children's eyes, particularly about the time they are to start to school, and in securing the best hygienic conditions for them during their school hours. Good ventilation, properly constructed desks, and sufficient and rightly directed light are requisites for the maintenance of normal vision. There should be a north light coming in over the left shoulder, and not falling directly on the desks. The walls and ceilings should be painted in light colors. There should be 1 foot of window space for every 5 feet of floor space, and small type should be distinctly read in the most remote corner of the school-room on a cloudy day. Books should be printed in large, broad-faced type, and on dull-faced paper. The desks should be sloping and so arranged as to avoid all stooping positions. In young myopes excessive near-work must be interdicted. Such children should be urged to forego studying, reading, and other indoor amusements, and must be encouraged to go out into the open air and take plenty of healthful exercise, meanwhile rigorously wearing their correcting glasses.

In myopia the book, writing, etc., should be placed at a distance of at least 13 inches from the eye, artificial or insufficient light should be avoided, and the eyes should be given frequent intermissions of rest.

In the progressive type of myopia, and in the extremely high degrees, near-work must be virtually excluded from the daily occupation. In such cases the treatment depends upon rest, abstinence from near-work, constitutional and hygienic measures, the relief of any increased ocular tension by the administration of eserin or by iridectomy, attention to the associate choroiditis and other

pathologic changes, and the constant use of correcting lenses.

Prescription of Glasses.—Ordinarily, it is desirable to prescribe spectacles that will give fair distant vision and, at the same time, enable the patient to read easily at the proper working distance. However, in cases of persons doing much near-work, a pair of weak lenses may be ordered for reading, etc., and stronger glasses for outdoor use, theaters, receptions, etc.

In myopia of 3 diopters or over the far-point is inside of the ordinary reading distance, and there is necessarily extra convergence; but, unfortunately, there is no necessity for accommodation; the adductors are deprived of this stimulus, and exophoria results. In order to cause the requisite accommodative stimulus to the adductors, constant use of the full correction of myopia has been urged. The theory of this is plausible, but the strain on the undeveloped accommodation is too severe, and serious asthenopia results. Unfortunately, most myopes complaining of unsatisfactory glasses are wearing not only their full correction, but are, in a majority of cases, over-corrected. A myope will naturally select a strong lens, and caution should be observed in the trial with the test-lenses, accepting as the proper refraction the weakest lens which gives normal vision, and which does not diminish the size of the letters, and, as the patients so often say, makes them appear better but further away.

In prescribing glasses for constant use some deduction from the full correction should be made in cases of children and young adults, in order that compromise lenses may be continually used which give fair distant vision, but which necessitate only a moderate accommodative effort in reading. It must always be remembered that overcorrected myopia may produce as distressing symptoms as uncorrected hyperopia.

At the presbyopic age bifocal lenses should be constantly worn and the full distance-correction ordered in the upper segment. In the high degrees of myopia (above 6 to 8 diopters) the full correction is never tolerated. In the unfortunate cases of extremely high myopia (12 to 20 diopters), with extensive choroidal changes, glasses are often of little service in making a useful working eye, and are so bulky and heavy as to be uncomfortable.

Removal of the Lens for High Myopia.—It is a well-known fact that the removal of the crystalline lens makes an emmetropic eye hyperopic by about 10 or 12 diopters. In the knowledge of this fact it has been suggested that removal of the lens would be an advisable procedure in cases of extremely high myopia: for instance, of from 15 to 20 diopters. Although this operation has been performed a number of times, the actual practical results are not definitely settled; there is great danger of retinal detachment, and, moreover, it is too radical a treatment to be advised to the beginner in ophthalmology. An ideal indication for this operation would be lenticular myopia.

MYOSITIS, INFECTIOUS.—An inflammation of voluntary muscles due to obscure infection; it may be acute or subacute, purulent or nonsuppurative. It is characterized by tenderness, slight edema, and swelling. Frequently an erythema appears over the body. It is differentiated from trichiniasis by examination of the muscle fragments, and by blood examination (eosinophilia being present in trichiniasis).

MYOSITIS OSSIFICANS.—A progressive congenital affection, usually first manifested in boyhood, and seldom seen in females. Masses of bone develop in the muscles, chiefly those of the back, producing deformity, eventually impeding respiration and so causing death in about ten years. It is often associated with irregular epiphyseal ossification, and with the absence or ill-development of the proximal phalanx of the thumb and great toe. It is believed that the connective-tissue of the muscle undergoes ossification while the true muscle fibers atrophy, but the pathology of the disease is quite obscure, and no treatment is of avail. A similar condition known as **myositis ossificans traumatica** may develop after severe injury. It is most common in the quadriceps extensor group in the thigh and in the muscles of the arm. In this form the ultimate prognosis is good. Cases in which operation is done late, after the osteoid tissue has ceased to grow, do well as a rule, but if operation is done early there is a decided tendency toward recurrence (Finney). As a prophylactic measure incision, and evacuation of the effused blood, with drainage of the affected area, is recommended.

MYOTICS.—See Miotics.

MYOTONIA CONGENITA (Thomsen's Disease.)—A rare congenital disease appearing in early childhood and in family groups, characterized by tonic spasms of the muscles when voluntary movements are made. The muscles are developed out of proportion to their power.

The facial, ocular and laryngeal muscles are rarely affected. There is rarely mental defect. The electrical reaction of the muscles involved is slow and associated with vermicular contractions between the poles—the myotonic reaction of Erb. The disease is incurable.

MYRISTICA (Nutmeg).—The kernel of the ripe seed of *M. fragrans*. Its properties are due mainly to the volatile oil. It is an aromatic stomachic and tonic, and in large doses a powerful narcotic. Dose, 5 to 15 grains. The oil is sometimes employed as a rubefacient in paralysis and rheumatism, and is much used as a condiment. **M., Oleum**, the volatile oil. Dose, 1 to 5 minims.

MYRRH.—A gum-resin obtained from the *Commiphora myrrha*, a tree of Arabia. It occurs in dark-colored, brownish-red, irregular shaped tears, having an agreeable aromatic odor and a bitter acrid taste. In medicinal amount it is stimulant to the circulation, and to uterine and bronchial mucous membranes. Dose, 5 to 15 grains. **M., Tinct.**, diluted with water or with potassium chlorate, is used in ulcerative stomatitis, spongy gums, acute pharyngitis, and in ptyalism. It is combined with other remedies for the treatment of chronic bronchitis, and in combination with iron is efficient in functional amenorrhea. In leukorrhea and chronic cystitis it is of service.

The pure tincture is sometimes applied with a small brush to spongy or tender gums, and it is of use as a gargle in ulcerated sore throat. Dose, 10 to 30 minims.

In stomatitis:

℞.	Tincture of myrrh.	gtt. xx
	Potassium chlorate,	ʒ j
	Elixir of calisaya,	ʒ iij.

Give a teaspoonful in water every 4 hours.

MYXEDEMA. Definition.—A disease characterized by the infiltration of the connective tissues of the body with a mucus-like substance and by atrophy of the thyroid gland.

Etiology.—The cause of the disease is the inability of the thyroid gland to perform its function, usually through atrophy. Rarely, it may be observed after removal of the gland. It is more common in women. Heredity is important, particularly in the maternal line.

Morbid Anatomy.—The connective tissue of the skin and subcutaneous tissues are infiltrated with a jelly-like substance containing mucin. The fibrillar and cellular elements of connective tissue are increased. Both of these processes may affect glands, muscles, nervous system, and the outer coats of the arteries. The thyroid gland is usually found to be atrophied.

Pathology.—With the atrophy or degeneration of the thyroid gland a hitherto undetermined something which is necessary for the well-being of the organism fails to be elaborated, and the changes enumerated occur. The secondary changes in organs result from the vascular degeneration.

Symptoms.—The face is swollen, rounded, with features less marked, and expressionless. The hands are spade-like and the feet misshapen; the body is bulky. The skin is thrown into folds, especially around the neck, and is dry, scaly, and thickened. The intellectual processes are sluggish, drowsiness is a quite constant symptom, and insanity often supervenes. The speech is slow. Myxedema in childhood, whether congenital or acquired, is termed cretinism. Subnormal temperatures, particularly in the later stages, are the rule.

Diagnosis.—The edema of chronic cardiac and renal disease is distinguished from this by the pitting and diminished hardness on pressure. The facies is not to be confounded with that of renal and cardiac disease, of which other physical signs are present.

Myxedema is distinguished from akromegaly in the great preponderance of instances in women, its development later in life, the absence of changes in bones, the full-moon face, the swollen and clubbed fingers, and the peculiar pale, waxy, boggy, and shining skin.

Prognosis.—The course of the disease is slow, and death from intercurrent affections is not unusual. Since 1892 the use of thyroid extract has modified the hitherto generally accepted opinion that the disease was of necessity fatal.

Treatment.—The patient should be protected from cold; hot baths, friction, and massage, with subcutaneous injections of pilocarpin, assist in maintaining the action of the skin. Inasmuch as the thyroid gland is found to be atrophied or degenerated in cases of this disease, and total removal of the gland is often followed by cachexia strumipriva (operative myxedema), the logical treatment consists in supplying to the organism that secretion essential to normal metabolism which in health is elaborated by the thyroid gland. The inconvenience of gland implantation, sheep's thyroids beng used, is sufficiently obvious. The injection of minced, raw, or slighty cooked sheep's thyroids, although successful in ameliorating the symptoms of the disease, speedily produced an insurmountable repugnance to them, so that their use was very generally abandoned. At present the glycerin extract, powdered extract, or a presumably active principle of the gland are the only ones employed. The glycerin extract is given by the mouth in daily dose of from 15 to 30 minims, representing from one-eighth to one-fourth of an average sheep's thyroid. If this seems to be ineffective, the amount should be increased until evidence of betterment is obtained. The initial dose should be maintained at semiweekly or weekly intervals until all symptoms of the disease have disappeared. Inasmuch as the substance which the thyroid supplies is essential to the health of the organism, continual administration of the remedy is necessary during the remainder of the patient's life, but at more infrequent intervals. The powdered gland may be given by the mouth in such doses that from one-eighth to one-third of a sheep's thyroid is represented; in amount it is usually 5 grains. Inasmuch as the salts and extractives in the gland have been shown to be useless, attempts have been made to isolate the active principle and at the same time to get rid of the products of decomposition which may be harmful. Fresh thyroid gland contains but one iodin-containing substance —the colloid matter—which consists of a proteid part (possibly a globulin) combined with an organic compound of iodin (crude iodothyrin), and the latter can be separated from the colloid by hydrolysis. Since the specific effects of the thyroid gland can be obtained either from the colloid or the separated iodothyrin, the latter is now chosen for thyroid administration. At present there is no satisfactory way of standardizing the thyroid preparations, but the average dose of colloid matter is 1 1/2 grains.

On the administration of preparations of the thyroid gland in myxedema it has been found that untoward and even poisonous symptoms may arise. If, during its use, cubnormal temperature, slow pulse, and mental hebetude are observed, the dose should be increased. Further, the dose should be larger in cold than in warm or hot weather. If, however, the pulse becomes quicker, evidences of circulatory disturbances arise, febrile reaction is marked, the patient becomes excitable, either the dose is too large or products of decomposition of proteid material are present as impurities. In the first case the dose should be diminished or the remedy stopped for a time; if the second, another preparation must be chosen. Symptoms of

cardiac paralysis and circulatory disorder are more likely to occur in postoperative myxedema (thyroidectomy for goiter). In this instance the heart must be carefully observed, and at the first signs of failure the remedy omitted, while strychnin, strophanthin, or nitroglycerin is employed; a combination of the first and last is the most useful. Since most of the instances of the ill-advised use of thyroid extract have occurred in the practice of surgeons, it is proper that this phase of the treatment should be delegated entirely to physicians. With care in the use of preparations of the thyroid gland their administration may be safely continued during the life of the patient. For other precautions and accidents the reader is referred to THYROID TREATMENT.

MYXOMA.—A connective-tissue tumor the consistency of which is similar to the jelly of Wharton of the umbilical cord. It consists of a gelatinous, mucin-containing intercellular substance, in which are scattered peculiar branched or stellate cells. See TUMORS.

N

NABOTHIAN CYSTS.—See Cervix Uteri (Endocervicitis).

NÆVUS. See Nevus.

NAILS, DISEASES.—Affections of the nail may be divided into those of the nail proper, and those of the soft parts in relation with the nail. Alterations in the texture of nails are not common. Alterations in form result from injury or skin-disease. The general state of health influences the growth of the nails, and after illness a deficient formation of horny matter may result, manifested by the production of a groove across the nail. The breadth of this groove roughly indicates the period and duration of illness.

Onychia is an inflammation of the matrix of a nail. The best-known form is of syphilitic origin, and is either subacute or fully developed. The subacute form is attended with pain, redness, and more or less ulceration of the matrix. The developed form is met with in adults. The nail soon rots and crumbles away at the root, leaving a ragged border attached to the distal portion of the finger. The free edges also suffer, and become broken and fissured.

The treatment includes attention to the primary disease. Hot moist dressings or poultices are suitable in almost all cases of acute inflammations, and may be followed by soothing antiseptic lotions and ointments.

Carbolic acid, 1 dram, with water, 4 ounces, makes a soothing antiseptic lotion, which may be poured on lint and wrapped around the last joint of the finger. Chloral, 5 to 10 grains, with 1 ounce of water, may also be used. Finely powdered lead nitrate makes an excellent remedy. Ointments of boric acid, of tar, of mercury, or red precipitate salve may be used. A free application of a strong solution of silver nitrate at the beginning of the inflammation will often prove curative. When granulations spring up, they may be covered with tannin or alum, or rubbed daily with a crystal of copper sulphate, or strong carbolic acid or the liquor ferri persulphatis applied. In chronic inflammations of parts around the edges, daily painting with a solution of silver nitrate, 10 grains to 1 fluidounce, is useful. These measures failing, removal of the portion of the nail at fault or of the whole nail may be performed. Malignant onychia requires removal of the entire nail, cauterization of the matrix, and dressing with iodoform gauze, and the internal use of tonics and nourishing diet.

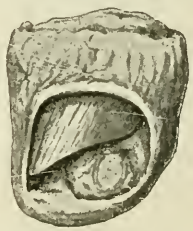
Syphilitic onychia is best treated with black or yellow wash, a weak solution of corrosive sublimate, by dusting with calomel, or by applying calomel ointment. Internal antisyphilitic measures are to be employed coincidently, and in strumous subjects constitutional treatment is also needed.

Paronychia, or whitlow, is an acute inflammation of the tissues around the matrix. It is generally of traumatic origin, and should be incised. In the milder forms the arm may be placed in a sling and the finger kept constantly wet with some weak antiseptic lotion, such as boric acid. Boric acid ointment may be used when the inflammation has subsided. Tonics, especially those containing quinin, are to be given internally. See Paronychia.

Ingrowing Nails.—Though occasionally on the fingers, ingrowing nails are most frequently found on the great toe, as the result of wearing tight boots and of cutting the nails square. A tight boot presses the skin over the sharp corner of the nail on each side, and ulceration ensues. There is lateral hypertrophy of the edge of the nail, or the soft tissues are forced over the margin of the nail. The pain caused by walking is often very severe.

Treatment.—In mild or trivial cases the trimming or clipping of the free margin of the nail, scraping of the dorsal surface with the edge of a bit of glass or with a knife, so as to reduce its thickness and to produce a tendency to curling upward or backward of its lateral margins, and the removal of any cuticle accumulated under the ingrowing edges of the nail are all that is required to give relief and prevent further progress. Pressure must be avoided. When ulceration has occurred, a minute roll of lint shreddings should be neatly packed beneath the tender overhanging skin and

Subungual Exostosis of the Great Toe.—(*Spencer and Gask.*)



The End of a Great Toe to Show the Characteristic Appearance of a Subungual Exostosis.—(*Spencer and Gask.*)

ingrowing edge. Strapping is then so applied as to retain the lint and drag upon the overhanging integument and keep it pulled away from contact with the ingrowing edge. The lint may be removed in a few days and the space filled with boric acid, iodoform, lead nitrate, alum, or zinc oxid. Exuberant granulations may be destroyed by silver nitrate, copper sulphate, perchlorid of iron, or pure carbolic acid. Repeated applications may destroy the sharp ingrowing edge of the nail.

Under local anesthesia the nail may be split, the offending portion removed, together with the soft tissue and the adjacent matrix, and the

wound antiseptically dressed. A somewhat popular operation is to remove a V-shaped piece of the side of the toe in which the nail is ingrown, including in the V the section of offending nail. The cut surfaces are drawn together with sutures, and the wound is dressed antiseptically.

Subungual exostosis forms a painful swelling which raises the middle while the two sides of the nail are unaltered. It generally affects the great toe. Complete removal of the ungual phalanx with the nail and nail-bed is the only satisfactory measure, the plantar surface being turned over as a flap.

NAPHTHALENE, Naphtalin. $C_{10}H_8$.—A hydrocarbon obtained from coal-tar, formed during the manufacture of ordinary coal gas. Chemically, it is one of the benzene derivatives. When redistilled, it crystallizes in colorless, rhomboid plates, of slightly tarry but strong odor, and burning, aromatic taste; insoluble in water, soluble in 15 of alcohol, very soluble in boiling alcohol, ether, chloroform, carbon disulphid, and fixed or volatile oils. It is seen frequently in the form of moulded blocks, under such names as *alabastrin* and *camphylen*, for preserving furs and flannels from moths, and for disinfecting urinals. Dose, 1 to 3 grains, in emulsion, or as a powder with sugar in wafers or capsules.

Naphthalene is employed as an antiseptic for the intestinal canal in typhoid fever, diarrhea, both acute and chronic, tuberculous diarrhea, and dysentery. It renders the urine aseptic and may be employed in vesical catarrh. It is used internally for bronchial asthma, verminous affections, the chronic pulmonary catarrh of the aged, and chronic bronchitis with copious secretion. It is said to be effective as a teniacide, also as a vermifuge for seat-worms given by injection, 15 to 30 grains in 3 ounces of olive oil. Burned in the patient's room it has given excellent results in pertussis, giving force to the belief that the well-known benefit resulting from taking children to gas-works for whooping-cough is due to the naphthalene fumes rather that to those of the gas-tar. Locally, naphthalene has high value as an antiseptic for indolent ulcers, sloughing wounds, open cancers, and pus cavities. Painted over organic remains it effectually prevents the ravages of insects, and has largely supplanted camphor for protecting woolen clothing from moths.

NAPHTHOL (Beta-Naphthol).—A phenol occurring in coal-tar, but usually prepared from naphthalene. It is one of several naphthols, and occurs in colorless, shining, crystalline laminæ, or a whitish, crystalline powder, of faint, phenol-like odor, and sharp taste. Soluble in 3/4 of alcohol, in about 1000 of water, and in 75 of boiling water; very soluble in boiling alcohol, ether, chloroform, olive oil, and petrolatum. Used as ointment, 1 to 5 for adults, but for children it should not be over 2 percent strength. Dose, 3 to 6 grains in cachet or pill.

Beta-naphthol is used in the form of a 2 percent soap in prurigo, herpes, ichthyosis and favus, also in a 1/2 to 5 percent alcoholic solution, or as a 10 percent ointment, for hyperidrosis, scabies, and eczema, but it is a dangerous and irritant application. Internally it has been employed in typhoid fever, dilatation of the stomach, intestinal dyspepsia, diarrhea and dysentery. Its germicidal rank is probably second to many other agents, but it is an efficient internal antiseptic, being practically nontoxic in medicinal doses. Dose, 3 to 6 grains.

NARCOPHIN.—A double salt, being the meconate of morphin and of narcotin. It is mainly used in connection with Twilight Sleep, *q.v.*

NARCOTICS.—See Hypnotics; Lambert Treatment for Narcotic Addiction; Antinarcotic Legislation.

NARCOTIN.—An alkaloid of opium, said to be sudorific and antipyretic, but it has no narcotic or hypnotic effects. Dose, 1 to 2 grains. See Opium.

NARGOL.—A compound of silver and nucleinic acid, containing 10 percent of silver, used in 1 to 5 or 10 percent solutions. It is more stable than protargol and less irritant in solutions of equal strength.

NASAL BONES.—See Nose (Injuries).

NASAL DISEASE.—See Nose (Caries); Rhinitis.

NAUHEIM TREATMENT.—See Heart-disease, Organic.

NAUSEA OF PREGNANCY.—See Pregnancy (Diagnosis, Pernicious Vomiting).

NAVEL.—An oval fossa of variable depth on the median line of the anterior abdominal wall. The cicatricial eminence at its bottom indicates the place where the umbilical cord was detached. See Umbilical Cord.

NEAR-SIGHTEDNESS.—See Myopia.

NECK, INJURIES.—**Burns** are particularly serious on account of the swelling and the edema of the larynx which may complicate them. Even when no deeper than the skin, they result in cicatrices which are most deplorable because of the appearance of the parts and because of the deviations they cause, sometimes binding the chin down to the sternum; for this reason they should be grafted at the earliest possible time. Deep burns extending to the muscles and to the vessels are most serious, even when limited, for obvious reasons. The cicatrices pass into keloids more often than in other regions.

Contusions are not frequent; they are usually produced by falls, blows, hanging, garrotting, throttling, the passage of a wheel over the neck, or by the pressure of the dislocated clavicle. A blow on the side of the neck is a great aim with pugilists, because it is almost a sure knock-down or knock-out; it is often grave in its results, because of the importance of the organs of the neck, and may be accompanied by fractures of the hyoid bone, larynx, and trachea, injuries to muscles, vessels, nerves, pharynx, esophagus, vertebral lesions, concussions, and contusions of the spinal cord; hematoma may form and become large and cause grave pressure-symptoms on all the structures. Death may occur after a few days from edema of the lungs; also from embolism from one of the large vessels of the neck.

Wounds of the neck are comparatively rare in civil practice; sometimes they are accidental and due to a fall on a fragment of glass, a stem of iron or wood; they are most commonly due to attempts at murder or suicide. Suicidal wounds are the

most common and the most interesting. The wounds are penetrating or nonpenetrating according to whether or not they reach the trachea, or the esophagus, or the vessels. **Superficial** or **extrafascial wounds** of the neck—*i. e.*, wounds not extending beyond the superficial cervical fascia—present nothing peculiar. However, a large **incised wound** of the external or anterior jugular, especially if these veins happen to be unusually large, may give entrance to air. In tracheotomy the anterior jugular and the inferior thyroid veins are often wounded. If the parallelism of the lips of the wound has been disturbed, there may be much infiltration of blood; this requires enlargement of the incision and ligation, in preference to pressure; cellulitis spreads rapidly.

Gunshot wounds are rare, yet there are instances when a bullet has traveled under the skin and above the fascia without penetration of the fascia. **Contused** and **lacerated wounds**, if extensive, may be followed by cicatrices and their consequences. **Gunpowder stains** should receive as careful attention as those of the face, especially if in the exposed parts of the neck. Gunshot wounds causing much destruction of skin present the same remarks as the lacerated wounds.

Deep or **subfascial wounds**—that is, wounds extending beyond the cervical fascia, and more or less deeply—are almost all very serious because of the almost invariable injury of some of the large vessels and nerves, or of the special organs of the neck, larynx, trachea, pharynx, and thyroid body, giving passages to air, food, and blood, each of which calls for special treatment.

Complications of the wounds of the neck are the following: Thrombus or extravasation of blood, due to the loss of parallelism of the lips of the wound through the various layers; entrance of air into the veins, more frequent and dangerous here than anywhere else; passage of food through the wound and into the larynx or trachea; hemorrhage, more or less profuse, according to the vessel injured and its accessibility; emphysema, due to injury of some point of the respiratory tract with a gravity greater than in any other region on account of the involvement of the arytenoepiglottic folds and the consequent obstruction of the larynx; aphonia from injury to the vocal cords or to the nerves; emphysema, edema, penetration of blood in larynx, or injury of the pneumogastric or laryngeal nerves; dyspnea due to the same cause, plus injury to the phrenic; dysphagia, due to swelling or pain; erysipelas is a frequent complication, as is pyemia or sepsis; edema of the glottis is very common; spasmodic croup, due to pressure or to nerve injury, is not rare; concussion of the cervical column communicated to the spinal cord, to the pneumogastric, phrenic, cervical plexus, and brachial plexus has been observed in severe wounds.

The symptoms of entrance of air into the veins are a wind-sucking or gurgling sound, immediate pallor of the face, dilatation of the pupil, irregular or tumultuous action of the heart, embarrassed breathing, and death. The wound should be plugged at once with the finger, and all the usual means of resuscitation vigorously and persistently applied. The amount of air introduced is a grave factor. If the wound is small, the operation may be continued by keeping the wound constantly filled with warm sterilized water.

The sequels of the wounds of the neck are: permanent aphonia or dyspnea or dysphagia, necrosis of the cartilages and of the hyoid bone; torticollis due to contraction of cicatrix, to inflammatory adhesions of the muscles, or to nerve injury; fistulous tracts; granulations obstructing the respiratory tract.

Deep punctured wounds striking the large vessels are those which are most commonly followed by deep and extensive extravasation and traumatic aneurysms; they call for the ligation of the two ends of the wounded vessels; it is here that a proximal loop ligature of the main trunk, low down when practicable, will be of the greatest assistance in controlling the hemorrhage during the search for the bleeding ends. They are also more commonly followed by emphysema than the incised wounds. When they involve a nerve, they may cause tetanus or spasmodic croup. **Deep incised wounds** are often rapidly fatal from the extensive hemorrhage, because it is rare that some artery or vein has not been opened; the same remarks apply here as applied to their treatment. **Deep contused and lacerated wounds** present here no special peculiari ies not covered by the foregoing descriptions and the description of these wounds in general.

Gunshot wounds usually cause much hemorrhage; they sometimes recover most unexpectedly; of course, their gravity varies with the injuries inflicted. When the ball is deeply seated, no dissection should be made to extract it until later, if it produces disturbance. See Gunshot Wounds.

Poisoned wounds—*i. e.*, bites, stings—are more frequent on the neck, on account of its exposed condition; also more grave, because no clothing has potected the parts; also because they are usually followed by great swelling, which, reaching the arytenoepiglottic folds, causes obstruction of the larynx. Bites of a rabid animal are more serious, because they have a shorter distance to travel to reach the central organs of innervation, and because no clothing has wiped the animal's teeth.

Foreign bodies in wounds of the neck are common—wadding, pieces of clothing, piece of the weapon or bullet, etc.

Fractures of the neck are rare. See Spine.

Dislocations and **sprains** are the result of injuries in which the head is much stretched, most commonly and especially when violently striking first upon the vertex; they give rise to great pain, particularly when the head is thrown backward. The treatment consists in thorough rest of the part by lying on a bed or by applying a liquid glass bandage.

In all injuries of the neck causing obstruction to the free circulation of the air, from whatever cause, there are great dyspnea, cyanosis, anxiety, rapid pulse, aphonia, dysphagia, and pain. Tracheotomy should be performed in such cases, and it is often advisable to operate before urgent symptoms present themselves, for death may come on

rapidly or suddenly before the patient can be reached.

Peculiarities of the Injuries of the Infrahyoid Region

Burns and the **effects of cold** are only peculiar in the possibility of being followed by cicatrices which bind the neck and chin down to the sternum in a very peculiar manner.

Contusions.—On account of the presence of the larynx and trachea, they may be followed by great concussion effects altogether out of proportion to the severity of the blow. Contusion of the thyroid cartilage by a blow upon and close to it may cause death without any appearance of a lesion. Contusions may cause rupture of the larynx and trachea. In hanging the compression very often bears upon the base of the tongue, and the larynx, with its vessels and nerves, is not injured. In strangulation when the traumatism is applied upon the larynx and the trachea, which may be torn by the fingers and the rope, all the structures are more or less torn. In some cases lesions of the skin of the neck, of the trachea, and of the larynx may cause inhibition of the heart, of the respiratory organs, and of the brain.

It is especially in case of traumatism of the anterior region of the neck that a complete loss of consciousness and a respiratory and cardiac syncope are observed. This takes place in cases of death through incomplete hanging, which does not prevent the passage of air through the respiratory passages. In such cases the red blood of the arteries continues red in the veins, whereas in death by true asphyxia the blood becomes rapidly black in the arteries.

Accidental wounds are rare; the most frequent are punctured wounds, resulting from a fall on a sharp body.

Homicidal wounds are not so rare; they are usually incised wounds, and a cutting instrument is used by the criminal to make believe they are self-inflicted or accidental.

Suicidal wounds are the most frequent; they are seldom punctured; they are usually incised wounds; they are most frequent at the point of the thyrohyoid ligament or below it; they are lacerated, jagged, deeper on the left side; they are usually directed from left to right, and obliquely downward or transversely across the neck; the large vessels are seldom injured. Usually the suicide, throwing his head back, cuts too high; the trachea and the rigidity of the sternomastoid protect the vessels. If the head is bent too much, the larynx, the trachea, and the sternomastoid also protect the vessels. There is usually a single gash. These wounds are more commonly fatal than the other wounds, because the victims are usually intoxicated or are laboring under delirium tremens or insanity. These patients should be watched closely, as they often tear away their dressings and die of hemorrhage. These wounds sometimes present much hemorrhage, although none of the larger vessels are hurt, except the anterior jugular vein; there are cases on record where air has penetrated into it and to the heart, causing death. The edges of these wounds are often much separated, and have a tendency to roll in on account of the action of the fibers of the platysma; coaptation, therefore, needs more care.

Lacerated wounds are very rare.

Gunshot wounds are also rare. Balls may traverse the neck without wounding any important structures, because the tissues are round in form, elastic, and movable.

Bites by dogs are comparatively common; the anterior region of the neck is the favorite aim of dogs, especially the bulldog; they cause all the lesions of strangulation and of incised wounds.

Nonpenetrating wounds—*i. e.*, not involving the larynx, pharynx, esophagus, or recurrent nerves—are not peculiarly serious and should be treated as elsewhere, taking care to secure the divided vessels, etc.

Punctured wounds, especially in duels, may penetrate into the mouth, pharynx, esophagus, larynx, or trachea; it is important to look for such penetrations, and to keep the parts as thoroughly disinfected as possible, because there is often risk of infection of the wound from within. The landmarks are the hyoid bone, the thyroid and cricoid cartilages. The laryngoscope should be used.

Penetrating wounds, due to any cause involving the respiratory or digestive tract and the recurrent nerve, are, of course, severe.

Penetrating wounds above the larynx are less dangerous than those of the larynx and those below it; the lower the wounds, the more dangerous they are.

Wounds through the thyrohyoid membrane penetrate into the pharynx, injure the epiglottis, the arytenoepiglottic folds, the cartilages, and the vocal cords; they are less dangerous than below because they allow feeding; they are more liable to suppuration.

Wounds of the larynx are comparatively frequent because of its prominence; they are usually very dangerous, and may be diagnosed by the rushing sound of the air passing through. They should be treated like those of the trachea.

Wounds of the trachea are commonly followed by severe hemorrhage, because of the large vessels around it, which may also have been wounded by the same cause. When the severance is incomplete, there is slight gaping; when the section is complete, the lower end is drawn in deep at each effort of respiration, and the soft parts cover up the orifice, causing suffocation. In all cases keep the blood and foreign substances out of the respiratory tract until hemorrhage is checked. Rose's position may be of assistance.

In **incomplete wounds** there is slight gaping, and the wound should not be stitched; the head should be flexed on the chest and fixed in that position by a liquid-glass bandage.

In **complete wounds,** when longitudinal, there is little gaping. In complete transverse wounds the retracted lower end should be searched for and a strong thread passed deeply through it; an attempt at stitching should be made; if it fails, a tracheotomy tube should be placed in it and it should be longer than the ordinary one, because the swelling

may lift it out of the trachea; the head should also be kept flexed; a moist cloth should be placed over the tube; the room should be warm—at about 70° —and a vessel with boiling water should keep the atmosphere moist, to avoid bronchitis and pneumonia. Later, we should be mindful of the exuberant granulations which may obliterate the canal.

The sequels of wounds of the air-passages are permanent contractions of these passages, aphonia, fistulous orifices, entire occlusion of larynx, the air passing through the external wound. Fistulæ are hard to cure.

Wounds of the pharynx and esophagus are usually through the side of the neck, by balls, knives, etc.; they cause much pain, spasms, hiccup, dysphagia, and more or less suffocation; there is escape of food through the wound, if this is of a certain size; the thirst is great. The patient should be fed by enema; if the use of the esophageal tube becomes necessary, from insufficiency of the rectal alimentation, it should not be left in place, but introduced each time. In incised wounds stitch immediately; in lacerated wounds let the wound granulate.

Rupture of the esophagus from contusions is rare; the special symptom is hematemesis. When the diagnosis is sure, cut down upon the injured spot along the anterior edge of the sternomastoid; stitch the wound if possible; if not, pack and let it granulate.

The immediate dangers of wounds of the anterior region of the neck are death from hemorrhage—although the hemorrhage stops from syncope, it may start again later—from asphyxia, due to the tongue or epiglottis or a piece of cartilage obstructing the passage, or to blood and clots in the larynx and trachea; from penetration of air in the veins. Penetration of the respiratory tract is recognized by cough, blood expectoration, hissing or boiling sound.

The secondary dangers are inflammation of the larynx, edema of the glottis, bronchitis, pneumonia, abscess and purulent dissections, emphysema, aphonia, more or less complete, and dysphagia; secondary hemorrhages are common and serious complications. In all injuries with solution of continuity of the mucous membrane the most frequent source of death may be mediastinal emphysema and inhalation pneumonia.

Wounds of the neck parallel to the longitudinal fibers of the muscles are more likely to be followed by emphysema. The remote effects and sequels may be exuberant granulations causing dyspnea; cicatrization, producing strictures of the larynx, trachea, and esophagus; persistent fistula; paralysis due to inflammatory thickening, which may disappear later, or to injury of recurrent nerves or the pressure of a bullet. All these complications should be treated here as elsewhere.

Dislocation of the hyoid bone is very rare. The is one case (Gibb) in which the dislocation was muscular; it was accompanied by a peculiar click on the left side of the neck and a sensation of choking; examination showed displacement of the left horn of the hyoid bone; reduction was effected by throwing the head backward toward the right side, so as to stretch the muscles of the neck, and then suddenly depressing the lower jaw, thus bringing the depressors of the hyoid bone into action.

All the following fractures are usually due to violent contusions:

Fracture of the hyoid bone is rare, but it is well known; the site is usually the great horn, near the body; it may be unilateral or bilateral; it is characterized more or less by hoarseness and dysphagia, according as it is without or with displacement and without or with deformity; accompanied by more severe symptoms, especially when swallowing fluids, which pass into the larynx because of the imperfect action of the epiglottis; it is reduced by using the fingers inside the oral cavity.

Fractures of the larynx are less rare than fractures of the hyoid bone; they are due to great violence; they are usually accompanied by much pain and suffocation, often calling for immediate reduction or for tracheotomy. Each cartilage may be fractured by itself; the thyroid is most frequently the site; fractures without displacement are not so grave. Fracture of the thyroid cartilage is more common in old people, because of the ossification of the cartilage. Fracture of the cricoid is more dangerous than the others, perhaps because of its small size, which causes slight displacements to be followed by serious obstruction.

Fractures or subcutaneous ruptures of the trachea without actual wound have been observed after great traumatism; they are less frequent than the others; they present the same symptoms and indications as the fractures of the larynx, but the lesions are lower down. The trachea should be opened below the fracture, and a long tracheotomy tube be introduced; when the fracture is low down, the lower end should be hooked, raised, and sutured to the skin or upper fragment.

Spontaneous ruptures of the trachea due to violent efforts are admitted by some. All these fractures are more serious if accompanied by displacement which obstructs the air-passages. The symptoms are those of obstruction and shock, in addition to those of fractures in general; crepitation, abnormal immobility, and also aphonia, dysphagia, and emphysema. The fragments should be replaced by external and internal manipulations; if necessary, the parts should be incised and the fragments stitched. Tracheotomy is often indicated; it is well to perform the operation before grave symptoms develop, because these sometimes come on so suddenly that the patient may succumb before operation is possible. See LARYNGOTOMY, TRACHEOTOMY.

Peculiarities of the Injuries of the Thyroid Body

Burns and **freezing** are only observed in cases of great and deep destruction of the neck.

Contusions are most common in all cases of much violence to the neck— as has been described —coexisting or not with fractures of the hyoid bone, larynx, and trachea. The peculiar features they present are symptoms of cerebral congestion, and also the fact that they may be followed by myxedema.

Wounds of the thyroid body are likely to be

serious on account of the great vascularity of the organ and its friability; the bleeding is usually great, especially if breathing is obstructed or laborious.

Punctured wounds are rare in the normal thyroid body, but are comparatively frequent in the hypertrophied organ or goiter, and, if deep, give rise to serious hemorrhages.

Incised wounds are usually suicidal; those of the upper angles are the most frequent and the most serious, because of the presence of the superior thyroid artery; in goiters they suppurate, as a rule, and usually run a benign course.

Lacerated wounds are not ordinarily followed by primary hemorrhage, but may present serious secondary hemorrhage.

Gunshot wounds call for the same remarks; the thyroid gland has been carried away by a missile. Treatment of hemorrhage is difficult because of the friability which will not allow a ligature to hold tight enough to arrest the bleeding with safety against secondary hemorrhage. The same remarks apply to the forceps left *in situ*. Deep suturing succeeds best, or a chain ligature or a purse-string ligature. A pin or needle suture, such as is used for harelip, sometimes succeeds; pressure is not borne; it is useless to ligate the nearest trunk because the other vessels will keep up the hemorrhage; when the bleeding is serious, tracheotomy, if practicable, sometimes stops the hemorrhage by relieving its congestion; in spite of all, death is sometimes the result of hemorrhage.

As regards **foreign bodies in wounds**, there is not a case on record where a bullet was found buried in a normal thyroid body. Poisoned wounds, bites, and stings are rare, except in conjunction with such in the infrahyoid region.

Peculiarities of the Injuries of the Suprahyoid or Submental Region

Burns are of peculiar importance, because the resulting cicatrices may draw the skin of the chin and of the lower lip, causing eversion of the lips and its consequences.

Contusions in this region are rare, because of the protection of the chin. In hanging the compression may often bear on the base of the tongue; the vessels, nerves, and larynx are uninjured.

Wounds of the suprahyoid region are very seldom homicidal, but almost always suicidal. **Penetrating wounds** only are of importance; punctured wounds are very rare; they are only observed in the cases of "hooking" of the chin. **Incised wounds**, when transverse, usually gape a great deal, but very little when longitudinal; usually the suicide, throwing his head back, cuts higher than he intends in the suprahyoid region, so that the borders of the stretched sternomastoid protect the vessels. The penetrating wounds open the cavity of the mouth, injure the tongue and epiglottis; there may be suffocation due to the blood or other foreign substances, or to the tongue or epiglottis falling back and occluding the larynx; there is usually much hemorrhage from the wounding of the lingual artery. More than in all injuries of the neck swelling and edema of the arytenoepiglottic folds, which are directly injured, are here met. The gaping is especially great when the head is thrown back; the saliva and food pass out of it during deglutition. Wounds of the epiglottis cause much suffocation, difficulty of speech, of deglutition, and coughing; thirst is a common symptom. **Lacerated wounds** have been observed in several cases of "hooking" of the chin.

Gunshot wounds seldom penetrate posteriorly, because the head, being usually thrown back, the revolver is naturally directed upward and rests under the chin, which is usually carried away by the shot.

Poisoned wounds, bites and stings present nothing peculiar. Foreign bodies in the wound are alimentary matter. The shock is as great as in all injuries to the air-passages, on account of the dyspnea and aphonia and dysphagia.

Peculiarities of the Injuries of the Submaxillary Region (Lateral Suprahyoid or Digastric Triangle)

These injuries present some peculiar interest because they may injure the facial or the lingual artery, or the hypoglossal nerve, and also because they may penetrate into the mouth. In regard to the diseases of the deep parts, it is well to state here at the outset, and to bear in mind, that the overlying lymphatic glands are more often affected than the tissue of the submaxillary salivary gland itself, and that practically it is immaterial which is involved.

Peculiarities of the Injuries of the Parotid Region.

Wounds.—Injuries of the parotid region are rare; they are grave, on account of cicatricial disfigurements and injuries to the facial nerve and to Steno's duct. **Punctured superficial wounds** are of no consequence, nor are the deeper wounds, unless the instrument is large and the great vessels are injured. **Incised superficial wounds** may injure the facial nerve and the duct, and may be followed by paralysis; when large, the divided nerve and duct should be at once stitched. Incised deep wounds are most serious. The diagnosis of the penetration of the gland rests upon the escape of saliva. When the wound is narrow, the hemorrhage and, later, the suppuration prevent the diagnosis; if the pus is very liquid, it is probable the gland is seriously injured. To prevent fistulæ stitch tightly and keep the jaw at rest. **Deep wounds** are more serious, because of the presence of the temporomaxillary vein, which becomes the external jugular; also of the other deep vessels. The bleeding is profuse and sometimes appalling; it should be at once stopped by plugging; then a provisional loop ligature should be applied on the common carotid close to the bifurcation; the bleeding points should then be ligated. If this fails, the source of the hemorrhage should be carefully determined. If it is the external carotid, ligate it; if the internal carotid, ligate it separately or ligate the common carotid at the bifurcation to prevent the return through the collateral circulation. If the jugular vein is injured, ligate

it as high up as possible, at least above the facial and lingual, or ligate there. After the ligation or ligations have been done, the accidental wound should be packed tightly with bits of aseptic sponges to prevent hemorrhage by the distal end of the vessels. This plugging will usually accomplish this, but plugging should never be relied upon if the trunk has not been ligated. The hemorrhage is almost sure to recur, and often the patient thus loses so much blood that when the ligations are at last performed, he succumbs to hemorrhagic anemia. When the hemorrhages are unmistakably venous, the thorough systematic sponge-plugging may suffice, even in wounds of the internal jugular. **Contused and lacerated wounds** call for the same remarks, but it must be remembered that although the primary hemorrhage may not be copious, the secondary hemorrhages are most to be dreaded, and proper instruction in consequence must be given.

Gunshot wounds suggest the same remarks with the aggravation of the presence of the ball in the deeper structures, in the pharynx, in the bones, or in the brain.

Poisoned wounds present nothing peculiar.

Peculiarities of the Injuries of the Lateral Region of the Neck (Region of the Sternomastoid or of the Carotid)

Burns or **frost-bites** present no peculiarity in the region of the sternomastoid, except when deep and reaching the sternomastoid or the underlying vessels and nerves.

Contusions or **blows** on the neck are always severe, but when striking the side of the neck over the jugular they are particularly severe, and are comparatively frequent. They may cause a hematoma in the sheath of the muscle; they may cause paralysis or contracture of the muscle, producing a variety of torticollis; the muscle is sometimes ruptured, also the vessels and the nerves, these have a train of symptoms which will be described further on.

Nonpenetrating wounds—*i. e.*, not extending deeper than the muscles and glands—are not serious unless through infection.

Penetrating punctured wounds of the neck may be deep without injuring the vessels and nerves, owing to the elasticity and mobility of the jugulocarotid vessels. Penetrating wounds of the external jugular, of the internal jugular, and the carotid arteries are more serious injuries. They all may give rise to circumscribed or diffused hematoma. When this is of some size and stationary, it must be aspirated or incised. When it pulsates and grows, it is because a traumatic aneurysm has formed, and the wounded vessel, vein, or artery must be ligated above and below the injured point. When the penetration is comparatively small, the sac may be incised at once, after making as good a pressure above and below as possible. When the puncture is large, and there is risk of the patient bleeding much before the proper ligatures are secured, a provisional loop ligature must be applied below the wounded point. When the wound or swelling is very low down, enough of the sternum must be resected to reach the root of the carotid and the innominate, and the provisional loop ligature applied there. Considering the gravity of a possible terrific hemorrhage, this advice is not too heroic. Never ligate the common or the internal carotid unless it is the wounded artery, because of the possible effects on the cerebral circulation. It is only when the persistent search for the wounded point of the vessel has not succeeded that the vessel itself should be ligated in continuity; below only, if possible. A ligature above, whenever applicable, should be applied to guard against recurrent distal hemorrhage. We must bear in mind that arteriovenous aneurysm often follows punctured wounds which have gone through the vein and the artery. Wounds of the vertebral artery in this part of the neck are more common in the canal of the transverse process. At the base of the neck wounds of the vertebral artery are more grave than those of the carotid.

The diagnosis of this wound will be made only when, upon cutting down through the extravasated blood, it is found that the carotid artery and the jugular vein are intact. When the hemorrhage is profuse, it should be stopped by plugging with the finger or by packing, and a loop ligature should be applied on the subclavian or the innominate before proceeding further; when the wound in the vertebral artery is located, it should be tied above and below; if necessary, the transverse process should be cut away with the bone-nippers. These remarks apply also to the wounds of the deep cervical, the inferior thyroid, the superior thyroid, the lingual, and the pharyngeal arteries.

Punctured penetrating wounds of the base of the neck are almost all fatal, on account of the impossibility of reaching the artery without fatal hemorrhage. Punctured wounds of the nerves of the region (recurrent, phrenic, pneumogastric, sympathetic, spinal accessory, cervical plexus) give rise to the symptoms of irritation of the nerves.

Nonpenetrating incised wounds are only serious if the external jugular vein has been injured, because air may then penetrate into the veins. When the edges of the wounds lose their parallelism, these may form a considerable hematoma. Incised wounds penetrating the sternomastoid and severing it incompletely are not so very serious.

Wounds dividing the sternomastoid muscle may result in curtailing power of the muscle from lengthening, due to the cicatrization. When the muscle has been completely severed and the head is still, it is sometimes brusquely thrown to the other side by the contraction of the intact sternomastoid. In case of division of the muscle from operation this does not take place, because the other muscles have gradually become accustomed, by the presence of the tumor, to keep the head properly balanced. The several ends must be strongly and closely stitched with strong catgut, and the head kept in proper position by a liquid-glass bandage.

Incised penetrating wounds of the internal jugular are perhaps more serious than the wounds of the carotid, because of the danger of penetration of

air. When the respiration becomes embarrassed, the hemorrhage increases, just as in tracheotomy, where, as soon as the tube is introduced, the hemorrhage ceases. These wounds are often due to tearing during the removal of tumors. Whatever be the cause, if the vein alone is wounded, the blood is black and flows continuously. The first thing to do is to plug the opening, to prevent the penetration of air; next make pressure above and below with the fingers, enlarge the wound, and fill it with boiled water to prevent the possible penetration of air; then look for the wounded vein and ligate both ends. The proximal end is the most dangerous, because of the penetration of air and of the abundance of blood coming from the heart. When the compressing fingers are in the way or if their pressure is ineffectual, a provisional loop ligature should be placed around the internal jugular until the wounded ends are ligated. When the wound is low down, it may be necessary to resect the sternum and place a provisional ligature around the innominate vein or the superior cava. Incised wounds of the superior thyroid, lingual, and facial veins close to the internal jugular are almost as severe.

Incised penetrating wounds of the carotids give rise to profuse, even terrific, hemorrhage. When the wound is large, or when the hemorrhage is moderate but does not receive prompt attention, it may be immediately fatal. Death from hemorrhage from the carotid will thus ensue in 4 minutes, it is said. When the larynx or trachea is wounded, the blood penetrating into them causes death also from suffocation. The hemorrhage is sometimes stopped by fainting, if the wound is not too large. Upon reaching such a case, the first thing to be done is to plug the wound with the fingers or to pack it quickly. Packing will stop the hemorrhage temporarily if the vessel is of any size above 1/16 of an inch. It is best and safest to enlarge the wound and attempt to ligate the two ends in the wound; if this causes too much bleeding, a loop ligature must be applied as described. If the bleeding has stopped of itself, it must be borne in mind that it will almost surely return, and that it may do so when proper surgical assistance cannot be procured, and the patient may bleed to death; therefore, the case should be treated as described for punctured wounds. Incised penetrating wounds of the root of the neck are almost all fatal on the spot. The same remarks as above apply here. It is sometimes difficult to recognize which vessel of the neck has been divided; spurting, however, is characteristic of arterial lesion, but the vein may be divided at the same time. When the vein and artery are simultaneously wounded, ligate the ends of both. In all cases when clamping stops the bleeding and a ligature cannot well be substituted, the clamp should be left in place 36 to 48 hours.

Punctured wounds of the nerves of the region (recurrent, phrenic, pneumogastric, sympathetic, spinal accessory, cervical plexus) give rise to the symptoms of the irritation of those nerves. Incised wounds of the nerves of the region (recurrent, phrenic, pneumogastric, sympathetic, spinal accessory, cervical plexus) are followed by the following symptoms:

When the recurrent is wounded, there is aphasia, more or less complete. The section of the phrenic and pneumogastric on one side only is accompanied by respiratory and circulatory irregularities; they are not necessarily fatal, but it is a most serious complication. Park has shown that only about 50 percent of these cases are fatal. Complete wounds of the sympathetic are followed by atresia of the pupil, slight ptosis, congestion of the conjunctiva, headache, congestion of the side of the face (unless only stimulated). It produces mydriasis, pallor of face, and protrusion of eyeball. Injury of the superior laryngeal nerve is sometimes very serious. When possible, the divided ends must be sutured with fine silk.

Penetrating or deep contused and lacerated wounds of the region do not expose so much to primary hemorrhage, but the suturing of the muscles, the ligation of the vessels, and the stitching of the nerves cannot be relied upon as safe, because of the sloughing that usually follows those wounds; for the same reason secondary hemorrhages are much more common and more grave. Penetrating or deep gunshot wounds of the region call for the same treatment, and, in addition, the frequent penetration of the digestive and respiratory tracts and spinal canal with their possible complications; the presence of a ball, or foreign bodies deeply lodged and unremovable in these wounds, injures the vessels more frequently and seriously than the deep punctured wounds. Here, less than anywhere else, should search be made for the bullet. When, however, the wound is larger, the finger may be introduced, and if the ball is felt, it should be removed.

Poisoned wounds, stings, bites, etc., present nothing peculiar in this region.

Foreign bodies, usually bullets, may remain embedded in the tissues without giving rise to any serious trouble; a bullet may thus remain in contact with the large vessels without causing disturbance, but not so with the nerves.

Rupture of the sternomastoid is more common than that of other muscles; it has taken place after falls, sudden twists, and violent muscular contractions. There are great pain, a depression on the course of the muscle, great hematoma; the head is often twisted by the action of the other muscle.

The treatment consists in placing the head in proper position, and immobilizing it in a liquid-glass bandage. The rupture is usually partial; when complete, the ends are far apart; it is well to cut down and stitch; otherwise a kind of torticollis may result from the lengthening of the muscle.

Peculiarities of the Injuries of the Supraclavicular Region

Burns or **frost-bites** are rare, as the region is usually well protected.

Contusions sometimes present hematomata so large as painfully to compress the branches of the brachial plexus. In fractures of the clavicle the brachial plexus may be injured.

Superficial punctured wounds may open the external jugular, the terminal part of the external and anterior jugulars and of the cephalic, but they are seldom serious unless infected. Punctured wounds of the subclavian vein and artery may also give rise to serious hematomata. When persistent, they should be aspirated or incised. We should bear in mind that hematoma may be due to a wound of the vein, and that the connection may still exist. This will surely be the case if, after aspiration, it fills up again. In case of incision the deeper clots should not be disturbed, so as not to open the wound in the vein in case that lesion has occurred.

Injury to the subclavian artery is recognized by the pulsations of the hematoma; it is then a traumatic aneurysm. The artery should be ligated. When the swelling is moderate, the ligation should be made in the supraclavicular region, using, if necessary, an aneurysmal needle with a detachable point. In the majority of cases this simple ligation will suffice to cure the aneurysm; if not, compression of the axillary or its ligation should also be done, then the sac incised, and the injured points ligated above and below. When on the right side, the artery can only be reached and encircled in its second portion after dividing the anterior scalene; no permanent ligature should be applied there; a provisional loop ligature should be placed, the sac incised, and the injured point of the third portion ligated permanently above and below. On the left side the ligation of the second portion can be made permanent at once, as it is as safe on this side as a permanent ligature is unsafe on the second portion of the right side. When the swelling is so great as to cause failure of the procedure outlined, or so as to discourage even the attempt, but only then, a provisional ligature should be applied upon the first portion of the subclavian; the axillary should be compressed or treated in the same way; then the sac is incised and the two ends ligated. In some cases these ends cannot be found; packing with bits of aseptic sponges should then be resorted to, with compression over it. Should the hemorrhage return, the clavicle should be sawed through and the two ends secured. When the artery on the right side is wounded close to the scalene, so as to compel ligation of the second portion, this should be done with double catgut, without rupturing the coats, and with a bloodless space between the ligatures. On the left side the second portion can be ligated with safety after the old method, but the new method should be applied there also in preference. The permanent ligation of the first portion on either side should not be done unless it can be done thoroughly, with double catgut, without rupturing the coats, and with a bloodless space between. As this cannot be safely done, as a rule, without resecting the inner extremity of the clavicle and the corresponding part of the sternum, this should only be done when the ligation of the second portion cannot be performed satisfactorily as described. Arteriovenous aneurysm, due to punctured wounds of both the vein and artery simultaneously, should not be interfered with unless they grow or cause serious pressure-symptoms. Then both the artery and the veins should be ligated above and below, and the sac extirpated, unless too adherent to surrounding structures; if left in place, it should be incised, to diminish its pressure effects; sometimes these continue, although abated.

Punctured wounds of the nerves rarely cause paralysis, but may cause persistent pain, neuralgia, and trophic changes in the area of distribution. Punctured wounds of the lymphatic duct on the right, and of the thoracic duct on the left, may produce a chyloma, which should be treated as a venous hematoma; usually it is only then that it is recognized. Punctured wounds of the apex of the lungs may be followed by emphysema, at first limited and then generalized.

Superficial **incised wounds** are not serious unless infected. Bleeding from the external and anterior jugulars and of the cephalic is easily arrested; however, the wounding of these veins near their point of discharge into the subclavian may be followed by severe hemorrhage and by entrance of air into the veins.

Incised wounds of the third portion of the subclavian artery, when large, are followed by rapid death; when smaller, they often cause traumatic aneurysms; the treatment is the same as indicated for punctured penetrating wounds. Incised wounds of the subclavian vein are most serious because of the amount of bleeding, often causing rapid death, and also because of the quick penetration of air into the vein. The vein should be at once plugged with the finger, or, better, an aseptic packing; then an attempt should be made to enlarge the wounds and to clamp it, then ligate the two ends. When this is impossible, a provisional loop ligature should be applied on the first portion of the vein; also compression should be made on the axilla and the two ends ligated. The ligation of the proximal end is to secure against hemorrhage and also against the entrance of air. But the ligation also of the distal end is, of course, indispensable.

Incised wounds of the lymphatic duct on the right side and of the thoracic duct on the left are diagnosed by the oozing of the peculiar fluid these ducts contain. If possible, the distal end should be ligated, and this usually stops the flow, since there is a valve on the proximal end. There is seldom, if ever, any discharge from it. When ligation is impossible, compression will often suffice. It is very seldom that any further trouble is noticed, because there exist usually two or three branches, and the uninjured ones carry on the circulation. When this fails and a chyle fistula is established, the patient loses flesh and succumbs.

Incised wounds of the brachial plexus are followed by paralysis of the affected area; they should be stitched at once. The lesions, from whatever cause, may affect only one branch. Paralysis never affects the interior, anterior and posterior surfaces of the arm, because there are supplied by the anastomoses of the intercostal filaments with those of the internal brachial cutaneous. They must not be confounded with the anesthesia and paralysis resulting from contusions of the shoulder in hysteric subjects (hysterotraumatism). The

treatment is by electricity. If a callus includes a nerve, it must be resected.

Incised wounds of the phrenic nerve are most serious. However, when the nerve has been pressed upon by a tumor for some time, the wounding of it is not so dangerous. Incised wounds of the apex of the lungs are not so likely to be followed by emphysema as the punctured wounds.

Contused and lacerated wounds are much more serious than clean wounds, because of the impossibility of primary union, and because of greater liability to secondary hemorrhage. Gunshot wounds also are serious, for similar reasons.

Dislocations of the head of the clavicle are a frequent cause of serious contusion of the region.

Fractures of the clavicle sometimes cause wounds of the vein or of the artery or of the brachial plexus. Shock accompanying injuries in this region is sometimes very great, on account of the large nerves implicated.

Peculiarities of the Injuries of the Posterior Region of the Neck

Burns and **frost-bites** are only particularly important here because of the cicatrices which may follow, causing disfigurement in an exposed part. and also possibly causing deviations of the head, from retraction.

Contusions are more frequent than in front; they are particularly painful, because the muscles contused are those which keep the head in balance; they are often accompanied by fracture of the spinous processes and laminæ, contusion and concussion of the spinal cord and even of the brain.

Punctured wounds, nonpenetrating—*i. e.*, not penetrating the vertebral artery and the spinal cord—are simple wounds, and seldom give rise to any trouble. However, should they be large punctured wounds, and strike the deep cervical artery or the posterior jugular veins, they may give rise to serious hematoma. When this persists, it should be aspirated or incised. When it pulsates, it is a traumatic aneurysm of the said artery, and should be treated as such. Punctured wounds of the vertebral artery may give rise to an aneurysm also, which must be treated as such—that is, by ligating above or below, or both, when possible, and then incised. Much hemorrhage must be expected from the untied end, and the surgeon must plug tightly with a septic sponge and make firm pressure with a bandage.

Punctured wounds of the spinal canal through the interlaminar spaces, when the head is flexed forcibly, or through a fracture of the laminæ, are serious only if becoming infected. Incised wounds reaching the spinal cord itself are followed by paralysis of the parts below. If the wound is and remains uninfected, the cicatrization by primary union may take place and the paralysis disappear; if not, it will be permanent. If between the occipital and the atlas or axis the medulla oblongata is severed, death is instantaneous. Infanticide is often effected by a long needle or pin driven between the occiput and the vertebra. If the lesion is above the origin of the phrenic, death follows quickly by paralysis of the diaphragm. Incised wounds of muscles are usually due to sabre cuts; they may include almost all the muscles; they may reach the vertebræ, when the head drops forward; the hemorrhage is great. Incised wound of the vertebral artery give rise to profuse hemorrhage. The peculiarities of the treatment of these wounds are the need of prompt attention, the impossibility of ligating both ends of the artery if it has been wounded high up, the suturing of the large muscles, the difficulty of keeping the head steady, and to secure drainage. A liquid-glass bandage or a jury-mast apparatus will assist materially.

Wounds of the posterior region are said to be followed by sexual impotency when the membranes of the cord are involved; also by paresis and wasting of the lower extremities and of the testicles.

Larrey contends that these results may take place even when the cord is not affected.

Gunshot wounds are usually serious if they reach the membranes or the cord. When pressure-symptoms are present, very extensive and deliberate dissections must be done to remove the ball, the fragments of broken lamellæ, or clots or foreign bodies which cause the pressure. Foreign bodies causing pressure-symptoms on the cord must be removed at almost any cost.

Ruptures of the muscles of the nucha are reported in those who carry heavy loads on the head; the symptoms are those of other muscular ruptures. Ruptures of the attachments of the rhomboid and of the levator anguli scapulæ have been seen in farm-laborers. Shock accompanying injuries of the posterior region is usually great, being often complicated by concussion and contusion of the cord or of the cerebellum or of the whole brain.

NECROSIS.—The death of cells surrounded by living tissues. Necrosis proper refers to death in mass; necrobiosis, to death of individual cells. Among the causes of necrosis are (1) direct injury; (2) obstruction of the circulation; (3) loss of trophic influence. The varieties of necrosis are: (1) Coagulative necrosis; (2) liquefactive necrosis; (3) cheesy necrosis; (4) dry and moist gangrene. See GANGRENE. Necrosed tissues may be absorbed, retained, or thrown off. The dead tissue is called *sequestrum* in case of bone and *sphacelus* in case of soft parts. In surgery the term necrosis is often applied specifically to the death of bone. See BONE (Diseases).

NELAVAN.—See SLEEPING SICKNESS.

NEPHRECTOMY.—See KIDNEY (Surgery).

NEPHRITIS (Bright's Disease; Inflammation of the kidney).—Marvelously accurate as were Bright's descriptions of many of the forms of renal disease which have since received his name, it is clearly unreasonable to limit the name to the conditions literally described by him, since others, evidently a part of the same process, were not included in his descriptions, while other additions, in turn, had to be made to fill out these. Naturally, too, all are not agreed, even to-day, as to what should be included under the term. On the other hand, it would be futile to attempt to eliminate the

words "Bright's disease" from the nosology. Under the term will be considered: (1) *Acute parenchymatous* or *acute diffuse nephritis;* (2) *chronic parenchymatous* or *chronic diffuse nephritis,* with a second or indurated stage of the latter; and (3) *chronic interstitial nephritis.* The *amyloid* or waxy kidney is not, strictly speaking, a variety of Bright's disease. Amyloid disease of the kidney occurs in two forms—first, as a part of general amyloid disease, shared by the kidney in common with the liver, spleen, and other organs; and, second, as amyloid infiltration of certain portions of kidney previously invaded by inflammation. See URINE (Examination).

Acute Parenchymatous Nephritis

The peculiarity of this form of Bright's disease is that, in the majority of cases, the cells lining the uriniferous tubules are the primary seat of attack. As such, the cells enlarge, proliferate, and degenerate, choking up the tubules and interfering with the proper elimination of excrementitious matters usually separated from the blood by the kidneys.

Etiology.—Most cases of acute parenchymatous nephritis are caused by the infectious diseases, especially scarlet fever and diphtheria, though cold, and especially cold combined with moisture, is an acknowledged cause.

Symptoms.—The first symptom to attract attention is generally a puffiness about the face (see FACE IN DIAGNOSIS), which usually extends to the extremities and, in extreme cases, to the trunk, producing in a word, general anasarca. Thus, attention is attracted to the urine, which often appears "smoky" to the naked eye, an appearance due to the presence of small quantities of blood in acid urine. The same urine, if made alkaline, will exhibit a brighter red hue. It contains albumin, commonly in large amount, and the microscope shows numerous blood discs, also blood casts, epithelial casts, and free renal epithelium. This may be regarded as the distinctive sediment of acute nephritis. Hyaline casts, which are not characteristic of any form of renal disease, are also present. To these are soon added, in all cases of prolonged duration, dark granular casts and dark granular cells representing degenerated renal cells. Pus-cells and pus-casts are sometimes present.

The urine of acute Bright's disease is also scanty, of correspondingly high specific gravity, and disposed to deposit uric acid crystals and mixed urates when in the fresh state. At the beginning the specific gravity of the urine is high. Complete suppression of urine is not infrequent. Various degrees of inconvenience result from the dropsy. It may involve the penis and scrotum, invade the serous cavities, especially the pleuræ and peritoneum. Positive fever is seldom present; neither is severe pain in the kidney region, although it is more frequent in this than in any other form of Bright's disease. The pulse is moderately accelerated. Nausea and vomiting sometimes usher in the disease.

The serious danger of acute Bright's disease is uremia, a toxic condition due to retention of excrementitious substances, of which urea is the type. Uremia possesses its own symptomatology. Headache and drowsiness may be initial symptoms. At other times sudden vomiting is the first sign. Not infrequently epileptoid convulsions, without previous warning, are the earliest manifestations; at all times an alarming and dangerous symptom. The convulsions usually alternate with periods of drowsiness, though sometimes also with lucid intervals. The onset of convulsions is sometimes preceded by sudden blindness and amaurosis. Sometimes the pulse is abnormally slow. If the condition does not pass away, exhaustion supervenes, and Cheyne-Stokes breathing may be the final symptom. Rarer symptoms of actue nephritis are an intense itching of the skin; shortness of breath, due to edema of the lungs or a feeble dilated heart; delusional insanity as a part of the uremic symptomatology; and palsies, monoplegic or hemiplegic.

Complications and sequels of acute nephritis are not numerous. They include pleurisy, pneumonia, bronchitis, and pulmonary edema. Hypertrophy of the left ventricle is a possible, but very rare, result.

Diagnosis.—The diagnosis is easy. Dropsy, beginning in the face, albuminuria, blood discs, blood casts, and epthelial casts in the urine point unmistakably to acute Bright's disease.

ACUTE PARENCHYMATOUS NEPHRITIS.	CHRONIC PARENCHYMATOUS NEPHRITIS.	CHRONIC INTERSTITIAL NEPHRITIS.
1. Most common in children, from exposure or infectious fevers.	1. Later life; often the consequence of acute attack.	1. Later life; often results from alcoholism, gout, lead-poisoning.
2. Edema of lower eyelids; then of upper extremities, trunk, and, lastly, lower extremities.	2. In early stage same as acute form; later, dropsy may diminish.	2. Dropsy slight or entirely absent.
3. Urine scanty, dark or smoky color, high specific gravity, 1025 or over.	3. Urine normal or increased amount; specific gravity may fall to 1010; urine pale.	3. Urine greatly increased; specific gravity low, 1005; urine pale in color.
4. Large amount of albumin.	4. Late in attack, greatly diminished; occasionally absent.	4. Albumin greatly diminished, often absent.
4. Variety of casts, such as hyaline, blood, epithelial, and waxy casts, also free red blood globules, and epithelial cells.	5. Large and small granular casts; compound granule cells, and fatty epithelium.	5. Hyaline or finely granular casts, occasionally dark in color; infrequently blood casts and oil droplets.
6. Urea diminished.	6. Urea diminished.	6. Urea diminished.
7. Recoveries frequent.	7. Recoveries rare.	7. Indefinite duration, but never cured.

Prognosis.—This is usually favorable if treatment is promptly instituted. Sometimes the disease is overlooked for a time, when it is more intractable. In fatal cases uremic convulsions often end the scene.

Treatmen .—Many cases recover withou other

treatment than rest in bed, warmth, and milk diet. These are all essential to a successful treatment. In severe cases dry cups, followed by fomentations, should be applied to the loins. In all cases brisk purgation should be produced, especially by the salines, including bitartrate of potassium and compound jalap powder. Calomel and jalap are good preliminary purges. Action of the skin should be favored by sweet spirit of niter, neutral mixture, warm applications and warm baths, and, if necessary, by the vapor bath.

Having secured a free action of the bowels, digitalis, 5 to 20 minims of the tincture every 4 hours, is the best diuretic, but it may be substituted by the tincture of strophanthus in the same dose, or by spartein in 1/4 to 1/2 of a grain doses every 4 hours. When spartein cannot be obtained, broom tea may be used. It is an efficient but nauseous diuretic. Infusion of cream of tartar and juniper berries is at once a good diuretic and aperient, or the cream of tartar may be used alone, making a drink which is pleasant when cool.

Fisher's Alkaline Treatment of Acute Nephritis.—Prof. Martin H. Fisher premising that all the changes that characterize nephritis, viz., the albuminuria, the specific morphological changes noted in the kidneys, the associated production of casts, the qualitative variations in the dissolved solids are due to a common cause—the abnormal production or accumulation of acid in the cells of the kidney—concludes that the entire purpose of our therapy must be to get alkali into the patient to neutralize the acids present. To this end he recommends administration by the rectum of sodium bicarbonate crystallized, 20 grams, sodium chlorid, 14 grams, and water enough to make 1000 c.c. This is administered high up in the bowel by the drop (Murphy) method at the body temperature.

Should uremic convulsions supervene, the most prompt and energetic measures must be used. Immediate elimination should be secured by active purgation by croton oil or elaterium, vapor baths, and, if necessary, pilocarpin should be employed to promote sweating. Pilocarpin hydrochlorid should be given hypodermically in doses of 1/12 to 1/3 grain, according to the age of the patient. Its action should be favored by warm covering and hot applications. The convulsions should be controlled by chloroform or chloral.

Chronic Parenchymatous Nephritis

In this form of chronic Bright's disease, beside the tubal involvement, the interstitial tissue becomes infiltrated with cells, which are later di erentiated into fibroid tissue, resulting in more or less induration. The tubular involvement is still a conspicuous part of the process. The tubules are distended by proliferated and degenerated cells, which include fatty cells as well as cells less advanced in degeneration. Certain white specks are resolvable by the microscope into coils of fattily degenerated tubules. Its typical macroscopic product is the large white kidney. An indurated form sometimes results, which is regarded by some as a further stage of the large white kidney—stage of secondary contraction—but probably also occurs as a direct result of the diffuse nephritis.

It may be a continuation of the acute form, or it may originate *de novo*, or it may arise insidiously, more frequently, perhaps, favored by a vulnerability due to a previous acute parenchymatous nephritis.

The symptoms include edema in various degrees, which in an advanced stage of the disease equals that described in acute nephritis. Less advanced stages exhibit slighter degrees of dropsy, while in some cases there is no edema. In many cases there is no dropsy in the initial stage.

The urine is albuminous, and the quantity of albumin is variously large. The sediment ncludes hyaline casts, oil casts, dark granular casts, and casts containing fatty renal cells. In addition are found free fatty renal cells, granular fatty cells (compound granule cells). More rarely blood-corpuscles are present, and in a few instances there is more or less constantly present blood—constituting chronic hemorrhagic nephritis. See URINE (Examination).

There are few other distinctive symptoms. Edema is not always present. A peculiar waxy appearance of the skin often betrays the disease, with a yellowish tinge, as contrasted with the opaque white of the edema of acute Bright's disease. Cardiac symptoms are more frequent than in the acute form. Hence weakness and shortness of breath are often symptoms. The same complications are liable to occur as in the acute form. There are no symptoms by which the onset of the stage of secondary contraction may certainly be recognized. Long duration of the illness is presumptive evidence that contraction has set in, and when there is superadded hypertrophy of the left ventricle and accentuation of the aortic second sound, with polyuria and lowered specific gravity of the urine, its occurrence is rendered more likely.

The diagnosis is usually easy. High albuminuria, with dropsy and fatty casts, free fatty renal cells, and granular fatty cells point easily to chronic parenchymatous nephritis. There are, however, intermediate forms, when the albumin is less copious and the distinctive forms of casts are wanting, when the distinction between chronic parenchymatous nephritis and chronic interstitial nephritis only becomes possible by prolonged study of the case.

Amyloid degeneration often invades chronic nephritis, but no additions are made to the symptoms by which such a state of affairs can be recognized. In the purer forms of amyloid disease the kidney shares the process with the spleen and liver, and enlargement of these, associated with the causes of such degeneration, come to our aid in diagnosis. See PHENOLSULPHONEPHTHALEIN TEST.

The prognosis is unfavorable as to cure, but if the cases are brought under proper management as to diet, habits of life, and some treatment by medi cine, much can be done to prolong life.

The treatment is, however, more difficult than in acute nephritis. More discrimination is required and results are more difficult of attainment. Spontaneous recovery is probably impossible.

The indications are, first, to improve nutrition, restrain the accumulation of toxic matters in the blood, and second, to combat symptoms and complications. The first indication is fulfilled by suitable food and tonics, including iron. The food should be easily assimilable, in which proteins are kept at a minimum. The careful regulation of the diet is exceedingly important and its selection is based upon the functional efficiency of the kidney, non-protein nitrogen of the blood, condition of the heart and blood pressure, the digestion and weight of the patient. The excretion of salt and of nitrogen is impaired, hence these substances must be restricted in the diet and in some instances, the salt must be entirely withheld. "It has not been shown that fresh fish, poultry and meat (not rich in purins, as kidneys, sweet-breads, liver and shad roe) are any more harmful to the nephritic patient than are vegetable proteins, such as nuts, peas, beans and oatmeal; but some patients may tolerate vegetable proteins better. There is no special difference between red and white meat, though the latter may be more easily digested. Boiled meats are better than those cooked in other ways because some of the extractives have been lost. For this reason meat soups should not be allowed to patients with nephritis, as they contain mostly meat extractives." The Karell treatment may be carried out as follows: "The patient receives 200 mils of milk, in 4 doses, at 4-hour intervals during the day, beginning early in the morning. This treatment is continued for about a week. The milk may be taken hot or cold, as the patient desires, but he is allowed no other fluid and no solid food. After this period of limited diet he is allowed one egg and a slice of dry toast a day, for 2 or 3 days; the food is then gradually increased during the next 2 weeks by adding an egg, more bread, rice or other cereal, so that at the end of this period he is back to his ordinary diet, that is, the diet considered correct for one in his condition. Whether or not a little meat should be allowed depends on the character of the nephritis and on the absence or presence of uremic symptoms. During this starvation period an enema or some vegetable cathartic should be used. If the patient suffers from extreme thirst, the amount of water allowed may be slightly increased, or if hunger becomes unendurable, he may be allowed a little more toast. If the edema is largely cardiac, he may be allowed a small amount of salt" (J. A. M. A., April 7, 1917).

Iron, quinin, and strychnin are excellent tonics, yet iron is too often indiscriminately given, and sometimes more harm is done with it than good by locking up secretions, causing headache and constipation. Large doses should be avoided. A few drops of the tincture of the chlorid of iron and a dram or two of Basham's mixture should suffice for a dose. Rest, bathing, and massage are advisable hygienic measures. The clothing should always include wool next the skin in winter and summer. Elimination by the skin is facilitated by such clothing. The urine should be tested by frequent analysis, and if the quantity of urea eliminated is small compared with that ingested, its excretion should be stimulated by warm baths, warm packs, or vapor baths. The urine elimination should be aided by aperient remedies, including salines. Edema is to be treated by the same measures as acute nephritis. Sometimes it is very helpful to scarify the legs. Enormous quantities of fluid are thus liberated, with great relief to the patient. Uremia should be treated as described under acute nephritis.

Chronic Interstitial Nephritis (Contracted Kidney)

In this form of Bright's disease the resultant is a small kidney in which the interstitial connective tissue predominates, but whether this is the result of a primary overgrowth of connective tissue at the expense of the tubular structure, or whether the latter slowly disintegrates to be as gradually replaced by fibroid tissue, is a question more unsettled of late than it formerly was.

The cause often cannot be traced. Overfeeding, gout, lead, alcohol, and syphilis causes a certain number of cases. Grief and anxiety have been assigned to rather an undue portion of responsibility by some authors. Hereditary influence must be admitted. Arteriosclerosis is a cause and a consequence.

Symptoms.—The characteristic of its symptomatology is insidiousness of onset. Often the disease is discovered accidentally in a routine examination of urine, or by the ophthalmologist in the eye clinic, when least suspected by the patient—an examination suggested by a dimness of vision or more or less blindness. As often the discovery of hypertrophy of the left ventricle without explainable cause leads to an examination of the urine, and the discovery of a small amount of albumin and a few casts. More rarely a sudden outburst of uremic convulsions is the first intimation of the presence of the disease, and may also be the concluding symptom. Headache is a frequent symptom, with unpleasant throbbing in the temples. Occipital headache is said to be especially characteristic, but this symptom occurs under so many conditions that it can scarcely be allowed any diagnostic value. Never, except sometimes toward the close of the disease, is there dropsy in a marked degree, though at times a tightness of the shoe or a swelling about the ankle toward evening first attracts the attention of the patient.

The changes in the urine are more or less characteristic. The quantity is always copious; its specific gravity is low, and in it are found usually only a few hyaline casts, occasionally containing an oil drop or two. Casts are often not found, though less frequently with the use of the centrifuge. Albumin is sometimes totally absent, and there is a prealbuminuric stage, rarely recognized, in which there is neither albumin nor casts. See URINE (Examination).

Arterial sclerosis, recognizable commonly only in the radials, sometimes in the temporals, is more or less characteristic. Its exact relation to the renal disease is perhaps not precisely determined. Sometimes found early, and even preceding other symptoms, it may then be regarded as a cause. At others, occurring later, it is perhaps a conse-

quence. The changes are chiefly in the intima and media, inflammatory and degenerative rather than hypertrophic in the muscular coat, as once supposed.

The diagnosis is commonly easy. The absence of dropsy, small amount of albumin, few hyaline casts, hypertrophy of the left ventricle, and albuminuric retinitis point rarely to anything else except the contracted kidney. Only in those cases of chronic parenchymatous nephritis referred to in the stage of secondary contraction or in the undeterminate and imperfectly developed first stage is there sometimes difficulty, which time and a careful study will remove. See PHENOLSULPHONEPHTHALEIN TEST.

The prognosis of contracted kidney is unfavorable as to recovery. No kidney in which the characteristic interstitial change has been wrought probably ever returns to its normal state. Something may be done to arrest further development of the disease, so far as it is possible to counteract the causes which favor its spread. Sooner or later the disease advances slowly or rapidly to an ultimate unfavorable termination.

Treatment.—As has been intimated, treatment must consist mainly in measures calculated to arrest the spread of the disease from localized foci in the kidney to larger areas. The uric acid of the gouty diathesis must be kept in solution or eliminated, lead must be dissolved out of the blood, alcohol and excessive eating, especially of protein foods, must be cut down, and the patient put upon a diet of milk, vegetables, and fruits. High arterial pressure should be reduced by full doses of nitroglycerin and aconite. If uremia threatens, milk and Vichy or milk and water should be given in lieu of all other nourishment for a time. The bowels should at all times be kept free, and medicines calculated to lock up secretions, such as iron and other astringents, should be avoided. The occasional use of mercurial aperients is helpful, and the free ingestion of liquids between meals should be encouraged. Diuretics are not indicated in the earlier stages so long as the secretion is free. The same hygienic measures described as necessary in chronic parenchymatous nephritis are essential in this form of disease. The treatment of uremia is identical with that described under acute and chronic parenchymatous nephritis.

Drugs are not likely to be serviceable in clearing away the interstitial overgrowth. Theoretically, iodin and mercury should do this, but biniodid and bichlorid of mercury in suitable doses have been given for months without result. The gold preparations are not recommended. There are, however, men of experience who claim to have had good results from all of these remedies, and there is no reason why their use should not be continued until their true value is determined. The use of opium in interstitial nephritis, especially for the control of uremic convulsions, is dangerous, and likely to prolong the condition it is purposed to relieve.

Amyloid Disease

There are two ways in which amyloid disease may invade the kidneys: first, as a complication of chronic diffuse nephritis; and, second, as a part of general amyloid disease when the kidneys share the process with the spleen, liver and other organs of the body. The first is not recognizable by any means at our disposal; the second may be inferred from the presence of the causes of amyloid disease: viz., syphilis, suppuration, and exhausting drains on the system, along with enlargement of the liver and spleen, albuminuria, and casts. The so-called waxy cast is probably more frequent in this form of chronic disease, but is not peculiar to it, or even to chronic disease at all, as it is found also in acute nephritis. In addition to these, the other varieties of casts more or less characteristic of chronic nephritis are also found: viz., oil casts, dark granular casts, and fatty renal cells. The albuminuria is not commonly so large as in the typical forms of chronic parenchymatous nephritis.

The treatment of the first of these forms is that of chronic parenchymatous nephritis; of the second, that of the condition causing the amyloid disease, aided by the tonic and restorative measures needed in the treatment of chronic parenchymatous nephritis.

NEPHRITIS OF PREGNANCY.—Kidney insufficiency occurs in about 6 percent of all pregnant women, and is the result of the kidney of pregnancy, or true nephritis.

The kidney of pregnancy is a peculiar noninflammatory condition in which the kidney becomes anemic and the epithelial cells become infiltrated with fat.

The cause is probably some condition which interferes with the blood supply to the kidney, such as compression of the kidney by the gravid uterus, spasmodic contraction of the renal arteries, and an exaggerated hydremia of pregnancy.

The symptoms usually manifest themselves during the latter months of pregnancy. These are albuminuria, more or less pronounced, and probably some hyaline and granular casts. Desquamated epithelial cells filled with fat may also be found. The condition becomes more marked as pregnancy advances, and it not infrequently terminates in an outbreak of eclampsia. It disappears spontaneously after labor.

Nephritis may manifest itself as an acute or chronic condition, the latter being the more common.

The symptoms are the same as in uncomplicated Bright's disease.

The differential diagnosis between chronic nephritis and the kidney of pregnancy may be determined by the following:

CHRONIC NEPHRITIS.	NEPHRITIS OF PREGNANCY.
1. There may be a history of previous kidney disturbance.	1. There is no such history.
2. There may be albuminuric retinitis.	2. There is no albuminuric retinitis.
3. Symptoms appear in the first half of pregnancy.	3. Symptoms appear in the latter half of pregnancy.

Chronic Nephritis.	Nephritis of Pregnancy.
4. Casts are usually present in large number—hyaline, granular, waxy, and fatty.	4. Hyaline and granular casts may appear, but are usually few in number.
5. Symptoms persist after delivery.	5. Symptoms disappear after delivery.

The prognosis is grave; eclampsia may occur at any time.

The treatment of kidney insufficiency during pregnancy should be prophylactic and curative. Every pregnant woman's urine should be regularly examined; during the first 6 months, once every 3 weeks; later, once every week or 10 days. Should albumin appear, daily quantitative examinations should be made. This is most conveniently done by the use of an Esbach's albuminometer. If the amount of albumin is slight, if there are no casts, and if there are no general symptoms, such as edema; dietetic and hygienic treatment is sufficient.

The patient should avoid exposure to cold and wet; the skin should be kept active by frequent bathing, followed by brisk rubbing; the bowels should be moved at least once daily; and the diet should be light and easily digested. No meat should be allowed. Milk, milk-broths, and the lighter vegetables are appropriate. Should the albumin increase in amount; should casts appear in abundance; and should there be edema of the face or extremities, thorough and active treatment is indicated. The patient should be confined to bed; the diet should be exclusively milk; the bowels should be moved 2 to 4 times daily by the use of salines; and diaphoresis should be encouraged by the use of hot baths. Diuretics are indicated, such as digitalis, caffein, strophanthus, and Basham's mixture. If, in spite of this treatment, the symptoms become progressively worse, the induction of abortion or premature labor is indicated. This is particularly urged if there are serious eye symptoms, or if there is persistent headache, since they are the premonitory symptoms of eclampsia. See Eclampsia.

NEPHRECTOMY.—See Kidney (Surgery).

NEPHROLITHIASIS.—See Kidney (Stone).

NEPHROLITHOTOMY.—See Kidney (Surgery).

NEPHRORRHAPHY.—See Kidney (Surgery).

NEPHROTOMY.—See Kidney (Surgery).

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Abducens (sixth cranial).	Motion	Fourth ventricle	External rectus of eye	Filaments.
Alveolar	Sensation	Inferior dental	Molar and bicuspid teeth, and adjacent gums.	Gingivales.
Articular	Trophic, sensory (?)	Anterior crural	Knee-joint	Capsular, synovial.
Articular, 2	Trophic, sensory (?)	Ulnar	Elbow-joint	Filaments.
Articular, recurrent	Motion	External popliteal	Knee-joint and anterior tibial muscle.	Filaments.
Auditory (eighth cranial).	Hearing	Restiform body	Internal ear	Vestibular, cochlear.
Auricular (*posterior*)	Motion	Facial	Retrahens aurem, attollens aurem, occipitofrontalis.	Auricular, occipital.
Auricularis magnus	Sensation	Cervical plexus, 2d and 3d cervical.	Parotid gland, face, ear	Facial, mastoid and auricular.
Auriculotemporal	Sensation	Inferior maxillary	Pinna and temple	Articular, two branches to meatus, parotid, anterior auricular, superficial temporal.
Buccal	Motion	Facial	Buccinator and orbicularis oris muscles.	Filaments.
Buccal, long	Sensation, motion (?)	Inferior maxillary	Cheek	Superior and inferior buccinator and external pterygoid.
Calcanean, internal	Sensation	Posterior tibial	Fascia and integument of heel and sole.	Several small filaments.
Cardiac (cervical and thoracic).	Inhibition	Vagus	Heart	Branches to cardiac plexuses.
Cavernous	Sensation	Prostatic plexus	Erectile structures of penis.	Filaments.

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Cervical, eight.....	Motion and sensation...	Cord.....	Trunk and upper extremities.	Ventral and dorsal divisions. See *Plexus.*
Cervical, 1st (anterior division).	Motion and sensation...	Cord.....	Rectus lateralis and two anterior recti.	Filaments and communicating to vagus, hypoglossal, sympathetic.
Cervical, 1st (posterior division).	Motion and sensation...	Cord.....	Recti, obliqui, complexus.	Communicating and cutaneous filaments.
Cervical, 2d (anterior division).	Motion and sensation...	Cord.....	Communicating.....	Ascending, descending, communicating and filaments.
Cervical, 2d (posterior division).	Motion and sensation...	Cord.....	Obliquus inferior, scalp, ear, complexus, splenius, trachelomastoid.	Internal or occipitalis major, and external.
Cervical, 3d (anterior division).	Motion and sensation...	Cord.....	Communicating.....	Ascending, descending, and communicating filaments.
Cervical, 3d (posterior division).	Motion and sensation...	Cord.....	Occiput, splenius, complexus.	Internal, external, and filaments.
Cervical, 4th (anterior division).	Motion and sensation...	Cord.....	Shoulder and communicating.	Communicating filaments, muscular, etc.
Cervicals, 5th to 8th (anterior divisions).	Motion and sensation...	Cord.....	Brachial plexus.....	Communicating.
Cervicals, 4th to 8th (posterior divisions).	Motion and sensation...	Cord.....	Muscles and skin of neck..	Internal and external branches.
Cervicofacial.....	Motion.....	Facial.....	Lower part of face and part of neck.	Buccal, supramaxillary, inframaxillary.
Chorda tympani.....	Motion.....	Facial.....	Tongue, tympanum, submaxillary gland.	Filaments.
Ciliary.....	Sensation, nutrition, motion.	Ciliary ganglion.....	Eyeball.....	Filaments.
Circumflex.....	Motion and sensation...	Brachial plexus.....	Teres minor, deltoid and skin.	Anterior, posterior and articular.
Coccygeal.....	Motion.....	Coccygeal plexus.....	Coccygeus and gluteus maximus.	Filaments.
Colli, superficialis....	Sensation.....	Cervical plexus.....	Platysma myoides and ventrolateral parts of neck.	Ascending and descending branches, filaments.
Communicans hypoglossi.	See *Communicans noni.*			
Communicans noni...	Motion and sensation...	Second cervical, third cervical.	Descendens noni, depressor muscles of hyoid bone.	Omohyoid and filament, ansa hypoglossi.
Communicating.....	Motion and sensation...	Cervical plexus.....	Spinal accessory.....	Branches.
Communicating.....	Sensation and motion...	First and second cervical	Vagus, hypoglossal, sympathetic.	Three branches and filaments.
Crural.....	Sensation.....	Genitocrural.....	Skin, upper and central part ant. aspect of thigh.	Filaments.
Crural, anterior.....	Motion and sensation...	Lumbar plexus, second, third and fourth lumbar nerves.	Thigh.....	Middle and internal cutaneous, long saphenous, muscular, articular
Cutaneous.....	Sensation.....	Musculospiral.....	Skin of arm, radial side of forearm.	One internal, two external.
Cutaneous.....	Sensation.....	Ulnar.....	Wrist and palm.....	1st and palmar cutaneous.

NERVES, TABLE OF PRINCIPAL

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Cutaneous (dorsal)...	Sensation.....	Ulnar.....	Little and ring fingers.....	Filaments and communicating branches.
Cutaneous (external)	Sensation.....	2d and 3d lumbar....	Skin of thigh.....	Anterior, posterior.
Cutaneous (internal)	Sensation.....	Brachial plexus.....	Forearm.....	Anterior and posterior branches and filaments.
Cutaneous (lesser internal) (*of Wrisberg*)	Sensation.....	Brachial plexus.....	Inner side of arm.....	Filaments.
Cutaneous (middle and internal).	Sensation. Motion (?).	Anterior crural.....	Thigh and communicating.	Communicating and filaments.
Cutaneous, perforating.	Sensation.....	Fourth sacral.....	Integument covering gluteus maximus.	Filaments.
Dental (inferior or mandibular).	Sensation.....	Inferior maxillary....	Teeth, muscles.....	Mylohyoid, incisor, mental, dental.
Dental, superior.....	See *Dentals* (*posterior* and *anterior*).			
Dentals (post. and ant.).	Sensation.....	Superior maxillary...	Teeth.....	Filaments.
Descendens hypoglossi.	Motor.....	Cervical plexus.....	Omohyoid, sternohyoid, sternothyroid, thyrohyoid, geniohyoid, hyoglossus and muscles of tongue.	Muscular, tongue.
Descendens noni.....	See *Descendens hypoglossi.*			
Digastric.....	Motion.....	Facial.....	Posterior belly of digastric.	Filaments.
Dorsal, 12 (anterior and posterior divisions).	Motion and sensation..	Cord.....	Muscles and skin of chest and trunk.	External, internal, cutaneous.
Dorsal (of clitoris)...	Homologue of dorsal of penis.....		.....	Filaments.
Dorsal (of penis).....	Sensation.....	Pudic.....	Penis.....	Filaments.
Facial (seventh cranial, portio dura).	Motion.....	Floor of fourth ventricle.	Face, ear, palate, tongue..	Petrosals, tympanic, chorda tympani, communicating, post. auricular, digastric, stylohyoid, lingual, temporal, malar, infraorbital, buccal, superior and inferior maxillary.
Frontal.....	Sensation.....	Ophthalmic.....	Forehead and eyelids.....	Supraorbital, supratrochlear.
Genital.....	Motion and sensation...	Genitocrural.....	Cremaster muscle.....	Filaments.
Genitocrural.....	Motion and sensation...	First and second lumbar.	Cremaster and thigh.....	Genital, crural, communicating.
Glossopharyngeal (ninth cranial).	Sensation and taste.....	Fourth ventricle.....	Tongue, middle ear, tonsils, pharynx, meninges.	Tympanic, carotid, pharyngeal, muscular, tonsillar, lingual.
Gluteal (inferior).....	Motion.....	Sacral plexus (2d and 3d sacral nerves).	Gluteus maximus.....	Filaments.
Gluteal (superior)....	Motion.....	Sacral plexus.....	Glutei, tensor vaginæ fem.	Filaments.
Gustatory.....	See *Lingual.*			
Hemorrhoidal (inferior).	Sensation and motion...	Pudic.....	External sphincter ani, and adjacent integument.	Filaments.
Hypogastric.....	Sensation.....	Iliohypogastric.....	Skin about external abdominal ring.	Filaments.

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Hypoglossal (twelfth cranial).	Motion	Floor of fourth ventricle.	Hyoglossus and hyoid muscles.	Descendens noni or hypoglossi, muscular, thyrohyoid, genichyoid and meningeal.
Iliac	Sensation	Iliohypogastric	Integument covering fore part of gluteal region.	Filaments.
Iliac	Sensation	Last dorsal	Integument covering fore part of gluteal region.	Filaments.
Iliohypogastric	Motion and sensation	First lumbar	Abdominal and gluteal regions.	Iliac, hypogastric, communicating.
Ilioinguinal	Motion and sensation	First lumbar	Inguinal region and scrotum.	Muscular, cutaneous and communicating.
Inframaxillary	Motion	Facial	Platysma myoides	Filaments.
Infraorbital	Sensation and motion	Facial	Nose and lip	Palpebral, nasal, labial.
Infratrochlear	Sensation	Nasal	Skin and conjunctiva of inner part of eye, lacrimal sac.	Filaments.
Intercostal	Motion and sensation	Spinal cord	Muscles and integument of thorax.	Muscular, anterior and lateral cutaneous.
Intercostohumeral	Sensation	Second intercostal	Integument of upper two-thirds of inner and posterior part of arm.	Filaments.
Interosseous (anterior).	Motion	Median	Deep muscles of forearm	Filaments.
Interosseous (posterior).	Motion and sensation	Musculospiral	Carpus and radial and posterior brachial regions.	Filaments.
Labial	Motion and sensation	Superior maxillary	Muscles and mucous membrane of lips.	Filaments.
Lacrimal	Sensation	Ophthalmic	Gland and conjunctiva	Filaments.
Laryngeal (recurrent or inferior).	Motion	Vagus	Larynx	Branches to all laryngeal mus. except cricothyroid.
Laryngeal (superior)	Sensation and motion	Vagus	Larynx	External — cricothyroid muscle and thyroid gland. Internal—mucous membrane of larynx.
Lingual	Motion and sensation	Facial	Mucous membrane of tongue, palatoglossus and styloglossus muscles.	Filaments.
Lingual	Sensation	Glossopharyngeal	Circumvallate papillæ and glands of tongue.	Filaments.
Lingual	Taste and sensation	Inferior maxillary	Tongue and mouth	Filaments.
Lumbar (5)	Motion and sensation	Cord	Lumbar and genital tissues.	Anterior and posterior divisions, lumbar plexus.
Malar	Motion	Facial	Lower part of orbicularis palpebrarum, and eyelids.	Filaments.
Malar	Sensation	Orbital	Skin over malar bone	Filaments.
Mandibular	See *Maxillary, inferior.*			
Masseteric	Motor	Inferior maxillary	Masseter muscle (and temporal?).	Filaments.
Maxillary (inferior)	Sensation, motion, and taste.	Trigeminus	Muscles of mastication, ear, cheek, tongue, teeth.	Masseteric, auriculotemporal, buccal, gustatory, inferior dental.

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Maxillary (superior).	Sensation	Trigeminus	Cheek, face, teeth	Orbital, sphenopalatine, dentals, infraorbital.
Median	Motion and sensation	Brachial plexus	Pronator radii teres, flexors, two lumbricales, fingers, palms.	Muscular, anterior interosseous, palmar cutaneous.
Meningeal	Sensation	Glossopharyngeal	Pia and arachnoid	Filaments.
Meningeal	Sensation	Hypoglossal	Dura mater	Filaments.
Meningeal	Sensation	Vagus	Dura around lateral sinus.	Filaments.
Meningeal, recurrent.	Sensation	Inferior maxillary	Dura and mastoid cells	Filaments.
Mental	Motion and sensation	Inferior maxillary	Mucous membrane of lower lip and chin.	Filaments.
Motor oculi (third cranial).	Motion	Floor of aqueduct of Sylvius.	All muscles of the eye, except external rectus, superior oblique, and orbicularis palpebrarum.	Filaments.
Muscular	Motion and sensation	First and second cervical.	Rec. cap. lat., rec., anterior major et minor	Filaments.
Muscular	Motion and sensation	Cervical plexus	Sternomastoid, lev. ang. scap., scal. med., trapez.	Filaments.
Muscular	Motion	Brachial plexus	Longus colli, scaleni, rhomboidei, subclavius.	Filaments.
Muscular	Motion	Musculospiral	Triceps, anconeus, supinat. long., extens. carpi rad. long., brach. antic.	Internal, posterior, external.
Muscular	Motion	Median	Superficial muscles of forearm.	Filaments.
Muscular	Motion	Ulnar	Flexor carpi ulnaris, flexor profundus digitorum.	Two branches.
Muscular	Motion	Great sciatic	Biceps, semimembranosus, semitendinosus, adductor magnus.	Filaments.
Muscular	Motion	Sacral plexus	Pyriformis, obturator int., gemelli, quad. femoris.	Filaments.
Muscular	Motion	Anterior crural	Pectineus and muscles of thigh.	Filaments.
Musculocutaneous	Motion and sensation	Brachial plexus	Coracobrach., biceps, brach. anticus, forearm.	Anterior and posterior.
Musculocutanéous	Motion and sensation	External popliteal	Muscles of fibular side of leg, skin of dorsum of foot,	Internal, external.
Musculospiral	Motion and sensation	Brachial plexus	Back of arm and forearm, skin of back of hand.	Musculocutaneous, radial, posterior interosseous.
Mylohyoid	Motion	Inferior maxillary	Mylohyoid and digastric muscles.	Filaments.
Nasal	Sensation	Dental, anterior	Mucous membrane of inferior meatus.	Filaments.
Nasal	Sensation	Maxillary, superior	ntegument of lateral aspect of nose.	Filaments.
Nasal	Sensation	Ophthalmic	Iris, ciliary ganglion, nose.	Ganglionic, ciliary, infratrochlear.
Obturator	Motion and sensation	Lumbar plexus, third and fourth nerves.	Obturator externus, adductors, joint and skin	Ant. and post. articulating and communicating.

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Obturator (accessory).	Motion and sensation..	Lumbar plexus.....	Pectineus and hip-joint ...	Filaments.
Occipital, smallest or 3d.	Sensation.....	Third cervical.....	Integument of occiput...	Filaments
Occipitalis, lesser or minor.	Sensation.....	Second cervical.....	Occipitofrontalis, ear, etc.	Communicating, auricular, filaments.
Occipitalis magnus....	Motion and sensation...	Second cervical.....	Complexus, trap. and scalp.	Filaments.
Oculomotor.....	See *Motor oculi.*			
Olfactory (first cranial).	Smell.....	Frontal lobe, optic thalamus and insula.	Schneiderian membrane of nose.	Twenty branches.
Ophthalmic.....	Sensation.....	Trigeminus.....	Forehead, eyes, nose.....	Frontal, lacrimal, nasal.
Optic (second cranial).	Sight.....	Cortical center in occipital lobe.	Retina.....	None.
Orbital.....	Sensation.....	Superior maxillary....	Temple and cheek.....	Temporal and malar.
Palmar cutaneous....	Sensation.....	Median.....	Thumb and palm.....	Outer and inner.
Palmar (deep).....	Motion.....	Ulnar.....	Little finger, dorsal and palmar interosseous, two inner lumbricales, abductor pollicis.	Filaments.
Palmar (superficial)..	Sensation and motion..	Ulnar.....	Palmaris brevis, inner side of hand and little finger.	Filaments and two digital branches.
Palpebral.....	Motor.....	Superior maxillary...	Integument of lower lid...	Filaments.
Parotid.....	Sensation.....	Auriculotemporal....	Parotid gland.....	Filaments.
Patheticus (4th cranial).	Motion.....	Valve of Vieussens...	Superior oblique of eye.....	None.
Pectineus.....	Motion.....	Anterior crural.....	Pectineus muscle.....	Filaments.
Perineal.....	Motion and sensation...	Pudic.....	Perineum, genitalia and skin of perineal region.	Cutaneous and muscular.
Perineal.....	Motion and sensation...	Fourth sacral.....	External sphincter ani and integument of anus.	Filaments.
Peroneal communicating.	Sensation.....	External popliteal....	Connecting external popliteal with short saphenous.	None.
Phrenic.....	Motion and sensation...	Third, fourth, and fifth cervical.	Diaphragm, pericardium, pleura.	Filaments.
Plantar (external)....	Motion and sensation..	Posterior tibial.....	Little toe and deep muscles of foot.	Superficial and deep.
Plantar (internal)....	Sensation and motion...	Posterior tibial.....	Sole of foot, adduct. pollic., flexor brev. digi., toes.	Cutaneous, muscular, articular, digital.
Pneumogastric (tenth cranial ("par vagum").	Sensation and motion...	Floor of fourth ventricle.	Ear, pharynx, larynx, heart, lungs, esophagus, stomach.	Auricular, pharyngeal, superior and inferior laryngeal, recurrent laryngeal, cardiac, pulmonary, esophageal, gastric, hepatic, communicating, meningeal.
Popliteal (external)..	Sensation and motion...	Great sciatic.....	Extensors of foot, skin, and fascia.	Anterior tibial, musculocutaneous, articular, cutaneous.
Popliteal (internal)...	Motion and sensation...	Great sciatic.....	Knee, gastrocnemius, tibialis posticus, plantaris, soleus, popliteus, skin of foot.	Articular, muscular, cutaneous, external saphenous, plantar, external or short saphenous.

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Pudendal, long (nerve of Soemmering).	Sensation	Small sciatic	Integument of genitalia and inner and proximal part of thigh.	Filaments.
Pudic	Motion and sensation	Sacral plexus	Perineum, anus, genitalia.	Inferior hemorrhoidal, perineal, cutaneous, dorsal of penis.
Radial	Sensation.	Musculocutaneous	Thumb and three fingers	External and internal.
Sacral (five)	Motion and sensation	Cord	Multifidus spinæ, skin, gluteal region.	Filaments and sacral plexus.
Saphenous (external or short).	Sensation	Internal popliteal	Integument of foot and little toe.	Filaments.
Saphenous (long or internal).	Sensation	Anterior crural	Knee, ankle	Cutaneous, patellar, communicating, filaments.
Sciatic (great)	Motion and sensation	Sacral plexus	Skin of leg, muscles of back of thigh and those of leg and foot.	Articular, muscular, popliteals.
Sciatic (small)	Sensation and motion	Sacral plexus	Perineum, back of thigh and leg, gluteus maximus.	Muscular, cutaneous, long pudendal.
Spinal accessory (eleventh cranial)	Motion	Floor of fourth ventricle.	Sternocleidomastoid, trapezius.	Filaments.
Splanchnic (great)	Sympathetic	Thoracic ganglia	Semilunar ganglion, renal and suprarenal plexuses.	Communicating and filaments.
Splanchnic (lesser)	Sympathetic	Tenth and eleventh thoracic ganglia, great splanchnic.	Celiac plexus and great splanchnic.	Communicating and filaments.
Splanchnic (renal or smallest).	Sympathetic	Last thoracic ganglion.	Renal and celiac plexus	Communicating and filaments.
Stylohyoid	Motion	Facial	Stylohyoid muscle	Filaments.
Subscapular (three)	Motion	Brachial plexus	Subscapular, teres major, and latissimus dorsi.	Filaments.
Supraacromial	Sensation	Cervical plexus	Skin over deltoid	Filaments.
Supraclavicular (descending).	Sensation	Third and fourth cervical.	Skin of neck, breast and shoulder.	Sternal, clavicular, acromial.
Supramandibular	See *Maxillary, superior.*			
Supramaxillary	See *Maxillary, superior.*			
Supraorbital	Sensation	Ophthalmic	Upper lid, forehead	Muscular, cutaneous and pericranial branches.
Suprascapular	Motion and sensation	Brachial plexus	Scapular muscles	Filaments.
Supratrochlear	Sensation	Ophthalmic	Forehead and upper eyelid.	Muscular and cutaneous.
Temporal	Motion	Inferior maxillary	Temporal muscle	Filaments.
Temporal	Sensation	Orbital	Integument over temporal muscle.	Filaments.
Temporal	Motion	Temporofacial	Orbicularis palpebrarum, occipitofrontalis, attrahens and attollens aurem, corrugator supercilii.	Muscular.
Temporal, superficial.	Sensation	Auriculotemporal	Integument over temporal fascia.	Filaments.
Temporofacial	Motion	Facial	Upper part of face	Temporal, malar, infraorbital.

NERVES, TABLE OF PRINCIPAL

Name.	Function.	Origin.	Distribution.	Branches.
Thoracic (ant. and ext.).	Motion.....	Brachial plexus.....	Pectoralis major et minor.	Filaments.
Thoracic (posterior or long). External respiratory nerve of Bell.	Motion.....	Brachial plexus.....	Serratus magnus.....	Filaments.
Tibial (anterior).....	Motion and sensation...	External popliteal....	Tibialis antic., extensor long. digit., peroneus ter. joints of foot, skin of great toe.	Muscular, external, internal.
Tibial (posterior)....	Motion and sensation...	Internal popliteal....	Tibialis post., flexor long. digit., flexor long. pollic., skin of heel and sole, knee-joint.	Plantars, muscular, calcaneoplantar, cutaneous or internal calcanean, articular.
Tonsillar.....	Sensation.....	Glossopharyngeal....	Tonsil, soft palate, and fauces.	Filaments.
Trigeminus or trifacial (fifth cranial).	Motion and sensation (taste).	Medulla and floor of fourth ventricle.	Skin and structures of face, tongue and teeth.	Ophthalmic, superior and inferior max. divisions.
Trochlear.....	See *Patheticus*.			
Ulnar.....	Motion and sensation...	Brachial plexus.....	Muscles, shoulder-joint and wrist-joint, and skin of little finger.	Two articular, muscular, palmar cutaneous, dorsal, superior palmar, deep palmar.
Vagus.....	See *Pneumogastric*.			
Vidian.....	Sensation.....	Union of large superficial and deep petrosal.	Sphenomaxillary fossa, and posterior part of upper nasal meatus.	Filaments, nasal.

NERVES, DISEASES.—See Neuralgia, Neuritis, Neuroma, etc.

NERVES, INJURIES. Wounds.—A nerve may be completely or partially divided, and the wound may be incised, lacerated, contused, or punctured.

The effects of wounds of nerves, in addition to the degeneration of the portion below the wound, are: (1) Paralysis of motion and sensation of the parts supplied by the nerve; (2) subsequent wasting, atrophy, and fatty degeneration of the paralyzed muscles; (3) certain trophic changes in the tissues whose nutrition is presided over by the injured nerve, such as a glazed, smooth, cold, and bluish-red condition of the skin, falling off of the hair, cracking and deformity of the nails, local ulcerations and gangrene of the fingers, etc.; (4) a marked diminution in the temperature of the part, which may be preceded for a few days or even a few weeks by a slight increase of 2 or 3 degrees; (5) affections of the joints resembling rheumatism, and apt to terminate in more or less complete ankylosis; (6) ascending neuritis, which is attended by severe pain in the cicatrix and shooting up the nerve, and pain in the area of its distribution; and (7), very rarely, changes in the nerve-centers of a functional or of an organic nature (Walsham).

Symptoms.—The immediate symptoms are loss of function in the parts supplied by the nerve—viz., muscular paralysis, local anesthesia, or loss of special sense—according as a motor, sensory, or nerve of special sense is injured. In the case of a mixed nerve, both motion and sensation will be lost; but sensation in some instances may be partially restored in a few days through anastomosing branches from other nerves. The remoter symptoms are wasting of the muscles, and the trophic changes of the skin, nails, etc., already alluded to, and sometimes pain in the cicatrix, and in the course of the nerve and its peripheral distribution. The muscles exhibit to electric tests the *reaction of degeneration—i. e.*, they do not respond to the faradic current, but contract on the application of a continuous current of less strength than that necessary to cause the contraction of normal muscles; the contraction elicited, moreover, is slow, long, and tetanic; and the sequence of polar reaction is altered ($ACC. > CCC.$ instead of $CCC. > ACC.$). Their response, however, to the continuous current becomes feebler until they finally cease to contract. As a consequence of the degeneration of the affected muscles, their opponents undergo adaptive shortening, thus producing various deformities: as, for example, the hammer fingers (*main en griffe*) seen after division of the ulnar nerve.

The treatment varies according as the wound of the nerve is recent or of long standing. In the former case the nerve should be sought in the wound, the divided end sutured, the limb placed at rest on a splint in such a position that the united ends are not subjected to tension, and every effort subsequently made to obtain healing of the wound of the soft parts by first intention. If the divided ends of the nerve are lacerated or contused,

the injured portions should be cleanly cut away before applying the sutures. If the nerve is only partially divided, the divided parts should be sutured. The sutures, consisting of fine China-silk twist, should be passed with a small curved needle through the sheath of the nerve in 4 or 5 places. In every recent wound it should be as much a matter of routine to suture large nerves, if divided. as to tie wounded arteries. If the nerve does not unite, an attempt may be made to procure union after the wound is healed, as may also be done in long-standing cases of nonunion, though many months or even a year or two may have elapsed. An incision over the ununited ends should be made parallel to the nerve, the bulbous upper end of which can generally be felt through the soft tissues. The ends, which may have retracted so as to be an inch or more apart, should be sought, the bulbous ends shaved away little by little with a sharp scalpel until plenty of nerve-fibers are seen on the surface of the section, the lower end also refreshed, and the two united in the manner described above. When the ends are embedded in much cicatricial tissue, they should be freed by careful dissection, and when much separated, stretched so as to bring them into apposition. If the nerve is only partially divided, and the divided portions are bound down by cicatricial tissue, the injured segment of nerve, in its entire thickness, should be cut away before applying the sutures. In some instances sensation may return within 24 hours of suture; but it may be more than a year in long-standing cases before the function of the nerve is restored. In the meanwhile the nutrition of the parts supplied by it should be promoted by warmth, and the muscles prevented as much as possible from degenerating by galvanism, massage, friction, and passive movements (Walsham).

Transplantation of nerves, or **nerve-grafting,** has become a recognized surgical procedure. In some cases, also, a piece of nerve has been taken from an animal for the purpose. An attempt to restore the function of the nerve in this way may be made when the proximal and the distal ends of a divided nerve cannot be brought into apposition: as, for instance, after a portion of nerve has been destroyed in a compound fracture, or after a portion of nerve, damaged by the contraction of cicatricial tissue, by the formation of callus, or by the growth of a tumor in its substance, has been removed. The conditions for success are: great care in dissecting out and handling the nerve, its immediate transference, the employment of a single suture at each end, the avoidance of all tension, strict asepsis, and immediate union of the wound of the soft parts.

Subcutaneous rupture of a nerve is rare, but is occasionally met with as the result of a severe twist or wrench. It is attended with severe pain at the time of injury, perhaps also referred to the periphery of the nerve, and the gradual formation of a bulbous swelling on the nerve immediately above the rupture. The same effects follow as in division of a nerve in an open wound. The treatment is also similar.

Compression of a nerve occasions numbness and tingling, and, if severe and prolonged, partial or complete paralysis of the parts supplied by it, and the series of changes already described. As examples may be mentioned crutch-palsy, due to the pressure of a crutch upon the large nerves in the axilla; the dropped wrist, from the involvement of the musculospiral nerve in the callus in fracture of the humerus; the tingling, numbness, and partial paralysis sometimes following dislocations of the shoulder from the pressure of the head of the displaced bone on the brachial plexus; the pain caused by the pressure of a tumor on a nerve; the "pins and needles" felt in the feet, after sitting on the edge of a chair, from compression of the sciatic nerve, etc.

The treatment consists in releasing, if practicable, the nerve from the compressing agent. If a wound of the soft tissues is necessary to accomplish this object, healing without suppuration should be obtained, if possible, as otherwise the nerve may again become compressed by the resulting scar-tissue.

Contusions.—A familiar example of this injury is a blow on the ulnar nerve, as it lies behind the internal condyle. There is intense pain at the spot struck, and shooting and "pins-and-needles" pains in the parts supplied by the nerve. These symptoms pass off shortly, but occasionally they may be more severe and last for several weeks, in which case there is probably some effusion of blood in the nerve. In rare instances ascending neuritis, persistent neuralgia, or even paralysis, and changes similar to those observed after complete division of a nerve, may follow.

Foreign Bodies.—A portion of a needle broken off in a nerve, the lodgment of small shot from a gun accident, etc., may give rise to inflammation of the nerve, persistent irritation and pain at the injured spot, spasm in the muscles, and pain or tingling in the parts supplied by the nerve. Such accidents have occasionally been followed by epileptiform convulsions. The treatment is to cut down upon and remove the foreign body.

NERVOUS DISEASES, EXAMINATION

Mode of Procedure in Diagnosing Diseases of the Nervous System

In making a diagnosis of diseases of the nervous system it is frequently advisable to resort to the plan of exclusion, and in this manner to eliminate such disorders as rheumatism, gout, and diseases of the joints, affections which disturb sensation or motion, or both. As syphilis is a very common cause, in diseases of the nervous system the possibility of such infection, even many years before the onset of the nervous symptoms, should be determined. For a full discussion of the diagnosis of syphilis, see Syphilis.

In all lesions of the nervous system there is either a disturbance of motion or of sensation, or of both. In some there is a disturbance of the special senses or of consciousness. It is necessary then to separate diseases of the brain,

diseases of the cord, and diseases of the peripheral nervous system. The elimination of eyestrain is of paramount importance in all nervous disorders.

A careful history will eliminate such conditions as gout, rheumatism, and joint affections. After these factors have been eliminated, it is determined whether or not the lesion is within the brain, in the spinal cord, or in the peripheral nerves. Spinal curvature may be found to be the cause.

Symptoms of Diseases of Brain, Spinal Cord, and Peripheral Nerves

Lesions of Brain.	Lesions of Cord.	Lesions of Peripheral Nerves.
1. Disturbances of consciousness.	1. Consciousness usually preserved.	1. Consciousness preserved.
2. Disturbances of special sense, as hearing, smelling, tasting, feeling.	2. No disturbance of nerves of special sense.	2. No disturbance of nerves of special sense except feeling.
3. Delusions and hallucinations.	3. No delusions or hallucinations.	3. Mind usually normal.
4. Paralysis frequently involves arms.	4. Paralysis frequently involves legs.	4. Paralysis may involve arm or leg, most frequently the latter.
5. Convulsions common.	5. Convulsions rare.	5. Convulsions rare.
6. Vomiting common.	6. Vomiting not common, except in tabes dorsalis.	6. Vomiting uncommon.
7. Sphincters frequently involved.	7. Sphincters frequently involved.	7. Usually control of sphincters.

Systematic Study of Diseases of the Nervous System

(1) Disturbances of motion; (2) disturbances of sensation; (3) disturbances of nutrition; (4) disturbances of consciousness; (5) disturbances of special sense; (6) psychic disturbances.

Paralysis

Varieties.—1. **Irregular paralysis,** arising from various regions of brain, giving rise to optic neuritis, vomiting, strabismus; or, if in the cord or peripheral nervous system, giving rise to paraplegia, neuritis, etc.

2. **Monoplegia,** arising from brain, as seen in small hemorrhage into cortical layer; or may arise from disease of peripheral nerve, as from traumatism.

3. **Hemiplegia.**—Hemorrhage into the cerebrum is the most common cause. Hemorrhages into cerebellum and crus cerebri are very rare.

Paraplegia may arise from hemorrhage into brain or cord, or it may arise from disease of peripheral nerves, as in multiple neuritis.

Convulsions

Varieties.—(1) Epileptiform; (2) tetanic; (3) hysteroid; (4) local.

In **epileptiform convulsion** consciousness is lost, and there are clonic spasms.

Tetanic convulsions are usually accompanied by consciousness, and the muscles most frequently affected are the muscles of the jaws and of deglutition. They occur in tetanus, strychnin-poisoning, tetany and spinal meningitis.

Hysteroid convulsions occur in hysteria; consciousness may or may not be present.

Local convulsions or **spasms** frequently affect the face, causing momentary spasms, as is seen in tic douloureux, which results from neuralgia of the fifth nerve.

Saltatory Spasm.—A transient or permanent condition allied to hysteria in which the attempt to stand results in a sudden violent contraction of the leg muscles.

Tremors

Tremors are involuntary vibratory movements and are produced by alternate contraction and relaxation of antagonistic muscles. They are observed most often in the arms, head, face, tongue, and hands. They may be *coarse* or *fine*. Tremors occur in chronic alcoholism, delirium tremens, paralysis agitans, and in poisoning by lead, mercury, arsenic, chloral and opium. Neurasthenia, debility from various causes, senility, hysteria, disseminated sclerosis, and paresis are accompanied by tremors. In *disseminated sclerosis,* the tremor is irregular, jerky, and increased by voluntary efforts to restrain it. The tremor is absent during rest but is brought about by movement. In *paralysis agitans,* it is regular and rhythmic, occurring both during rest and movement. The tremor of *senility* is exceedingly fine and begins in the hands, often extending to the face. It occurs at first only during motion, disappearing during rest. When age is far advanced it may occur during both rest and movement.

Choreiform movements are coarse, incoordinated, involuntary movements of a jerky and irregular character usually separated by short intervals. They may simulate, to some extent, purposeful movements. Among the causes may be mentioned idiopathic chorea, Huntingdon's chorea, posthemiplegic chorea, organic brain disease, habit, hysteria, reflex irritation, etc.

Athetoid movements are slow, more or less rhythmic twisting movements of the fingers and toes. They are observed in cerebral palsies of children, after hemiplegia in adults, and polioencephalitis.

The Gait

The Ataxic Gait.—In locomotor ataxia the characteristic development of incoordination of movements comes on slowly. It is frequently observed by the patient from the inability to walk after dark. The characteristic gait is manifested by the fact that the foot is raised high in the air with a rotatory motion, and is dropped quickly so that the whole of the sole strikes the floor at the same time.

The Spastic Gait.—In spastic paraplegia or lateral sclerosis, the gait is manifested by the legs being dragged behind the patient, the toes frequently scraping the ground; the knees seem to come together, and the limbs may shake from the clonus which may be present.

Festination is observed in paralysis agitans. In this movement the patient appears to be in the act

of falling forward, when the steps become faster and faster, then suddenly cease, and the patient may fall backward or on the side, should he receive no support from in front.

The Gait of Pseudomuscular Hypertrophy.—The limbs are generally well nourished, frequently greatly enlarged, and in walking the feet are thrown outward straddling; the abdomen is greatly enlarged, and the body movements are slow and awkward.

Titubation is observed in diseases of cerebellum. It may be mistaken for the gait of locomotor ataxia, except that it is more irregular. If the patient is put in the reclining attitude, the motions may be perfectly controlled, while in locomotor ataxia there is partial loss of voluntary motion, as is seen when the patient tries to touch the tip of the nose when the eyes are closed.

In *myotonia* (*q. v.*) any muscular action such as walking is begun with difficulty. The stiffness gradually, however, disappears and progression is easy.

In *intermittent claudication* (*q. v.*) walking is associated with rigidity, numbness, cramps, weakness and disorders of sensation.

The Reflexes

As a rule, when the "reflexes" are spoken of in diseases of the nervous system, the tendon or patellar reflex of the knee-joint is meant: this is probably due to the contraction of the muscle itself, brought about by its normal irritability. As the impulse communicated to the muscle is transmitted through the medium of the spinal cord, it may be said that the reflexes are governed by this portion of the nervous system.

The Knee-jerk or Patellar Reflex.—This symptom is elicited by having patient cross the knees while in a sitting posture, and after distracting attention, gentle taps are made over quadriceps tendon immediately below the patella.

The knee-jerk is increased in lateral sclerosis, disseminated sclerosis, incomplete lesions of the cord above the lumbar segment, irritability of the spinal cord such as occurs in spinal meningitis, strychnin poisoning, hysteria, etc., and in some cases of organic cerebral disease.

The knee-jerk is decreased in locomotor ataxia, neuritis, pseudomuscular hypertrophy, poliomyelitis, myelitis, and in poisoning by spinal depressant drugs. Pronounced physical exhaustion also serves to lessen the tendon reflexes.

Ankle-clonus.—This symptom is elicited by allowing patient to cross the knees, and by elevating the foot so that the entire limb is on the same plane, then, by a sudden push upward, there is a tremulous movement or vibration communicated to the hand, frequently lasting for many seconds.

The *Babinski reflex* is the extension of the great toe which follows tickling the sole of the foot. Normally flexion follows such a procedure. The reflex occurs most often in hemiplegia, diplegia, and diseases of the motor tract of the cord.

Arm-jerk and jaw-jerk are also frequently elicited.

Paradoxic contraction, a peculiar phenomenon allied to the reflexes, first studied by Westphal, is occasionally noted. Its cause is unknown. In the *tibialis anticus* muscle it is induced by forcibly flexing the foot on the leg. As a result, the foot remains thus flexed for a considerable time, then slowly relaxes. On repeating the flexion, the tetanic contraction recurs, but the response gradually diminishes in intensity. Contractions induced by faradism may similarly persist. More rarely it may be induced in the flexors of the leg and forearms. It has been observed in early tabes dorsalis, multiple sclerosis, hysteria, and paralysis agitans.

Vasomotor Disturbances

Paralysis of the vasomotor system occurs as a symptom of hysteria, neurasthenia, and other functional neuroses, and follows injuries of the sympathetic nerve. It is manifested by abnormal redness of the skin with a sensation of heat and a rise in the dermal temperature. Vasomotor spasm is indicated by pallor and coolness of the skin with formication and stiffness. It is observed with functional disturbances of the sympathetic system and may be followed by trophic disturbances such as occur in scleroderma and symmetric gangrene.

Disturbances of Sensation

Loss of sensation is most common. This is called **anesthesia. Hyperesthesia** is a condition in which the sensation is increased above the normal. **Paresthesia** consists of abnormal sensations, such as "pins-and-needles" pains. Subjective painful sensations or nerve ache is known as **neuralgia.**

Areas of anesthesia may be determined by the prick of a pin, by the finger stroke, by the application of heat (flame or coal) or cold (ice), and by the faradic current. **Monanesthesia** is a condition in which the sensation is lost in but one member. **Hemianesthesia** means loss of sensation over the lateral half of the body. **Analgesia** means insensibility to pain. It is met with in hysteria and syringomyelia especially.

Disturbances of Consciousness

The principal alterations to which consciousness is subject in nervous diseases are coma, trance, somnambulism, ecstasy, and catalepsy.

Coma is an abnormally deep and prolonged sleep in which the cerebral functions are in abeyance, characterized by stertorous breathing, relaxation of the sphincters, lividity of the face, loss of parallelism of the optic axes, and an inability to respond to external stimuli. It may be gradual or sudden in its onset; complete or partial, transient or permanent. It may be due to organic brain disease, traumatism, cerebral anemia, epilepsy, sunstroke, hysteria, various convulsive states, and various toxic agents in the blood, introduced either from without or produced within the body.

Trance is an hysteric manifestation characterized by a prolonged abnormal sleep from which the patient cannot be aroused and in which the vital functions are reduced to a minimum.

Somnambulism is a condition of half-sleep in which the senses are but partially suspended and

the patient is able to perform various feats automatically. Ordinary sleep-walking may occur in health but the more pronounced varieties of this condition are observed in hysteria and in hypnotized subjects.

Ecstasy is a peculiar state of the mind in which a delusion so governs the mental functions that the entire nervous system is held in a condition of subjection or apparent insensibility. It is usually an hysteric manifestation.

Catalepsy is characterized by loss of will and by muscular rigidity. It occurs in paroxysms with loss of consciousness, the limbs remaining for long periods in any position in which they are placed. It occurs in hysteria, various psychoses, hypnotic states, and organic brain disease.

Disturbances of the Special Senses

Miosis, or contraction of the pupil, frequently occurs in opium-poisoning, locomotor ataxia, paretic dementia, and uremia.

Inequality of the pupils may be found in such conditions as organic brain-disease, locomotor ataxia, and paretic dementia.

The Argyll Robertson pupil occurs in locomotor ataxia. In this phenomenon the pupil fails to respond to light, but accommodates for distance. See PUPIL.

Nystagmus.—A peculiar condition of the eyeball in which an outward and an inward oscillation occurs. It may be observed in disseminated sclerosis and diseases at the base of the brain.

Ocular movements are often impaired or paralyzed, and the muscles involved give evidence of the nervous lesion. See EYE-MUSCLES.

The Ear

Tinnitus aurium is a peculiar ringing or buzzing sound in the ear observed in middle-ear or Ménière's disease. It may be produced by administering large doses of quinin or salicylic acid. See EAR.

Psychic Disturbances

Delusion.—By this is meant a faulty belief concerning a subject of physical demonstration, out of which the person cannot be reasoned by adequate methods for the time being (Wood).

Illusion means a perverted conception, attributing life and motion to inanimate things.

Hallucination.—A false perception. Frequently occurs in the insane, and is one in which the patient appears to hear voices and to see faces where none exist.

Morbid Impulse.—An irresistible desire to commit an act which the patient knows to be wrong (Stevens).

Disturbances of Nutrition. (*Trophic Derangements*)

By this term is meant changes in the nerves and muscles of a part, giving rise to a change in the contractility when a galvanic battery is applied and resulting also in muscular atrophy, arthropathies, ulcerations, and trophic affections of the skin, nails and hair. These trophic or nutritive phenomena are closely related to vasomotor phenomena.

Reaction of Degeneration

To determine this reaction, a galvanic battery of moderate strength should be used. The battery should always be tested by dipping the sponges in a weak saline solution or in water. In the galvanic battery there are what are termed the *anode*, or positive pole, and the *kathode*, or negative pole. By placing the kathode over a normal muscle and closing the circuit, a strong contraction occurs; when the anode is placed over the normal muscle, the contraction is greatly lessened. There is no contraction in either case when the circuit is broken. With a strong galvanic current contractions of the normal muscle occur, and the anodal is greater than the kathodal. In the reaction of degeneration all these reactions are altered or even reversed.

Another simple degenerative reaction is given by Gowers, who states that the faradic irritability is lost, while the galvanic irritability is increased, and often changed in quality.

The circuit of a galvanic battery is said to be *closed*, *made*, or *complete* when the elements are connected outside of the fluid.

NEURALGIA.—A severe paroxysmal pain in the area of distribution of a nerve or along its course.

Etiology.—Age, sex, heredity, and anemia are important predisposing causes. The true nature of neuralgia is obscure; it is possible that in many cases the cause is an inflammatory or circulatory disturbance in the nerve-trunk. Among exciting causes, cold and traumatism play an important rôle. Certain disease-poisons, as those of typhoid fever, variola, malaria, and *metallic* poisons, such as lead, arsenic, copper, mercury, in addition to alcohol and nicotin, are sometimes causative agents of neuralgia. Gout and diabetes also occasionally give rise to neuralgia. Finally, there is a class of so-called reflex neuralgias, such as those due to eye-strain and those met with in connection with uterine and ovarian disease and occurring in remote organs. Lesions of the central nervous system also give rise to attacks of neuralgic pain.

Varieties.—According to the nerves involved, the following varieties occur: Trifacial, or tic douloureux (prosopalgia); cervicooccipital, cervicobrachial, and brachial neuralgias; neuralgia of the phrenic nerve; neuralgias of the trunk, such as dorsointercostal, lumboabdominal, and possibly pleurodynia; neuralgia of the spinal column, sacral neuralgia, and coccygodynia; neuralgia of the feet; and visceral neuralgia. The fifth nerve is a favorite seat for reflex neuralgias.

Symptoms.—Pain is the most important symptom. It is of a spontaneous nature; occurs in paroxysms; runs along the course of the nerve by the nervi nervorum; and is of a darting, burning character. These paroxysms, lasting from a few moments to some hours, may return at regular intervals. Certain tender points exist along the course of the nerve, usually where the nerve passes from a deeper to a more superficial position. These pains are supposed to be caused by sudden explosions in the ganglionic cells in the gray matter of the cerebrum, where all nerve-fibers terminate. Other symptoms of neuralgia are

numbness, transient hyperesthesia, vomiting and various vasomotor disturbances.

Diagnosis is usually easy. Neuralgia may be distinguished from organic disease of a part by the presence of great superficial tenderness, by a hysteric temperament, and by the absence of all the other symptoms of organic disease; from neuritis, by the intermittent nature of the pain, by its occurring in hysteric subjects, and by the absence of the constitutional symptoms of inflammation. When neuritis and neuralgia exist together, the diagnosis may be difficult. Here the presence of superficial tenderness and a relief of the pain by deep pressure points to neuralgia, while in neuritis, on deep pressure the pain is extreme. The severe forms of neuritis are followed by anesthesia and muscular wasting, with changes in muscular irritability. In compression of nerves the pain is continuous, and the symptoms and consequences of neuritis will sooner or later ensue. Muscular rheumatism differs in its localization in muscles and groups of muscles. It is continuous, and the pain increases on motion.

The treatment of pain during the paroxysm calls for the administration of powerful anodynes. Morphin and opium and their preparations are foremost, and should be given in full doses by the mouth or hypodermically. Acupuncture and hypodermic medication may be combined. In sciatica this is probably the best treatment. Cocain hypodermically (1/4 of a grain) may be preferred to morphin.

Ammonium chlorid, 20 grains in solution, may be given every 4 hours. Quinin is to be used when a malarial origin is suspected. Antipyrin, acetanilid, acetphenetidin, and salol sometimes act with rapidity. Exalgin gives relief, but without diminishing the tendency to future paroxysms.

The following may be administered.

℞. Acetanilid, gr. xx
Citrated caffein, gr. x
Camphor monobromate, gr. v.
Make 10 pills; give 1 pill every 2 hours.

Cannabis indica, in doses of 1/2 grain of the extract, is efficacious in neuralgias of the pelvic region and in neuralgia in migraine sufferers. Gelsemium and its alkaloids are valuable for the affection confined to the dental branches of the fifth nerve. Chloral has been recommended, but almost always fails. Croton-chloral or butyl-chloral has been recommended for neuralgia of the fifth nerve. It may be administered to advantage in combination with cannabis indica, as follows:

℞. Butyl-chloral hydrate, gr. c
Extract of cannabis indica, gr. ijss.
Divide into 20 pills. Give 1 pill every 3 hours.

Chloroform and ether may be used as inhalations, to give speedy relief in desperate attacks of neuralgia, while amyl nitrite, nitroglycerin, and other nitrites give the best chance of relief in cardiac neuralgic conditions. Recently, castor oil has been highly recommended. It is given before breakfast in doses of from 1 to 2 ounces.

Belladonna and atropin are drugs long employed in the treatment of neuralgia. They are probably of more benefit in the abdominal and pelvic varieties than in facial neuralgia. Belladonna is used locally, moreover, often with relief. Hyoscyamus, hyoscin, and stramonium are employed in much the same way as belladonna.
The following may be tried:

℞. Tincture of hyoscyamus,
Tincture of stramonium,
Tincture of belladonna, } each, ℥ iv.
Give 25 drops in a tablespoonful of water every 4 hours.

Of local applications, pressure may relieve mild cases. Menthol, ointments of veratrin and aconite, the tincture of aconite painted over an involved area, the extract of belladonna, thinned with glycerin, and the oleate of morphin are of service. Blisters, (by chloroform, either pure or diluted) sinapisms and camphor may be used. Cocain will act on mucous surfaces, but not on the skin. Acupuncture and aquapuncture are employed. Chloroform, osmic acid, and phenol have been injected hypodermically.

Freezing the part with ether spray often proves useful. The continuous electric current may be used, placing the positive sponge near the seat of pain, and with the negative gently rubbing the neuralgic spot until the skin is slightly reddened, and until it causes a faint tingling or burning, but not pain.

In the most intractable cases the surgical means that may be tried are nerve stretching or excision of a portion of the nerve. Of the two operations the latter is to be preferred, but too often the pain returns after it. In fact, the operation can only be of use when the pain is peripheral, due to some irritation existing between the part cut and the ends of the nerve. If the neuralgia depends upon any central cause, or if the irritations exists higher up than the point divided, the operation has always eventually failed, although at times a temporary cessation of pain for a few weeks has occurred. See Lumbago, Sciatica, etc.

NEURASTHENIA.—Neurasthenia is a nervous state or condition marked by irritable weakness. It is commonly known as nervous prostration or nervous exhaustion, and presents a great many variable and inconstant subjective symptoms and a few significant objective phenomena. All forms of nervous energy—mental, motor, and organic—are disturbed, so that fatigue in these various spheres is more quickly occasioned than in health.

Etiology.—The majority of cases occur during the age of reproductive activity, and the disorder is rare after the age of 50. It sometimes occurs in childhood and during adolescence in individuals of a pronounced neuropathic tendency. Both sexes are about equally subject to it. High altitude and extremes of climatic conditions favor its development. Hebrews, Slavs, and Scandinavians are especially subject to it. A neuropathic heredity commonly furnishes the field in

which it develops. Debilitating conditions in the antecedents are very common; gout, rheumatism, tuberculosis, syphilis, excesses, malaria, and all the various cachexias in parents are likely to be followed by neurasthenia in the offspring.

Among the inciting causes, overwork or overstrain of any kind is the most potent. Anxiety, worry, disappointment, excesses, deprivation of sleep, and anything that makes continuous and exacting demands upon the endurance of patients may induce this condition of nervous exhaustion. Traumatism, especially when attended by fright and shock, and mental shocks of all varieties may induce it with great readiness and sometimes suddenly. It may be symptomatic of or secondary to all sorts of chronic diseases and various toxic states, such as lithemia, alcoholism, and syphilis. Most cases present a multiplicity of predisposing exciting causes.

Dana sums up the leading causes of neurasthenia as follows:

1. Hereditary nerve instability.
2. Overwork and worry.
3. Severe shocks, with or without injury.
4. Infections.
5. Abuse of stimulants and narcotics.
6. Abuse of sexual functions.
7. Disorder of digestive functions and autotoxemia.

This means that the causes are most often a bad heredity and foolish living.

Pathology.—The pathologic anatomy of neurasthenia is not known. The best conception of the development of this disorder is obtained from a consideration of the changes which take place in motor cells when subjected to natural fatigue, as demonstrated by Hodge. It seems probable that when cells are continually overtaxed, recuperation and a full restoration of their potential energy do not take place except after a prolonged rest, and it is conceivable that in certain instances restoration may be impossible.

Symptoms.—The most important and commonly encountered symptoms in neurasthenia are headache, backache, gastrointestinal atony, neuromuscular weakness, cerebral depression, mental irritability, and insomnia. To these may be added an almost infinite number of subjective complaints, which vary in different cases, and even in the same case. They may all be considered systematically, as follows:

Motor Disorders.—Muscular weakness is constantly found. This is commonly demonstrated by the ready fatigue upon exertion. Often the patient is able to put forth an ordinary amount of strength for one or two efforts, and thereafter is left weak and trembling. Constant effort is impossible. Tremor is frequently present, and is easily provoked by muscular effort. It may be present in any of the extremities, and is often seen in the face and lips, especially when the patient is embarrassed or mentally disturbed. The tendon reflexes are generally intensified. This is particularly true of the knee-jerk. It sometimes happens that if the knee-jerk is repeatedly elicited, the exaggeration becomes less and less, showing the ready fatigue of the reflex arc. Irritability in muscles and nerve-trunks is sometimes demonstrable by sharply tapping the parts.

Sensory Disturbances.—Neurasthenics complain of many subjective sensory disturbances. A tired feeling is almost invariably present, and headache is one of the most common symptoms. It may be slight and constant, but more often is produced by muscular, and especially by mental, effort or by any disturbing emotion. Commonly occipital, it may be frontal, temporal, or vertical, and often is attended by a feeling of drawing in the back of the neck. The sensation as of a weight upon the head, a binding band around the brows, the leadcap headache, are extremely common. Backache is usually present in neurasthenics, and is probably a fatigue symptom, though sometimes referable to a disturbance in the stomach and hypersensitiveness along the spine. Its common location is the small of the back, between the shoulders, and at the nape of the neck. It frequently results in the patients padding their chairs or retaining the recumbent position, and is usually intensified by any effort or disturbing circumstance. Tenderness of a superficial character is usually found over the spine, but sometimes is intensified by deep pressure. The spine may be sensitive its whole length, but usually presents a number of hypersensitive points. Near the occiput, over the seventh cervical spine, at the lower end of the scapula, at the waist, at the tip of the sacrum, and over the coccyx are favorable locations for these sensitive areas. Sensitiveness and spontaneous pain in various portions of the trunk and limbs are frequently present, but the outlines of these sensitive and painful areas are not sharply defined, and are likely to shift position and intensity within a period of a few minutes or hours. Various vague sensations of heat, cold, prickling, tightness, numbness, stiffness, weakness, fatigue, soreness upon pressure, etc., referred to various portions of the body and limbs, or to the internal organs, particularly the cardiac region, are constantly encountered. Those having reference to the pelvic and generative organs have in some cases a special prominence.

Visual Disturbance.—Neurasthenics find reading more or less irksome and often impossible. Headache, ocular distress, blurring of the letters, and other indications of eye-strain are readily induced. Another difficulty is furnished by inability to concentrate attention. Appropriate investigation usually demonstrates ready fatigue of the muscular apparatus of accommodation and a ready retinal exhaustion. In taking the chart of the visual fields it is a common experience to find them rapidly reduced within the course of a few minutes, and the fields for colors are usually concentrically contracted. Varying degrees of asthenopia mark a case of neurasthenia the same day, or even within the same hour. Heterophoric disturbances may be commonly encountered, but they are usually inconstant in their manifestations, and tend to disappear when the physical and nervous state of the patient is reestablished. Sometimes

there is intense photophobia, keeping the patient within darkened rooms, due apparently to retinal hyperesthesia. Other patients complain of obscurities of vision. Hearing and smell may be intensified and irritable or weakened, but are never lost as a part of the neurasthenic symptom-group. Tinnitus and hyperacusia are sometimes encountered, and most neurasthenics are readily startled by sudden, slight, and insignificant noises. Complaints of disagreeable and peculiar odors and tastes are analogous disturbances.

Gastrointestinal Disorders.—Nervous indigestion is commonly encountered. The appetite is often capricious, but may be excessive or diminished. Sometimes the mere thought of food is repugnant. Gaseous eructations, borborygmi, gastric distention and dilatation, often attended by cardiac palpitation and precordial pain, are generally encountered in pronounced neurasthenia. Hydrochloric acid may disappear from the gastric secretion, and digestion is usually retarded and inefficient, with alternating constipation and diarrhea.

Circulatory Disorders.—Cardiac palpitation, due to gastric disturbance or provoked by slight mental or muscular activity, is commonly encountered, in some instances reaching an intense degree, attended by precordial pain, tumultuous heart action, throbbing and general distress, strongly suggestive of a stenocardial attack. The pulse ordinarily is rapid, and may range from 100 to 140, being promptly accelerated by any disturbing element. Anemic cases are likely to present exaggerated hemic murmurs, while the feebleness of the circulation is manifested in the cold extremities that are usually encountered. Vasomotor storms, sweating, flushing, and blushing are the rule, and these may be general, localized, or unilateral.

Secretory Disorders.—The urine is ordinarily scant and of high specific gravity, with a relative increase of uric acid or urea and a great abundance of phosphates and oxalates. In other instances the urine may be neutral or alkaline, and commonly at intervals neurasthenics pass a large quantity of limpid urine of a low specific gravity. Secretions—as the perspiration, saliva, and gastric, intestinal, and synovial fluids—are commonly deficient, but may be increased, or may increase and decrease from time to time.

Genital Disorders.—The average male neurasthenic complains of lessened sexual power, which is often at first attended by nocturnal emissions, and if the urine shows a little cloudiness, he is at once convinced that he has spermatorrhea. Any early indiscretions are likely to be recalled, and the patient may become extremely morbid regarding his genital tract. Impotence may actually exist. Women have analogous conditions.

Mental Disorders.—The mental state of neurasthenia is one of its most important features. All the mental activites show the element of irritable weakness. The capacity for mental work is abridged, yet at times neurasthenics have moments of great mental activity. Protracted mental effort, however, is irksome or impossible, the power of attention is reduced, memory for recent events becomes defective, and there is general mental asthenia. Active spontaneous mentation and the flow of ideas to which the patient has been accustomed do not take place so readily, sometimes leading them to fear that they are losing their minds, and they frequently state that they cannot think. Self-reliance and courage are frequently completely lost, so that the patient becomes suspicious of himself, apprehensive, introspective, and usually more or less hypochondriacal. Whatever feature of the disease strongly fixes his attention is dwelt upon, and he is likely to develop some one of the numerous nosophobias. The morbid self-watchfulness naturally leads to depression, and neurasthenics are always lacking in cheerfulness. Fears are their common portion. These usually are incited by some incident or have reference to some physical condition, and often become well-formulated delusions, which all but dominate the patient, and in certain instances become fixed insane delusions, then carrying the patient over the boundary into the field of alienism. In the lowered physical and mental state the patient has not the same interest in and affection for his friends and family; he becomes exacting, peevish, fretful, and despondent. The emotions are unstable; neurasthenics, from their fears and loss of courage, are easily moved to tears, and sometimes become markedly hysteric.

Sleep.—Disorder of sleep is one of the earliest features of neurasthenia, and frequently for a long time precedes other marked indications of the nervous state. As a rule, neurasthenics have difficulty in getting to sleep, ideas of one sort or another, usually unpleasant, pursue them to their beds, and even if they fall asleep, they are troubled by dreams of an unpleasant and often of an exciting, worrisome, and depressing character. Nightmares and formulated dreams of a disturbing sort are common in neurasthenia, and the patient, as a rule, awakes unrefreshed in the morning, being more despondent and hopeless than at night.

The Physical Condition.—In neurasthenia of long standing general nutrition is almost invariably affected, and all degrees of anemia and emaciation may be encountered. But neurasthenia of moderate degree and character is consistent with fair nutrition, and often with a certain amount of fatness. Some of the most inveterate neurasthenics become quite stout, but, as a rule, neurasthenics are nutritionally defective.

Forms.—Various forms of neurasthenia have been described, apparently depending upon the prominence of certain groups of symptoms. Spinal, cerebral, and sexual neurasthenias have been described, but neurasthenia is one and indivisible, and all portions of the nervous apparatus show the disorder to some degree. In proportion, however, as head, spine, or pelvic symptoms preponderate, the particular case is modified in a corresponding way, and most cases of so-called nervous dyspepsia are merely cases of neurasthenia with prominence of the gastric features. Very many neurasthenics, especially women, develop hysteria, and a combination, indicated by the

term hysteroneurasthenia, is frequently encountered. It is very difficult to say when the disorders of neurasthenia become the defects of hysteria, and as a matter of clinical fact nearly all hysterics present some neurasthenia.

Course.—Neurasthenia is essentially chronic. Ordinarily its onset is insidious, but great moral, physical, or mental shocks may suddenly induce it. Once established, it tends to persist, and ordinarily the conditions which led to its development cannot be easily modified. Frequent remissions are presented, and patients once affected with neurasthenia are subject to relapses, even after long periods of freedom. In patients under adult years the disease is likely to improve spontaneously and to recur with readiness.

Diagnosis.—The diagnosis of neurasthenia is easy; the story of the neurasthenic usually suffices to make the diagnosis. The difficulty lies in overlooking some organic disease of which the neurasthenia may be symptomatic. A diagnosis of simple neurasthenia is never justified until all organic conditions have been investigated. Actual hypochondriasis and melancholia are to be differentiated.

Prognosis.—The prospects in neurasthenia are commonly good if the patient is below the age of 40 years and can be properly controlled and managed. This, however, is sometimes very difficult to accomplish, as circumstances may preclude that avoidance of fatigue and interruption of occupation usually necessary. If of a psychopathic stock, pronounced mental enfeeblement may occur, and should be apprehended. Occurring in patients before the age of 20, nervous prostration is likely to yield more or less readily, and to relapse frequently. After 40 the prognosis is less hopeful, as the neurasthenic exhaustion appears to have taken place in tissues that have lost their elasticity and recuperative powers, and complete recovery after this age is very exceptional. Cases of extreme emaciation often respond admirably to treatment, while some of the most inveterate instances do not present any considerable physical disorder. The presence of organic disease modifies the outlook in proportion as it is or is not manageable.

Treatment.—There is but one treatment for neurasthenia, and that is rest. Whatever function or quality of the individual has been overtaxed must be allowed an opportunity for recuperation. This is more easily said than accomplished. In cases of simple neurasthenia in women the Weir Mitchell rest cure usually is well advised, and oftentimes secures brilliant results. In men it is scarcely practicable, and usually fails when attempted. A change of scene, of atmosphere, freedom from suggestive surroundings, undue sympathy, and of well-meant but harmful solicitude, are generally of the first importance. The patient needs encouragement and all the hopeful suggestions that can in any way be brought to bear. In proper sanitariums this can be provided for the severe cases. In milder cases one should give up half his daily work, lie abed late in the morning, go to bed early at night, take a nap in the middle of the day, receive small quantities of readily digested food at frequent intervals, strengthening applications of water in the form of cold spinal douches in the morning, and quieting applications of water at bedtime in the form of warm baths or packs. In addition the patient should drink a considerable quantity of water. Neurasthenics, as a rule, shun drinking-water. Elimination from the skin, bowels, and kidneys is greatly increased by these simple measures. Massage, salt baths, alcohol rubs, and general frictions serve a very good purpose in some cases, being refreshing and strengthening. Many patients who are greatly troubled with insomnia promptly drop off to sleep after a half-hour's gentle massage. Many of these patients need to see the physician frequently; the reiterated encouragement of the trusted adviser is often of more benefit than all other measures combined.

Office treatment in mild cases, by the use of one form or another of electricity, hypodermic injections of small doses of strychnin or of plain water, the use of dry cups, or any other means which serves to fix the attention of neurasthenics and give a helpful turn to their thoughts, may be properly used with the full understanding on the part of the physician of its suggestive value. Patients should not be allowed to constantly discuss their symptoms and fears with members of their family or any one else, and it is essential to provide for them a certain amount of recreation, which is not at the same time fatiguing. It is highly injudicious to advise a neurasthenic to ride horseback or a bicycle, or to attempt to turn the mind from his ailments by a course of reading or study. A vacation, with a change of air and scene, or a sea voyage, often answers perfectly in mild cases.

In the anemic and emaciated and severe cases the scale is the best index as to the success of treatment. A gain of a pound or so is most encouraging. The question of diet is, therefore, of extreme importance. Keeping in mind the gastrointestinal atony, it is necessary to supply food in a form that is easily assimilated and least liable to fermentation. Many of these patients will digest a small amount of food thoroughly, while double the amount will cause extreme distress. Therefore small quantities of food, particularly of the sorts that are easily digested, should be frequently administered.

The drug treatment of neurasthenia may be practically dismissed with a word. Large doses of strychnin should be condemned. Occasionally a hypnotic to reestablish the sleep habit may be given with decided advantage. The hypnotic should be selected with a view to its being in force at the time the restlessness is most prominent. If the warm bath and a glass of hot milk or of malted milk, or even of hot water, does not suffice to put the patient to sleep, a pint of beer, with hot bath, may have the desired result. Should this fail, 10 grains of trional 2 hours before bedtime may be given. If the patient goes to sleep readily but wakes up after midnight, trional may be given in a dry powder at bedtime. Bromids, chloral, and opiates are to be avoided. Gastric disturbance

may sometimes be relieved by subgallate to bismuth, small doses of calomel, beta-naphthol, or other antiseptic preparations which inhibit fermentation. Constipation must be controlled. As a rule, the physician will best succeed in managing cases of neurasthenia in proportion as he understands their mental requirements and can, by a vigorous personality, override their fears and control their actions, thereby securing for them the curative rest which is partial or absolute in proportion to the severity of the disorder.

NEURITIS.—An inflammation of the nerve-trunks; characterized by pain and paresis of the parts supplied by the affected nerve-trunk.

Etiology.—Wounds and injuries or compression of nerves; cold and damp; syphilis; lead.

Symptoms.—The onset may be accompanied by febrile reaction. The most decided symptom is pain along the course of the nerve-trunk and its peripheral distribution, of a burning, tingling, tearing, intense character, increased by pressure or motion. If the affected nerve is a mixed one—sensory and motor—spasmodic contractions and muscular cramps occur, followed by impaired motion, terminating in paresis of the muscles innervated by the affected trunk. If the inflammation proceeds to the destruction of the nerve-trunk, wasting and degeneration of the muscular tissue ensue. Various trophic changes also occur, such as cutaneous eruptions and clubbing of the nails. The electrocontractility is impaired or lost.

Diagnosis.—Myalgia or muscular pain is not associated with paralysis, nor does the pain follow the course of a nerve-trunk. In neuralgia there is pain, but, as a rule, no tenderness. In fact, it is relieved by pressure. See NEURALGIA.

Prognosis is generally favorable with proper treatment.

Treatment.—Repeated blistering along the course of the nerve, with full doses of potassium iodid, are usually successful. Sodium salicylate, phenacetin, and antifebrin are each of utility. As the more acute symptoms subside, the use of galvanism or a feeble, slowly interrupted faradic current restores the disordered function of nerve and muscle.

NEURITIS, MULTIPLE. (Polyneuritis, Korsakow's Psychosis, Peripheral Neuritis).—A parenchymatous inflammation of a number of symmetric nerves, simultaneously or in rapid succession; characterized by pain, numbness, loss of power, or ataxia, with muscular atrophy. Mental symptoms are often associated.

Etiology.—Alcoholism; syphilis; malaria; lead, arsenic, or silver; following diphtheria, typhoid fever, and rheumatism. Beri-beri and kakké are epidemic varieties of multiple neuritis and the result of a special poison. See BERI-BERI.

It is likely that the various causes named develop in the blood a poison, having a particular susceptibility or selective action for nerve-fibers.

Symptoms.—The affection is generally bilateral and symmetric. An important characteristic is its peripheral distribution, the inflammation being most intense at the extremities of the nerves, lessening progressively toward the center, usually terminating before the nerve-roots are reached. The inflammatory process affects the nerve-fibers primarily and the sheath and connective tissue secondarily—a parenchymatous inflammation. The affected muscles are paler and smaller than normal, the fibers reduced in size and undergoing granular changes.

All plans suggested for classifying the varieties of multiple neuritis are imperfect. The onset may be sudden, even overwhelming, causing rapid death, but is usually subacute or chronic in its course, the symptoms being wide-spread in proportion to the acuteness, intensity, and cause of the malady. The symptoms may be described under three forms—a motor, a sensory, and an ataxic form.

The motor form shows motor weakness, chiefly involving the flexors of the ankles, the extensors of the toes, and the extensors of the wrist and fingers in the forearms. Inflammation of the anterior tibial or peroneal nerve in the leg, and the radial branch of the musculo-spiral in the arm, results in the double "wrist-drop" and "foot-drop" so characteristic of this disease. Any nerves of the body may be affected, the symptoms varying with the particular nerves.

The sensory form shows pains, tenderness, tingling, and numbness, with loss of cutaneous sensibility.

The ataxic form shows incoordination with or without sensory disturbances, but with loss of the muscular sense.

The forms may all be associated, in greater or less extent, in any one case. Muscular atrophy begins early and progresses with the disease. The knee-jerk is feeble or absent. The electrocontractility is feeble or lost. In alcoholic cases there may be delirium, mania, and delusions, associated with tremors. Trophic changes may occur in the nails, hair, and skin. The characteristic glossy condition of the skin, with some edema, is due to involvement of the vasomotor nerves. Rarely the vagus, optic, and laryngeal nerves are involved. The disease may be ushered in with fever, 101° to 103° F., rapid, feeble pulse, headache, nausea, vomiting, with delirium or confusion.

The alcoholic variety affects chiefly all the limbs; the malarial, the legs; diphtheritic, the pharyngeal and motors of the eye; rheumatic, the face; and lead, the arms.

Diagnosis.—Early diagnosis is most important, as prompt treatment may prevent idleness and months of suffering. Since the symptoms of this wide-spread affection have been properly separated from diseases of the spinal cord, with which they were formerly always associated, the diagnosis is very readily determined. The distinctive features are symmetric localization of the sensory and motor symptoms first and mainly in the extremities, and the tenderness of the skin, nerve-trunks, and muscles. The disease may be confused with rheumatism, neuralgia, tabes dorsalis, poliomyelitis, and other spinal diseases, and hysteric palsy.

Prognosis.—The earlier the treatment is insti-

tuted, the better the prognosis. At best, months are required for recovery and even years may be necessary. Involvement of spinal cord precludes total recovery. The return of faradic irritability in nerve and muscle is favorable. To sum up with Gowers: "The prognosis is better in the sensory than in the motor form; better when the arm escapes than when all the limbs are involved; better in cases of chronic than acute onset; and better if a case of apparently acute onset is really such than if it succeeds slight symptoms of longer duration."

Treatment.—The removal of the cause, if possible, is a primary step in treatment. Along with this, rest is most important, and the rest should be complete—in bed. Alcohol should not be allowed, although in cases of great debility its gradual withdrawal may be justified. The patient should, on the other hand, be fed on the most nutritious food. Local anodyne applications may be resorted to to relieve the pain, and may be varied according to effect. Dry heat, moist heat, applications of lead-water and laudanum, and ointments of aconite and veratrin are some of those which may be employed. Wrapping the parts in cotton or wool is sometimes beneficial. Warm baths are soothing; sometimes very hot ones give relief. Postures assumed because of the relief they give to pain should not be too long permitted, lest deformity result by contractions and adhesion difficult or impossible to overcome. Dropping of the feet should be prevented by splints or by the support of sand-bags. The same is true of flexion at the knee and hip.

As to drugs, they are of little use; the salicylates, phenacetin, antifebrin, and antipyrin may be useful in mild cases, and should be tried in doses of 5 to 15 grains. They are more particularly useful in cases due to cold. Extreme pain may demand the cautious use of morphin hypodermically in doses of 1/6 to 1/3 of a grain combined with 1/150 of a grain of atropin, which modifies and improves the action of morphin most happily. For the mental symptoms, the hydrobromid of hyoscin in doses of 1/200 to 1/100 of a grain hypodermically, or hyoscin in doses of 1/400 to 1/150 of a grain may be tried. Mercurials, so highly approved of in simple neuritis, are useless here. The iodids are sometimes beneficial in chronic cases. Roborant medicines, such as iron and cod-liver oil, are indicated to build up the patient, who is generally broken down. Electricity and massage are very useful after convalescence has set in (Tyson).

NEUROMA.—A tumor of or on a nerve. Many a neuroma is really a fibroma. See Tumors.

NEVUS (or Nævus).—A mark or blemish due to dilatation of the blood-vessels near the surface of the skin or within its texture.

Nævi often grow with marked rapidity, and, though rarely causing fatal hemorrhage, occasion serious inconvenience and great disfigurement. Sometimes they spontaneously disappear, but more often remain stationary. Cystic degeneration or suppuration may occur. Microscopically, a nævus is composed of large capillaries, arterial and venous trunks of larger size, connective tissue, fat, and sometimes sweat- or sebaceous glands. Inflammation of a nævus generally leads to a spontaneous cure. Hence, the injection of carbolic acid is used in the treatment of nævi. But there is danger of an irritating fluid entering a large vessel and passing to the heart, setting up a coagulation causing instant death. Ligation, pressure, application of caustics, such as fuming nitric acid, electrolysis, puncture with the actual cautery, and complete excision of the mass, are also employed in removal. A capillary nævus may quickly be cured by touching it once or twice with fuming nitric acid. A knitting-needle at a dull red heat or the galvanocautery may be employed. Sodium ethylate, in 5 percent solution, applied by a glass rod on 2 or 3 successive days, has been used to destroy the growth. The best plan for the cure of the cavernous variety is excision. Astringent injections are not advised.

Nævus Pigmentosus (Pigmentary Mole).—Circumscribed pigmentary deposit, usually congenital, with or without associated hypertrophy of other cutaneous structures. A "mole" may consist merely of a circumscribed deposit of pigment, or there may be, in addition, hypertrophy of the papillæ, of the hairs, and of the connective tissue. Nævi vary in size from a pea to the palm of the hand or larger, are rough or smooth, elevated or nonelevated, and of a brownish or blackish color.

According to the cutaneous structures involved, various forms of pigmentary nævi are distinguished.

Nævus spilus is a term given to a smooth, flat, pigmented nævus devoid of hair.

Nævus pilosus is a pigmented nævus covered with a growth of downy or stiff hairs.

Nævus verrucosus is a pigmented nævus with an irregular or wart-like surface.

Nævus lipomatodes is an elevated pigmented nævus with connective tissue and fat hypertrophy.

The etiology is obscure. Hairy moles are usually congenital; nonhairy ones acquired. There is increased pigment deposit in the cells of the rete mucosum and also in the corium. In nævus verrucosus the papillæ are greatly hypertrophied. There is often more or less connective-tissue hypertrophy.

Treatment.—The growths may be removed by means of the knife, caustics, or electrolysis. The last named is particularly useful in the treatment of hairy moles.

NEW-BORN INFANT.—As soon as the child is born it should be held by the feet, with the head down, and, with the little finger introduced into the mouth, any foreign material that may obstruct the air-passages should be removed.

As soon as pulsations in the cord cease, it should be ligated with an aseptic ligature, about two fingers' breadth from the abdominal wall. An ordinary surgeon's knot, reinforced by a double bow-knot to permit tightening after the child has had its bath, should be used for this purpose. The cord should now be cut, the free end being allowed to drain into some convenient receptacle.

Asphyxia Neonatorum.—If the child is born

asphyxiated, the cord should be ligated and cut immediately, and all mucus extracted from the throat and fauces.

If the case is of minor degree, *stimulation of the reflexes* will be sufficient to establish normal respiration. This is best accomplished by slapping the buttocks and back of the child with the end of a wet towel, by pouring a few drops of ether on its abdomen, or by immersing its back and extremities in warm water and pouring ice-water on its epigastrium. The faradic current, if it can be obtained, is a very powerful stimulant. Inasmuch as shock is a factor of considerable importance in this condition hot saline infusion into the rectum or hypodermics of strychnin (1/200 grain) or brandy (5 to 6 drops) are indicated. In advanced asphyxia artificial respiration should be resorted to immediately. The best methods are *Schultze's* and *mouth-to-mouth insufflation.*

Schultze's Method.—The child is seized by the shoulders from behind with both hands, in such a way that the right index-finger of the operator is in the right axilla of the child from behind forward, and the left index-finger in the left axilla, the thumbs hanging loosely over the clavicles. The other 3 fingers hang diagonally downward along the back of the thorax. The operator stands with his feet apart, and holds the child as described, practically hanging on the index-fingers in the first position, with the feet downward, the whole weight resting on the index-fingers in the axillæ, the head being supported by the ulnar borders of the hands. This is the first inspiratory position. At once the operator swings the child gently forward and upward. When the operator's hands are somewhat above the horizontal the child is moved gently, so that the lower end of the body falls forward toward its head. The body is not flung over, but moved gently until the lower end rests on the chest. In this position the chest and upper end of the abdomen are compressed tightly. The child's thorax rests on the tips of the thumbs of the operator. As a result of this forcible expiration, the fluids usually pour out of the nose and mouth of the infant. The child is allowed to rest in this position (the first expiratory position) about 1 or 2 seconds. The operator gradually lowers his arms, the child's body bends back, and he again holds the infant hanging on his index-fingers with its feet downward; this is the second inspiratory position. The movements are repeated 15 to 20 times in the minute.

Mouth-to-mouth insufflation is performed as follows: Wrap the child in a towel and lay it upon its back on a table or chair, with the head well extended. This is best accomplished by placing a drinking-mug or similar article under the child's neck. Place a piece of clean gauze over its mouth; take a quick inspiration and blow lightly through the gauze. The lungs will immediately become inflated. Secure expiration by compressing the chest and flexing the head. This should be repeated 15 or 20 times to the minute until the child breathes naturally. A very good plan is to alternate the foregoing methods, using one for 3 or 4 minutes and then substituting the other. Efforts at resuscitation should be continued until the child breathes freely or until the heart stops beating.

Other methods are as follows:

Byrd's (H. L.) Method.—The physician's hands are placed under the middle portion of the child's back, with their ulnar borders in contact and at right angles to the spine. With the thumbs extended, the two extremities of the trunk are carried forward by gentle but firm pressure, so that they form an angle of 45 degrees with each other in the diaphragmatic region. Then the angle is reversed by carrying backward the shoulders and the nates.

Laborde's Method.—Rhythmic tractions are made upon the tongue in order to excite the respiratory center. The tongue, covered with gauze, is drawn out by the fingers and allowed to fall back again 15 to 30 times a minute.

Dew's Method.—The infant is grasped in the left hand, allowing the neck to rest between the thumb and forefinger, the head falling far over backward. The upper portion of the back and scapulæ rest in the palm of the hand, the other 3 fingers being inserted in the axilla of the babe's left arm, raising it upward and outward. The right hand grasps the babe's knees, and the lower portion of the body is depressed to favor inspiration. The movement is reversed to favor expiration, the head, shoulders, and chest being brought forward, and the thighs pressed upon the abdomen.

Forest's Method.—The child is placed on its face and quick, violent pressure is made on the back; then it is placed in a pail of hot water, and the hands carried upward until the child is suspended by its arms, and mouth-to-mouth insufflation is practised; the arms are then lowered and the body doubled forward; these movements are repeated at the rate of 40 a minute.

Pacini's Method.—The child lying on its back, the operator stands at its head and grasps the axillæ, pulling the shoulders forward and upward to compress the thorax, and allowing them to fall in order to expand the chest.

Schroeder's Method.—The babe, while in a bath, is supported by the operator on the back, its head, arms, and pelvis being allowed to fall backward; a forceful expiration is then effected by bending up the babe over its belly, thereby compressing the thorax.

Sylvester's method may be used, the head being supported and the feet held firmly by an assistant.

Recently, the pulmotor has been modified so as to be of service in cases of asphyxia neonatorum. See Artificial Respiration; Pulmotor.

Eyes.—Wash the eyes with clean warm water, and drop on the cornea of each eye one drop of a one or two per cent solution of silver nitrate. See Conjunctivitis (Ophthalmia Neonatorum).

Bathing.—As soon as the third stage of labor is completed and the mother has been made comfortable, the child should be cleansed. It should first be anointed freely with sweet oil to remove the vernix caseosa, and then washed with soap and warm water. The nurse should avoid the eyes during this procedure, since the slightest amount of soap or dirty water coming in contact with them may produce an ophthalmia. Subsequently the

child should receive a daily bath. The temperature of the bath should be about 90° F. Appropriate precautions should be made to prevent the child from being chilled when it is removed from the bath.

Cord.—The cord should now be examined closely. If the ligature has become loosened, the bow-knot should be undone, and a firm surgeon's knot substituted. The cut end of the cord should be dusted freely with a powder composed of salicylic acid and starch—1 part of the former to 5 of the latter. It should then be dressed with salicylated or borated absorbent cotton and kept as dry as possible, and the binder applied. At its subsequent daily baths the cord should be closely inspected and fresh powder and dressing applied.

Clothing.—An infant should be clothed as follows: A binder of soft flannel, a diaper, a knit shirt, and knit woolen shoes. Over these should go 2 skirts. These should be suspended from the shoulders. Finally should come its dress. During the winter a knit jacket may be worn over the dress, and, particularly if the child is subject to attacks of coryza, a cap is desirable to protect it from drafts.

The child should have an abundance of diapers, which must be changed from 16 to 24 times daily. To prevent chafing, perfect cleanliness must be maintained and some dusting-powder, like lycopodium or compound talcum, used.

Nursing.—During the first 48 hours the child should be put to the breast regularly every 4 hours. The colostrum that it receives from the breast acts as a mild laxative and secures free evacuation of the meconium in the child's intestinal tract. After the milk appears, it should be put to the breast every 2 hours during the day, and 2 or 3 times at night. This interval should gradually be lengthened until at the end of about the third month it is nursed every 3 hours during the day and once or twice at night. See Infant (Care), Infant Feeding, etc.

NICOTIN.—$C_{10}H_{14}N_2$. A poisonous alkaloid found in the leaves of the tobacco plant; a colorless, oily fluid, of acrid taste and penetrating odor, readily soluble in water, and forming soluble salts with acids. In tetanus and strychnin poisoning the dose is 1/20 to 1/10 minim in 2 hours. The proportion of nicotin in tobacco is about 1 : 1700. Turkish tobacco contains little or none. It is an open question whether or not there is more nicotin in tobacco before or after curing. Nicotin, even in minute doses (1/7 of a grain), causes symptoms of gastric irritation, with an extreme degree of collapse, abolishing the function of motor nerves and paralyzing respiration. A dose of 1/15 grain has caused death in a human being. For the depression due to excessive smoking, 1 to 2 drams of Hoffmann's anodyne, or the spirit of nitrous ether, is effective. Strychnin is the best physiologic antidote to nicotin.

The treatment of poisoning by nicotin consists in the use of strychnin, the employment of cardiac stimulants, external heat, and atropin, while the stomach should be evacuated, tannin, the iodids, and artificial respiration employed. See Tobacco; and Lambert's Treatment for Narcotic Addiction.

NICTITATION.—Clonic spasm of the orbicularis; and is really frequently repeated involuntary winking. It may be associated with hysteria, chorea, or general neurasthenia; in fact, it may be a symptom of nearly any reflex neurosis. It often becomes a habit. Clonic spasms of the orbicularis sometimes appear after the use of eserin. In persons doing considerable eye-work, there is doubtless some uncorrected error of refraction. The treatment of this condition consists in administering remedies alleviating the nervous condition, or in correcting the ametropia.

NIGHT-BLINDNESS.—See Hemeralopia.

NIGHTMARE.—A feeling of distress or suffocation during sleep, attended by fright, hideous dreams, and often by inability to stimulate muscular contraction, except in the slightest degree. A heavy meal or indigestible food has generally been taken before the sleep, and this is especially so in those of a nervous temperament, whose digestion is weak. Eye-strain sometimes causes night-terrors. A closely allied condition occurs as a consequence of brain-exhaustion, and in those whose sleep has continually been broken in consequence of overwork, by application to study, business details, or literary pursuits. Certain forms of incipient delirium are akin to it, such as occur in various febrile diseases or as a result of alcoholic excesses.

Treatment.—The diet should be light, and late meals and indigestible food avoided. A teaspoonful of camphor water, repeated if necessary, may be the best remedy. For the nightmare of adults potassium bromid in small doses may be administered. In the attacks of night-screaming of children the digestive organs are frequently at fault, although they are sometimes associated with worms and delayed dentition. The moral surroundings of children so affected should be closely studied. Ghost stories and appalling tales should be discontinued. Indigestion is to be treated by a few grains of sodium bicarbonate and powdered rhubarb. Forbidding potatoes, candies, puddings, fruit, and cake may have a salutary effect. Potassium, sodium, and ammonium bromids are probably the best means of preventing future attacks. Sulphonal, chloral, or trional may also be given. Punishment, cold douches, or treatment adding to the distress are to be condemned. During the attack, efforts should be made to soothe the child and calm its fears by assurances of present safety.

The following mixture may be given every night at bedtime to a child of 1 year:

℞. Ammonium bromid, Sodium bromid, Wine or antimony, each, ʒ ss
Simple syrup, ʒ j
Peppermint water, enough for ʒ ij.

Give a teaspoonful at bedtime.

NIGHT-SWEATS.—The profuse nocturnal sweating often observed in pulmonary tuberculosis and other wasting disorders. In tubercu-

osis of the lung they are one of the most distressing features, and may come on early in the disease, although they are more persistent and frequent after cavities have formed.

Treatment.—Belladonna, or its alkaloid, atropin, is one of the best remedies. It may be given internally, or externally as a liniment. It is especially beneficial when applied externally to children. Atropin, 1/200 to 1/100 grain hypodermically, or 1/60 to 1/20 grain by the mouth, is useful when given about 1 hour before the usual or expected time of beginning of sweating; duboisin may be used instead. Aromatic sulphuric acid may be used alone, or with belladonna or morphin, to check night-sweats, but it creates indigestion. Camphoric acid, given dry on the tongue, not over 2 hours before the expected sweating, is considered one of the very best remedies against sweating from various causes, but especially that from phthisis when it is very profuse. The dose is 10 to 30 grains. Pilocarpin, 1/20 grain hypodermically, or given in the same dose thrice daily by the mouth, may be used to check profuse perspiration, even when atropin fails. Dover's powder will often check a profuse colliquative sweating. Agaricin, muscarin, and zinc oxid at bedtime are useful for the night-sweats of phthisis.

℞. Zinc oxid, gr. xxx
Extract of belladonna, gr. iij.
Make into 10 pills. Give 1 pill before going to bed.

Tannic and gallic acids, salicin, and ergot are all employed.

Acetic acid, diluted one-half with water, alum dissolved in weak alcohol, and naphthol in a 5 percent alcoholic solution are used locally. Oleate of zinc and of aluminum may also be used. See Tuberculosis.

NIPPLE.—See Breast (Diseases).

NITER.—See Ether, Nitrates.

NITRATES.—The salts of nitric acid. All nitrates are soluble in water. A solution called acid phenylsulphate, and composed of 46 1/2 grains of phenol in 5 1/2 drams of strong sulphuric acid, is used for the detection of nitrates in water. See Water.

Potassium nitrate, or saltpeter, sodium nitrate, and silver nitrate are the most commonly used nitrates in medicine. These and the other nitrates are described under the metallic titles. They are poisonous, and are often taken with suicidal intent. Emetics and the stomach-tube should be used, and soap in quantity administered. Demulcent drinks should follow, and emollient enemata used to protect the lining membranes of the intestines. Milk may be used with benefit. Of antagonists, opium in small doses may be administered for the subsequent depression, and aromatics and brandy are of value.

NITRIC ACID.—A colorless, fuming liquid, very caustic and corrosive, of strong acid reaction, used only externally as a caustic. Its preparations are: **Diluted Nitric Acid,** 10 percent nitric acid, given in the dose of 3 to 40 minims, well diluted. **Nitrohydrochloric Acid** or **Nitromuriatic Acid** (aqua regia), a golden-yellow, fuming, corrosive liquid, having 18 volumes of nitric acid and 82 volumes of hydrochloric acid, a drop of which, added to a test-solution of potassium iodid, will liberate iodin in abundance. Dose, 1 to 8 minims, well diluted. **Diluted Nitrohydrochloric Acid.** Consists of nitric acid 4, hydrochloric acid 18, water 78. Dose, 5 to 20 minims, well diluted.

Therapeutics.—Nitric acid does not tend to relax the bowels, as does nitrohydrochloric acid. It coagulates, but does not redissolve, the albumin of the tissues, and thus soon makes a barrier for itself. It is used externally to destroy warts, chancres, hemorrhoids, phagedenic ulcers, in gangrene, etc. For indolent ulcers a solution of from 5 to 30 drops to the ounce is of use. In oxaluria nitric acid is preferable to the nitromuriatic acid. Three-drop doses of nitric acid are beneficial when small ulcers in the mouth or stomatitis exist. In gastric indigestion, intestinal dyspepsia, the green summer diarrhea of children, and combined with pepsin in the chronic diarrhea of children, it is stimulant and astringent. A lotion of nitric acid, 1/2 to 1 dram to a pint of water, is of service in bleeding hemorrhoids. The dilute acid should be taken through a glass tube to protect the teeth.

In cholera morbus:

℞. Nitric acid, ʒ j
Tincture of opium, gtt. xl
Camphor water, ʒ viij.
Give one-fourth part every 3 or 4 hours.

Nitrohydrochloric acid is an efficient cholagog, and is employed with benefit in jaundice, dyspepsia, the so-called bilious condition, and also in acidity of the stomach. The official dilute acid rapidly deteriorates, and the strong acid also is unstable. It is best to use only the strong acid freshly prepared, which is of an orange-red color. This should be constantly protected from light and taken well diluted.

NITRITES.—The salts of nitrous acid, HNO_2. The term is also applied to certain combinations with organic radicles, as nitroglycerin, $C_2H_5(NO_2)_3$, nitrobenzol, amyl nitrite, and other compounds.

Physiologic Action.—Amyl nitrite and the other nitrites agree closely in their general action, producing great vascular dilatation by paralyzing the sympathetic system, the vasomotor center, or the muscular coat of the arterioles—which, is yet undecided. They cause tumultuous action of the heart by relaxing its inhibition; lowered respiration, from paralysis of the respiratory muscles and impairment of the ozonizing function of the blood; diminution of sensation, motility, and reflexes; a sense of heat, but lowered body-temperature; also throbbing pain in the head, beating carotids, quickened pulse, flushed face, and vertigo. Sodium nitrite is slower in action than amyl nitrite, and does not cause so much throbbing headache as nitroglycerin. It may be given in solution with water. The action of all these agents is

probably due to the nitrous acid contained in them. Nitroglycerin acts similarly to the nitrites, but less promptly, and its action is more enduring. The headache it produces is of intensely frontal character, and persists for hours after the other effects have passed off. It is more suitable than amyl nitrite for internal administration.

Therapeutics.—Amyl nitrite possesses a peculiar fruity odor. It is useful in attacks of angina pectoris, asthma, epileptiform convulsions, transient hemianopsia, and occasionally in sea-sickness. Dose, internally, 1/4 to 1 minim, dissolved in alcohol; by inhalation 2 to 5 minims, generally put up in glass beads.

Nitroglycerin is sometimes of benefit in neuralgic dysmenorrhea and in sea-sickness; in chronic interstitial nephritis; and in hiccup and migraine of spasmodic character, and has given immediate relief in neuralgia of the fifth nerve and in sciatica. In angina pectoris it gives more lasting effects than amyl nitrite. In the weak heart of the aged, or in that from fatty degeneration, or when, as in Bright's disease, arterial tension is above the normal, and in irritable and overacting heart, it is of service. It is a dangerous explosive, and should not be kept in stronger solution than 1 percent. Dose, 1/200 to 1/50 minim or more, according to susceptibility.

Sodium nitrite may be used in hemicrania, angina pectoris, and in asthma of purely bronchial and neurotic origin. In chronic desquamative nephritis, with a weak and dilated heart, it is useful. By prescribing it with spirit of chloroform or ammonia water, and small doses of morphin, disagreeable symptoms may be avoided. Dose, 1/2 to 3 grains.

Poisoning.—Ergot, belladonna, strychnin, brucin, digitalis, picrotoxin, and all other agents which increase the functional activity of the spinal cord and sympathetic, are antagonistic, though by reason of their slower rate of diffusion the antagonism may not always be available. Stimulants, artificial respiration, the alternate cold and hot douche, with cold to the head, and ergotin or atropin subcutaneously, are the best means to be used in cases of poisoning by the nitrites.

NITROGLYCERIN.—See Nitrites.

NITROUS ETHER.—See Ether.

NITROUS OXID.—N_2O. Nitrogen Monoxide. A gaseous compound known also as laughing gas, devoid of odor, but with a slightly sweetish taste, which, when inhaled, produces mental exaltation and cerebral excitement, followed by anesthesia. It is the safest of all anesthetics, but ought not to be given to those far advanced in age or having atheromatous arteries. It rarely produces any disagreeable after-effects, save a slight dizziness for a few hours. It is much used in dentistry. Its preparation requires apparatus too cumbersome for the ordinary practitioner of medicine. When first inhaled, the face becomes flushed, then of deadly pallor, and the lower jaw may drop; at this time anesthesia is complete, and the operation should be quickly performed. The gas should be administered without access of air, and if so, insensibility is usually attained in from 50 to 80 seconds from the commencement of inhalation. The following points are to be studied in the administration of nitrous oxid as an anesthetic:

1. The patient should have a full and free expansion of the chest. To obtain this all impediments to free chest movement should be removed. The head should not be thrown back nor flexed in any direction, and the feet should be so placed that if violently extended, they cannot come in contact with a wall or other fixed point of resistance. Two hours after a moderate meal is not too soon for administration. It may be reinspired with safety, when necessary.

2. The apparatus employed should be of modern description, and in good working order. Nitrous oxid is supplied in a liquid form, condensed by its manufacturers into wrought-iron bottles, whence it is liberated into bags from which it is to be inhaled. The bag should not be filled within the patient's sight, never overfilled, and should rest in the patient's lap during inhalation. The bottles should be small, duplex, and should both be connected with the air-bag, so that one may be drawn from if the other is exhausted, without delay. The screw-plugs in bottles should be turned loose, and away from the operator or surrounding persons. The mask may be of celluloid, and its rubber pad should be inflated immediately before use.

3. During administration the mask should fit so closely as to allow no admission of air. If it is wished to prolong unconsciousness, the mask should be lifted up after 6 or 8 full breaths of gas have been taken, or signs of anesthetization are apparent, so that air may be once more inhaled, and more gas then administered, etc.

4. During and immediately after operation care is to be exercised against a vigorous inspiratory effort drawing materials—blood-clots, portions of extracted teeth, or other substances—into the larynx. The mouth is to be washed out while the head is turned to one side.

5. If possible, a qualified assistant should be on hand to administer the gas, and to guard against complications from the possible occurrence of erotic delusions in female patients.

For description of nitrous oxid and oxygen anesthesia in major surgery, see Anesthetics (General).

NOCTURNAL EMISSIONS.—Too frequent emissions reduce the strength, make the patient irritable and weak, and gradually prey upon his mind. When masturbation is practised, extreme mental depression ensues. Nocturnal emissions occurring in normal males who are continent and chaste are not to be interfered with unless excessive.

Treatment.—Unchaste literature and lascivious thoughts are to be avoided. A hard mattress and light covering is advisable. Sleeping on the back is undesirable. A spool is sometimes tied around the loins so that when the sleeper rolls on his back, he is awakened by the pressure. Of drugs used to prevent the nocturnal emissions, potassium bromid, in doses of 20 grains at bedtime, or the same amount of chloral, may be taken. Hyoscin

hydrobromid, 1/100 grain, has been recommended. Cold sponging of the perineum and loins night and morning has been of great benefit. All irritations of the bladder or genitourinary system should be corrected. Potassium citrate, in doses of 20 grains in water 3 times daily, will render the urine unirritating and alkaline, and allay a provocative cause of emissions. Arsenic alone or in combination with strychnin is often of service when given in full dose. Stimulating foods and drinks are to be avoided.

NOCTURNAL ENURESIS.—See Urine (Incontinence).

NOMA.—See Stomatitis (Gangrenous).

NOGUCHI'S TEST.—See Syphilis.

NOSE-BLEED.—See Epistaxis.

NOSE, CARIES AND NECROSIS.—Inflammation of the bones of the nose, leading to caries and necrosis, is usually the result of syphilis, hereditary or acquired; but it may be due to tubercle or glanders, to injury, the presence of foreign bodies, septic decomposition, mercury, and occasionally the fumes of bichromate of potassium. The septum may be attacked, so that the bridge of the nose sinks in (although, in an adult, a great deal may be lost without any apparent alteration in shape), or the turbinate bones, or the roof, and in the latter case there is always the risk of meningitis.

The symptoms are those of inflammation of the mucous membrane, but the discharge is always profuse and fetid, the breath exceedingly foul, and nothing, so long as any dead bone exists, gives more than temporary relief. In many cases the diagnosis is clear at once; either there is a perforation of the hard plate, or a probe introduced into the nasal cavity strikes the sequestrum at once; but sometimes, especially when it lies toward the upper and back part, detection is a matter of very great difficulty.

Treatment.—The dead bone must be removed as soon as it is loose, careful attention being paid at the same time to any constitutional taint that is present. In most cases it can be extracted, under an anesthetic, through the anterior nares; sometimes it is easier to push it back into the pharynx (the two forefingers can usually be made to meet in the inferior meatus of the nose, the one introduced from the front, the other from behind, when the patient is anesthetized), but the operator must be prepared for free, though not usually serious, hemorrhage. When, owing to the size of the fragment, this cannot be done, Rouge's operation may be performed—*i. e.*, an incision made through the mucous membrane, where it is reflected from the under surface of the upper lip on to the gum, the cartilaginous septum detached from the anterior nasal spine, and, if necessary, from the maxillary crest; the alæ detached at the margins, and the upper lip with the nose lifted up and reflected on to the forehead. The nasal cavities are thoroughly opened up to view by this, the whole interior can be examined, and then the nose and lip replaced without a suture being required or a mark left. If the dead bone, without being loose, is fairly accessible, as frequently happens in hereditary syphilis, it may be partially dissolved away by a sulphurous acid spray (which also helps to check the fetor), and occasionally can be chipped off in little pieces with a fine chisel, but care must be taken that the instrument does not slip and penetrate the roof. See Rhinitis (Chronic).

NOSE, CATARRH.—See Rhinitis.

NOSE, DEFORMITIES.—**Congenital malformations** are rare; deformities, on the other hand, resulting from injury, lupus, or syphilis, are very common.

Deviations of the septum, if causing severe symptoms, may be straightened by means of forceps or operation, but the tendency to return is often so great that either the process must be repeated again and again, or an intranasal splint must be worn for some time.

Extensive destruction of the soft parts can sometimes be remedied by means of a plastic operation; but in cases in which it is due to disease, this should never be attempted until the stump is perfectly sound.

The two best known methods of **rhinoplasty** are the Indian, and that first carried out by Tagliacozzi (the Italian). In the former a flap of suitable shape is marked out upon the forehead, having its pedicle immediately over the root of the nose, or slightly to one side, so that it can be twisted down more easily. This is carefully dissected up [Langenbeck recommends that the periosteum should be brought away with it], adjusted in a bed prepared for it by cutting away the old scar-tissue around the margins of the orifice, and secured with sutures, hollow plugs being inserted into the nostril, so that it may retain its shape. To avoid the sinking inward of the tip, Langenbeck reflected some of the bony margin of the nostril, fashioning a flap from each side, so that they should meet like the rafters of a roof in the middle; but when the nose has been destroyed by inflammation, this proceeding is rarely practicable. In the Italian method the skin is taken from the arm over the biceps. In the original plan the flap was raised by an incision down each side and left to granulate; then the upper end was separated; and, after the skin, detached now on 3 sides, had begun to shrink, it was carefully fixed by sutures in the freshly cut margins of the defect. The arm is fixed with plaster bandages in a suitable position, and must be so retained without the slightest traction for at least 8 days. The treatment has since been shortened by detaching the flap at an earlier date, but naturally with some risk. Of these two methods there is no doubt that the former is the better when it is practicable, in spite of the scar it leaves. In the latter the transplanted flap sinks into a shapeless mass. Neither, however, is really satisfactory, and it is probable that in most cases the deformity would be better concealed by an artificial nose made from vulcanite or enameled silver and fastened on to the spectacle-frame.

In cases in which one ala only is defective, Langenbeck's plan of reflecting a flap from the other on the opposite side (leaving it attached by a bridge upon the dorsum) tends to diminish, or at least equalize, the deformity. There is, however, some

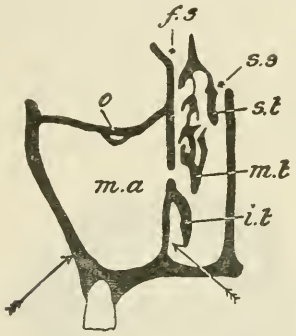
difficulty in separating the skin from the cartilage without cutting or bruising it, owing to the very close connection that exists between the two. See PLASTIC SURGERY.

NOSE, DISEASE OF THE ACCESSORY SINUSES

Empyema of the Maxillary Antrum

This sinus is an air space in the upper jaw lined with thin mucous membrane and communicating with the middle meatus of the nose by an opening about one inch above its floor. Into the floor project the roots of the molar teeth, which are separated by only a very thin plate of bone; but the roots of any of the teeth in the upper jaw may communicate with it.

Empyema of the antrum is a collection of mucopus prevented from escaping into the nose owing to the orifice being obstructed, or owing to the fact that it is above the level of the floor. The empyema may form in course of an acute inflammation, especially during influenza, or may occur



THE MAXILLARY ANTRUM.

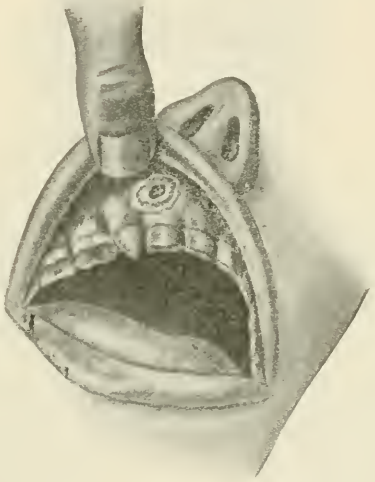
i.t, *m.t*, *s.t*. Inferior, middle and superior turbinals. *m.a*, Maxillary antrum opening into middle turbinal fossa. *f.s*, Frontal sinus and infundibulum, into which open anterior ethmoidal cells. *s.s*, Orifice of sphenoidal sinus. *o*, Infraorbital canal. Arrows show the points at which the antrum is punctured.—(*Spencer and Gask.*)

as a subacute affection by extension from a dental alveolus, and less commonly from necrosis of bone; or it may be a mere chronic retention, owing to the orifice being blocked by nasal polypi. An empyema may rarely be the result of an acute osteomyelitis of the walls of the maxillary antrum, set up by septic inflammation in the mouth, such as cancrum oris, or it may follow gonorrheal conjunctivitis.

The **signs** are neuralgic pain and inflammatory swelling of the cheek, with fever. Pus may escape from the nose, pale yellow, intermittent in its flow, and its odor will then be perceived, especially by the patient; whereas in atrophic ozena the patient may be unconscious of the foul odor, so evident to bystanders. It flows when the patient's head is bent forward, or may be directed backward into the pharynx and disturb the patient's appetite. The interior of the nose should be wiped free of pus, and the patient's head bent, after which the meatus will be again full. When it does not escape the signs of tension are more marked.

Transillumination of the upper jaw serves to confirm this. The patient is seated in a dark room, or is examined under a photographer's cloth, supported by an umbrella. A small electric lamp is placed in the mouth and the lips closed, when a dull glare will illuminate the sound cheek and pupil, leaving the pupil on the diseased side and the infraorbital region partly in shadow. With eyes closed the patient experiences a dull red glow in the eye of the sound side, which is absent on the diseased side. It is this unequal illumination of the two sides which is important for diagnosis.

If neglected, the empyema may burst on the cheek or lead to necrosis of the upper jaw, or there may be septic absorption resulting in pyemia; or septic thrombosis of the orbital veins may occur, producing proptosis or acute optic neuritis; or the



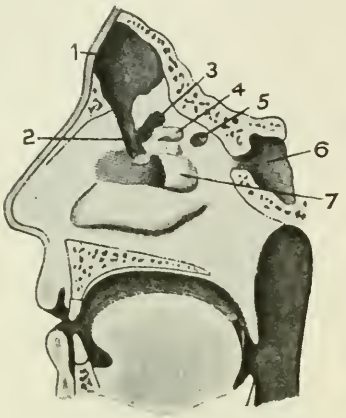
PUNCTURE OF THE MAXILLARY ANTRUM THROUGH THE CANINE FOSSA.—(*Spencer and Gask.*)

thrombosis may extend further back to the cavernous sinus and brain, setting up meningitis.

Treatment.—Cocain is applied to the inferior meatus and then a trocar and cannula is pushed through the wall into the antrum. If pus escapes the cannula can be kept in or it is replaced by a tube and the antrum frequently irrigated. Or the hole may be enlarged under gas at the same time that the anterior end of the inferior turbinal is removed. This provides an opening level with the floor of the antrum which shows no tendency to close, and through which the antrum can be easily irrigated or by passing a catheter like a eustachian, or female urethral catheter. If there are polypi to be removed from the antrum, the aperture as above is further enlarged by raising the lip from the gum so as to expose the lateral nasal wall of the superior maxilla which is chipped away until

a finger and a sharp spoon can be inserted. Polypi and dead bone are scraped away, but healthy mucous membrane is left. After this a plug of iodoform gauze is inserted and brought out through the nostril, while the communication with the mouth is closed by suture. Blood is prevented from running back by temporarily plugging the posterior nares before cutting away the turbinal.

If the disease is dental in origin the antrum may be perforated through the canine fossa, and a counter-opening made into the inferior meatus



Sinuses Opening into the Upper Part of the Nose.

1. Frontal sinus. 2. Infundibulum. 3. Opening of anterior ethmoidal cells. 4. Superior turbinal. 5. Opening of posterior ethmoidal cells. 6. Sphenoidal sinus. 7. Middle turbinal partly cut away. (*Spencer and Gask.*)

of the nose as above; for then the communication with the mouth will soon close spontaneously. Dental surgeons, instead of making the counter-opening, pass a short cannula through the perforated socket of an extracted tooth, the lower end of the cannula being fixed in a dental plate and closed by a split plug with a knob to facilitate withdrawal. This is retained until the mucous membrane of the antrum has returned to the normal. But the objection is that dead bone, polypi, or food materials from the mouth may keep up the discharge indefinitely.

Mucocele and Empyema of the Frontal Sinuses. **Mucocele.**—Retention of mucus may occur in the frontal sinus owing to swelling and hypertrophy of the nasal mucous membrane over the middle turbinal, or to the formation or polypi in that region. The anterior wall of the sinus after a time becomes thinned and a fluctuating swelling forms on the forehead to one or both sides of the middle line. An acute inflammation of the nasal mucous membrane, such as may be set up by influenza, may spread up the infundibulum to the frontal sinuses, giving rise to an *empyema* with or without an intermittent discharge of pus into the nose.

The **symptoms** are frontal headache, and when there is suppuration, severe frontal pain, also redness and edema of the forehead and eyelids, and later fluctuation and pointing. With this is a continuous discharge of pus through the infundibulum, or the passage of a probe into the infundibulum may push aside polypoid granulations, and be followed by a flow of pus.

An X-ray examination shows the size of the frontal sinus, which varies from a small dilatation of the upper end of the infundibulum to one extending upward on the forehead and outward to the outer angle of the orbit, the sinus of the two sides freely communicating.

Treatment.—A *mucocele* may be relieved by excising the anterior end of the middle turbinal bone and also any polypi, then the frontal sinus is washed out by passing a cannula.

An *empyema*, when the mucous membrane is still healthy, may be relieved in the same way. If it is of some standing and there is a polypoid degeneration of the mucous lining, an incision is required. This is an angular one about 1 1/2 inches in length, through the inner margin of the eyebrow down to the bone. The periosteum along with the pulley of the superior oblique muscle is pushed toward the orbit. Then the floor of the frontal sinus is entered at its lowest level through the roof of the orbit just behind the inner angle. The whole sinus is scraped out including the infundibulum, and a free communication with the nose reestablished. A rubber tube is now cut off the length to reach from the upper end of the infundibulum to the free margin of the anterior nares. To hold it in place a temporary suture is

Frontal Sinus Operation.

On the right side is shown the line of the incision; on the left side, the opening made into the sinus. (*Spencer and Gask.*)

inserted at each end of the tube. This enables the skin wound to be entirely closed, and so a fistula and puckered scar is avoided.

In the case of a very large frontal sinus some of the anterior and inferior wall must be clipped away, and the nan iodoform plug is required to stop the hemorrhage, after the removal of which a secondary suturing of the skin can be done.

Disease of the Ethmoidal and Sphenoidal Sinuses. —The ethmoidal sinuses lie along the inner wall of the orbit, and a mucocele produces a swelling on the inner side of the orbit, which pushes the eye outward and causes squint.

The sphenoidal sinus lies behind in the base

of the skull. The orifice of the sphenoidal sinus can be reached by first applying cocain, then passing a probe backward and upward across the center of the middle turbinal, while the shank of the probe is kept in contact with the lower margin of the anterior nares.

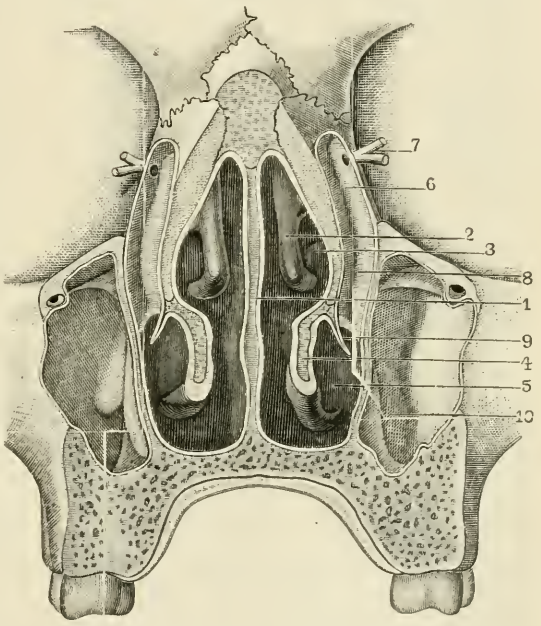
Ethmoidal and sphenoidal empyemas give rise to deep-seated pain in the orbit and back of the nose, with a discharge into the nasopharynx. The dangerous complications are septic basal meningitis and thrombosis of the cavernous sinus. Exophthalmos, ptosis, strabismus, retrobulbar neuritis, and blindness occur when the nerves at the back of the orbit become involved. **Treatment.**—Removal of the anterior end of the middle turbinal may relieve simple retention. The ethmoidal cells may be curetted from the nose, regard being had to the nearness of the meninges and cavernous sinus. The anterior ethmoidal cells are reached through the inner side of the orbit, by extending the incision for the frontal sinus a little downward. The sphenoidal sinus opening is enlarged under the guidance of the probe passed as above. A general anesthetic may be given, a speculum inserted, and a fine cutting hook is passed in and the orifice enlarged, or fine punch forceps may be employed for the purpose. (Spencer and Gask.)

NOSE, EXAMINATION.—This organ consists of two parts: the external, made up of skin, cartilage, and bone; and the internal, or nasal fossæ, which communicate with the pharnyx posteriorly through the medium of the posterior nares. The anterior nares form the entrance to the nostrils. Each nostril contains 3 turbinated bones—the superior, middle, and inferior—thus dividing it into the superior, middle and inferior meatuses. The whole of the internal surface is covered with mucous membrane, that on the turbinated bodies being easily congested and highly erectile. The portion covering the lower and anterior portions of the middle and inferior turbinated bodies frequently gives rise to catarrhal inflammation with obstruction of the nasal chamber. Thick, viscid mucus is constantly secreted from muciparous and serous glands lining the internal surface of the nostrils, which catches foreign particles that have been inhaled and also warms the air before it reaches the lungs. The nasal cavities (choanæ) communicate with the ethmoid, frontal, and sphenoid sinuses and the antrum of Highmore, all of which are lined by a prolongation of the nasal mucous membrane. The superior portion of each nasal chamber is supplied by filaments from the olfactory nerve and controls the sense of smell, while that portion below the lower border of the middle turbinated bone may be termed the respiratory portion.

Anterior Rhinoscopy.—The essentials are: A good light, a nasal speculum, a nasal probe, and a head-mirror with a central opening.

The patient should be seated facing the examiner, and with the light behind or on each side of head, and on a level with the eye of the operator. After anesthetizing the anterior nares with a few drops of a 10 percent solution of cocain, the nasal speculum is introduced, and at the same time the light is reflected into the nares by means of the head-mirror. It is essential for the examiner to always look through the central opening of the head-mirror rather than from above or below. It is best to examine the nares anteriorly, gradually going backward until the whole anterior chamber has been surveyed. A hypertrophic condition can be quickly determined by applying a few drops of a solution of cocain (10 percent) to a suspected spot by means of a pledget of cotton wrapped around the probe, when, if no organic change has taken place, the erectile tissue quickly contracts and the enlargement disappears. Care should be exercised at all times against cocain poisoning.

Posterior Rhinoscopy.—For this are needed a tongue-depressor, head-reflector, throat-mirror, palate-hook, and throat-applicator. The patient should be seated in the same position as for anterior rhinoscopy. A few drops of a solution of cocain (5 percent) are then applied to the upper and posterior vault of the pharynx and the palatine folds (care being exercised to prevent swallowing the fluid), and, after waiting a minute or two, the tongue-depressor is inserted in the mouth to a sufficient distance to hold the organ down, but not sufficiently to cause gagging. The light is then directed toward the pharynx, and the mirror, after being slightly heated (to prevent it becoming



Transverse Section of Nasal Fossæ.

1. Nasal septum. 2. Anterior extremity of middle turbinated bone. 3. Middle meatus. 4. Section of inferior turbinated bone. 5. Inferior meatus. 6. Lacrimal canal. 7. Canaliculi. 8. Nasal canal. 9. Section of reflected mucous membrane. 10. Maxillary sinus or antrum of Highmore.

cloudy from the moisture during respiration), is introduced well back into the pharynx, and, by rotating it slightly, the choanæ are surveyed thoroughly. Subsequently the lower portions of the posterior nares are examined. Directions should be given to the patient to breathe naturally during the examination, otherwise the soft palate retracts and closes the posterior orifices. In some cases the tongue-depressor causes gagging, and in these cases the organ may be held out of the way by grasping it within the folds of a napkin. The examination is often an educative one on the part of the patient, and the first trial may fail.

NOSE, FOREIGN BODIES.—Peas, beads, pebbles, beans, marbles, and the like are sometimes pushed up the nose by children, and sooner or later lead to inflammation and nasal discharge. Foreign bodies may enter the nose from vomiting. Insects may fly or crawl into the nose.

In cases in which it is difficult to grasp the foreign body with a small blunt hook, scoop, or properly curved forceps, or to push it back into the pharynx, the following device may be employed: A small sized Nélaton catheter, to the distal end of which a long silk ligature is attached, is carefully and slowly passed into the nares until it reaches the pharynx; the gagging induced forces the catheter out of the mouth; it is then seized and the ligature pulled through, about 8 inches being allowed to remain outside of the nose. A small wad of absorbent cotton fastened to the buccal end is slowly drawn upward into the posterior nares and along the inferior meatus. The foreign body, particularly if it is a tack or an object with jagged edges, is generally caught and dragged out of the anterior nares with the cotton.

The appearance of the nasal mucous membrane after the removal of the offending body is apparently one of severe ulceration. Under simple instillation of lukewarm salt-water (0.75 per cent), or weak boric acid solution, the parts readily and quickly assume their normal appearance.

NOSE, FRACTURE.—The nasal bones often suffer from direct violence; the fracture may be compound, either externally or internally, or both, or it may be comminuted, and the injury may be limited to the bones themselves, or the septum may be bent or crushed in, or the other bones that surround the nasal cavities may be involved as well. Hemorrhage is always profuse; emphysema is occasionally present from the escape of air into the tissues, and deformity and swelling are generally very considerable.

Treatment.—No pains should be spared to effect reduction as early as possible. Manipulation is exceedingly painful, so that, if the displacement is at all extensive, it is advisable to give an anesthetic. The bleeding, which is sure to be profuse, must be checked afterward by injecting ice-cold water, or by the application of an ice-bag. Elevation from within with a steel director, or a pair of dressing-forceps, may be tried first, but they are not of much service in really bad cases. In some instances it is necessary to grasp the fragments with smooth-bladed forceps, bent so as not to pinch the soft tissues near the nostril, and twist them into position. Later on a great deal may be done to correct any deformity that is left by means of pressure. A spring truss may be used, especially at night, outside the face, or, as Erichsen suggests, india-rubber bags may be introduced into the nostril and inflated. Spectacle- or eye-glass splints have also been used with success. Suppuration is not uncommon, but it is rarely serious; ozena and necrosis, however, occasionally occur, and when the fracture extends on to the face so as to involve the nasal process of the superior maxilla, stricture of the lacrimal duct generally follows.

NOSE, POLYPS.—Polyps of the nasal passages form soft, gelatinous, semitranslucent masses, pale pink or yellow in color, projecting from the surface of the mucous membrane, and sometimes reaching far into the anterior and posterior nares. At first they are small and sessile, and in any advanced case numbers in this stage can be seen between the larger ones. Those that project toward the front may usually be seen at once (or if the patient expires forcibly) forming smooth, pedunculated masses very soft to the touch, and moving up and down with each breath. The deeper ones may require a speculum, and those that grow into the posterior nares can only be detected by introducing the finger round the margin of the soft palate. Occasionally, when one has been exposed to the air for any time, the surface becomes dry and rough, and then it may possibly be mistaken for an overgrowth of the mucous membrane over the inferior turbinated bone; otherwise it is difficult to see how such an error can arise.

Symptoms.—Chronic catarrh is always present. The breathing is obstructed (especially in wet weather, when the polyp swells up); the mouth is held open; the voice is altered and becomes muffled; the sense of smell, and often that of hearing, is lost; and nearly always there is constant frontal headache. In severe cases the shape of the nose may become altered by the internal pressure; the lacrimal duct obstructed; the septum displaced to one side; and the eustachian tube occluded. As a rule, there are no bleeding and no offensive discharge, both of which symptoms are common in the case of malignant growths.

Treatment.—There are various ways of removing polyps. The simplest is to grasp the neck as high up as possible with a pair of slightly curved forceps, having long serrated blades, and twist it round and round until it comes away. If there is a very distinct pedicle, the ordinary wire écraseur may be employed, or the galvanocautery, cocain being used to allay the pain and prevent sneezing. Polyps that lie far back, in or near the posterior nares, can only be snared if the forefinger of the other hand is carried around the back of the soft palate to guide the loop. The bleeding is free, but ceases at once upon the application of ice-cold water. The chief difficulty is to make the removal thorough; and the operator should not be satisfied until the passage between the two nares is completely freed. Even then many small growths

must be left behind, and these, released from the pressure of the larger ones and stimulated by the inflammation that follows the operation, are almost sure to spring up rapidly. To prevent this, tannic acid or sulphate of zinc may be used as snuff, or the cavity may be washed out with boric acid and alcohol, or with other astringents; but constant care is needed. In the worst cases it may be necessary to perform Rouge's operation.

After removal, true polyps return rapidly, hence it is necessary to have the case under observation; the base of each polyp should be cauterized with trichloracetic acid or the galvanocautery. Should a young polyp be detected, it should be removed at once, and its base treated accordingly. The nasal passages should be kept cleansed with some simple collunarium, such as chlorate of potassium and bicarbonate of sodium in water at 95° F., followed by a spray of some bland protective, such as albolin or vaselin, to the cauterized surfaces and mucous membrane. This local treatment should be conjoined with such drugs as will improve the constitutional condition of the patient, as arsenic, syrup of the iodid of iron, or the hypophosphites. See Adenoid Vegetations.

NOSTALGIA(Home-sickness).—An abnormally exaggerated longing for home, relatives, or friends. It is most frequent among the Swiss mountaineers and other persons who have always led an isolated life, and have been more or less dependent upon a small circle of relatives and friends for companionship and diversion. Nostalgia represents a combination of psychic and bodily disturbances, and must be defined as a disease, and may become the object of medical treatment. It is most troublesome when it occurs in new military recruits, and may lead to melancholia and even death. Often the only cure is to allow a return home. Nostalgia must not be confounded with disappointment or moroseness produced by illness, bad temper, or discontent with the temporary position abroad. Compulsory absence from home has great influence in causing nostalgia, and in these cases there is more liability to nostalgia than in those in which the patients are at liberty to go where they please.

NOVARGAN.—Silver proteinate. An organic silver-albumin compound containing 10 percent of silver. As a bactericide, it is claimed to be more effective and less irritating than other protein-silver compounds. In the form of a 15 percent solution it is said to be useful for the treatment of gonorrhea, especially as an abortive in the first stage.

NOVASPIRIN.—Methylene-citrylsalicylic acid. It is decomposed in the intestines into methylene-citric acid and salicylic acid after passing through the stomach unchanged. Its diaphoretic action is slight, and it is said to be devoid of unpleasant effects. It is recommended in influenza, neuralgia, gouty and rheumatic conditions. Dose, 8 to 15 grains.

NOVOCAIN.—A local anesthetic similar to cocain. It is recommended as a substitute for the latter and is claimed to be far less toxic than any of the cocain substitutes.

NUCLEIN.—Nuclein is that constituent of the cell by virtue of which it grows, develops, and reproduces itself. It is the chemic basis of the nucleus. Nuclein is contained in the cellular envelope of the tubercle bacillus, and it is the nuclein which takes the stain. It has been obtained from the thymus and thyroid glands, spleen, testicle, white of egg, and from brewers' yeast. It is abundant in the polymorphonuclear leukocyte, and is set free upon the destruction of those corpuscles. When glandular activity is at its highest, leukocytosis occurs, hence an increased amount of nuclein, and concurrently an increase in the germicidal property of blood-serum. The number of kinds of nuclein is limited only by the different varieties of cells.

While Vaughan and other authors look upon nuclein as the essential element that gives the blood-serum its specific germicidal properties, there are others (probably the majority) who maintain that the ductless glands—thyroid, thymus, suprarenal and pituitary bodies—all secrete certain essential principles, which not only are used for the general body nutrition, but also aid in protecting the system against attacks by pathogenic microorganisms.

Many look upon nuclein as the prototype which gives rise, by decomposition, to alloxin bodies, of which uric acid is a member, and it is believed that the latter product in great part depends upon the amount of nuclein destroyed in the system, and that it rises or falls concurrently with the destruction of nuclein.

Chemically, nuclein consists of a complex proteid base and nucleinic acid, containing from 5 to 9 percent of phosphorus. The terms "nuclein" and "nucleinic acid" are often used interchangeably, as it is generally impossible to obtain nucleinic acid from the albuminous base. Physiologically, nuclein acts by stimulating glandular activity with increase in the number of polymorphonuclear leukocytes, and therefore as increase in the germicidal action of blood-serum. By some authors nuclein is supposed to be the "natural antitoxin."

Nuclein has a selective action and is not germicidal to certain varieties of bacteria. It, however, kills the tubercle bacillus. Introduced into the system hypodermically, it causes, within 3 to 5 hours, an increased frequency of the pulse, a rise of 1 degree or more in the temperature of the body and an increase in the number of multinuclear leukocytes (leukocytosis). In 76 cases of tuberculosis in all stages and with no exclusions, Vaughan reports recovery in 24 percent. King reports 30 similar cases with 22 percent recoveries. The remedy to be effective must be given hypodermically, once daily, over long periods (frequently months), selecting a slightly alkaline solution. Vaughan employed the 1 percent solution in doses of 60 to 80 minims, while King used the 5 percent solution in doses of 50 minims.

Nuclein has been successfully used in diphtheria, suppurative tonsillitis and other suppurative disorders, also in chronic rheumatism and malaria, chronic bronchial catarrh and neurasthenia.

Experience goes to show, however, that in cases in which there is rapid destruction of living tissue

and great depression the remedy is of no benefit and may do harm.

NUCLEOALBUMIN.—One of the series of nucleins obtainable from cell protoplasm, poorer in nucleinic acid than the plastins of the nucleus. It appears to be the most constant of the proteids obtainable from cell protoplasm, but is not confined to cells, being the chief constituent of tissue-fibrinogen. The chief proteid of milk (*caseinogen*), the so-called mucin of bile, and the mucinoid substance in the mucus of urine, are nucleoalbumins. Nucleoalbumin is insoluble in acetic acid, precipitable by magnesium sulphate, not reducible by prolonged heat in the presence of an acid. It is formed by the combination of nuclein and albumin in the process of digestion. It contains phosphorus. The presence of nucleoalbumin in the urine has been observed in leukemia, icterus, diphtheria, and in scarlatina and other varieties of nephritis.

NURSING.—See Infant Feeding, New-born Infant.

NUTMEG.—See Myristica.

NUTMEG LIVER.—A mottled appearance of the liver, the center of the acini being dark, while the periphery is lighter in color. The condition is seen especially in passive congestion and in fatty infiltration. See Liver.

NUX VOMICA (Poison Nut, Quaker Button, Dogbutton).—The dried, ripe seed of *Strychnos nux-vomica*, containing not less than 1.25 percent of strychnin. Its properties are due mainly to two alkaloids—strychnin and brucin—with the properties of which its own properties are identical. In small doses it is a bitter tonic, exciting the secretions and stimulating the functions of the body. In larger doses it exalts the function of the spinal cord, causing tetanic spasms of the extensor muscles. In toxic doses it paralyzes the functions of the spinal cord, arrests respiration, and causes death by suffocation. It is valuable as a general tonic in cardiac failure, in hemiplegia, dyspnea, and in certain forms of amblyopia. Strychnin is now the acknowledged remedy for inebriety. The tincture of nux vomica is excellent in atonic dyspepsia and gastric catarrh, especially in drunkards and in constipation from atony. It is valuable in neuralgia, in the condition known as torpid liver, and, through its influence on the pneumogastric, in many kinds of coughs. Dose, 1/2 to 1 1/2 grains.

The alkaloid strychnin is also contained in the St. Ignatius' bean, or ignatia in the proportion of 1 percent, and in the bark of the tropical blind-weed, a creeping vine found in the mountains of Tonquin and Cochin China.

Poisoning by strychnin has some points in common with tetanus. In the latter affection the lower jaw first manifests stiffness, and is affected throughout the attack, while in poisoning by strychnin the jaw is not affected until late, and then only during the paroxysm. The diagnosis of strychnin poisoning from hysteria requires attention only for a short time.

Treatment.—Vomiting should be encouraged if convulsions have not already set in; in such case the stomach-pump may be used. Quiet and absolute rest are to be obtained as soon as possible, and the patient removed from every irritation, as a mere touch may set up a convulsion. Large doses of chloral hydrate may be given in doses of 1/2 dram, repeated in a half-hour. Potassium permanganate given in large doses may be antidotal. Tannic acid forms an insoluble tannate, and iodin in dilute solution and soluble iodids are antidotes. Butylchloral hydrate is a very active antagonist. Potassium bromid is too slow in action for practical use. Chloroform or ether may be used to bring about muscular relaxation. Hydrastin hydrochlorid, in doses of 1 grain hypodermically, has been successfully employed, and amyl nitrite has been given by inhalation with good result.

Incompatible with *nux vomica* and *strychnin* are alkalies and their carbonates, bromids, iodids, chlorids, and all other alkaloidal precipitants. Oils and fats retard the absorption of strychnin salts. Physiologically incompatible are aconite, alcohol, amyl nitrite, atropin, chloral hydrate, chloroform, curarin, digitalis, hydrocyanic acid, morphin, nicotin, paraldehyd, physostigmin, potassium bromid, urethane.

Preparations.—**Extract Nucis Vomicæ** should contain 5 percent of strychnin. Dose, 1/8 to 3/4 grain up to a maximum in 24 hours of 2 grains. **Fluidextract Nucis Vomicæ** should contain 1 percent of strychnin. Dose, 1/2 to 1 1/2 minims. **Tinct. Nucis Vomicæ** should contain 1/10 percent of strychnin. Dose, 5 to 15 minims. **Strychnin,** an alkaloid obtained from nux vomica, ignatia, and other plants, crystalline, intensely bitter even in 1 to 700,000 solution, of alkaline reaction, soluble in 7 of chloroform, 110 of alcohol, 6700 of water. It is a constituent of ferri et strychninæ citras, pil. laxativæ comp., and the elixir, glyceritum and syrupus ferri quininæ et strychninæ phosphatum. Dose, 1/100 to 1/30 grain. **Strychninæ Sulphas,** crystalline, efflorescent, odorless, of intensely bitter taste, even in 1 to 700,000 solution, neutral reaction, soluble in 50 of water, in 109 of alcohol, and in 2 of boiling water, insoluble in ether. It contains 75 percent of strychnin. Dose, 1/100 to 1/20 grain, but after tolerance is attained much larger doses may be safely used. **Strychninæ Nitras,** soluble in 90 parts of cold water, 3 of boiling water, in 70 of alcohol, and in 26 of glycerin, insoluble in ether. It contains 84 percent of strychnin, and is preferred to the sulphate for hypodermic use, being less irritant. Dose, 1/100 to 1/20 grain, or more after tolerance is attained. The nitrate in doses of gr. 1/30 to 1/20, hypodermically three or four times daily for a week, and less frequently for two weeks longer, removes the craving for stimulants, counteracts the vasomotor paralysis to which most of the injurious effects of alcohol are due, and is probably in other respects a true antagonist to the action of that narcotic poison on the human organism.

NYCTALOPIA.—Nyctalopia etymologically means night-blindness, but the general usage making the term mean night-vision is so strongly intrenched that it is useless and confusing to

reinstate the old significance. The condition in which one sees better at night, relatively speaking, than by day, is due to some lesion in the macular region rendering it blind; at night the pupil dilates more than in the daytime, and hence vision with the extramacular or peripheral portions of the retina is correspondingly better. Nyctalopia is a symptom of serious retinal disease, and not a disease in itself. All night-prowling animals have widely-dilated pupils, and in addition to this they have in the retina a special organ called the *tapetum lucidum*, the function of which is to reflect to a focus in front of them the relatively few rays of light that enter the widely dilated pupil, and thus enable them the better to see their way. Hence, the luminous appearance of the eyes of such animals in the dark.

NYMPHÆ.—See Vulva.

NYMPHOMANIA.—See Mania.

NYSTAGMUS.—Involuntary oscillation of the eyeball due to spasmodic jerking movements of the eye, not interfering with the voluntary movements, but accompanying them. It is the result of defective coordination, inadequate light, and errors of refraction. The involuntary movements may be horizontal or vertical, oblique, or rotations about the visual axis. Internal squint is a frequent accompaniment, and there may be simultaneous shaking of the head.

The commonest form of nystagmus is that coming from some deficiency of vision in both eyes, beginning in childhood, particularly in amblyopia, the result of the destructive changes after ophthalmia neonatorum and in retinitis pigmentosa. It also exists in microphthalmos, albinism, and some varieties of congenital cataract. Miners who constantly strain their eyes in the darkness sometimes develop the disease. Nystagmus from cerebral disease is only of symptomatic significance. It is especially important in the diagnosis of multiple sclerosis.

Treatment, beyond simple rest and the relief of the distressing symptoms, is of little value. It must always be remembered that there is a possibility of improving the visual acuity and modifying the disease by correcting lenses. The prognosis of the nystagmus is never encouraging, even under the most favorable circumstances.

O

OAK.—See Quercus.

OBESITY.—Obesity may be defined as an excessive development of fat throughout the body. There are two forms, the anemic and the plethoric.

Etiology.—Heredity is a potent factor. Over-indulgence in carbohydrates, fats, and albumins is a frequent cause. Diseases marked by defective oxidation, as chlorosis and sexual continence, are often the exciting conditions of this disease; so, too, is lack of exercise or muscular inactivity.

Morbid Anatomy.—Increased subcutaneous fat, rounded face, pendulous cheeks, protuberant abdomen, and gross legs and buttocks are evident. There is an accumulation of fat over the chest and in the mediastinum, and enlarged liver and increased intraabdominal fat. In the later stages there is a fatty infiltration of the heart-muscle.

Pathology.—Although corpulent individuals may eat but little fatty foods, they are frequently hearty eaters of all classes of foods. The carbohydrates are not only directly productive of fat-increase, but by saving the stored fat, indirectly aid in the development of this condition; hence sugars, starches, and alcohol (beer in particular) are productive of corpulence. Alcohol, by hastening the metabolism of albumin, sets free fat-producing substances which may be stored. Diminished oxidation from anemia, for example, or lack of muscular exercise, favors this condition.

Symptoms.—The increased bulk of the patient renders his movements sluggish and may interfere with locomotion, producing a waddling gait. Dyspnea, from mechanic interference with respiration, fatty chest-wall, mediastinal fat, or enlarged liver, are early symptoms. Later, a true cardiac dyspnea from fatty infiltration of the heart-muscle, secondary to arteriosclerosis, may arise. A late symptom is the effusion which takes place, showing itself as anasarca, ascites, hydropericardium, and hydrothorax. Eczema, secondary to intertrigo, adds much to the discomfort of the patient.

Prognosis.—Marked corpulence is not incompatible with long life and considerable comfort. When excessive, the conditions mentioned are likely to supervene, and death, often sudden, results. The prospect of recovery is lessened by the fact that most patients find the treatment irksome, and are induced with great difficulty to continue it.

Complications.—The obese are especially prone to contract heart, disease, diabetes, asthma, gallstones apoplexy, gout, disturbances of secretory organs. They stand major operations poorly and can make little resistance when attacked by severe acute infections.

Treatment.—Two indications present themselves: (1) Diminish the food-supply, and (2) oxdize the fat already stored. For the first, 3 prominent systems are those of Banting, Ebstein, and Oertel.

The Banting system nearly excludes fats, forbids the largest possible amount of sugar and starches, and limits the daily amount of fluids taken to 35 ounces. The patients are practically starved, in that they are allowed only 20 to 25 ounces of dry food daily, about one-half of this being meat. The fault of this method lies in its failure to secure elimination of waste products, and it is likely to result in serious malnutrition.

The Ebstein method allows fat on the theory that it does not produce stored fat and clogs the appetite. Sugar- and starch-containing vegetables, as potatoes and all farinaceous foods—3 1/2 ounces of bread each day being excepted—are forbidden. The quantity of fluids is limited. Black tea, without milk or sugar, and light wines are allowed. A moderate amount of meat is permitted.

The Oertel system not only regulated the diet, but pays especial attention to the heart and circulation. For convenience, these patients are divided into 2 classes: (1) Those in whom there are no marked respiratory and circulatory disturbances, and (2) those in whom the oxygen intake is diminished, so that dyspnea is readily excited. For the first class double the amount of fat and carbohydrates, with much larger amount of albuminates, is allowed, as compared with the second class. In the latter class the amount of liquid ingested is markedly reduced. As compared with the Ebstein and Banting systems, it gives nearly the same amount of albuminates as the Banting, and one-half to three-quarters more than the Ebstein. It allows from 3 to 4 times as much fat as the Banting, and from one-third to one-half as much as the Ebstein. For the carbohydrates, the same to one-third more than the Banting, and one-half more to double that of Ebstein. When exercise can be taken, the more generous diet of Oertel should be chosen. Other systems have been employed, and may be adapted to individual patients, but that of Oertel has a wider application than any other, especially when combined with systematic exercise to strengthen the heart-muscle and massage to stimulate the circulation. In detail, the diet should consist chiefly of albuminates—lean of roast or boiled beef, veal, mutton, game, and eggs. Green vegetables, as cabbage and spinach, are allowed; fat and carbohydrates only in small quantities, and 4 to 6 ounces of bread a day. The liquid drunk must be limited to 6 ounces of coffee, tea, or milk, morning and evening, with 12 ounces of wine, and 8 to 16 ounces of water during the 24 hours. In warm weather this amount may be slightly increased, but beer is

absolutely prohibited. To prevent formation of fat, the following diet table should be observed:

Morning.—One cup of coffee or tea, with a little milk, altogether about 6 ounces. Bread, 3 ounces.

Noon.—Three to 4 ounces of soup; 7 to 8 ounces of roast or boiled beef, veal, game, or not too fat poultry; salad or a light vegetable; a little fish (cooked without fat); 1 ounce of bread or farinaceous pudding (never more than 3 ounces), and 3 to 6 ounces of fresh fruit. In hot weather, or in absence of fresh fruits, 6 to 8 ounces of light wine may be taken.

Afternoon.—Coffee or tea with milk to 6 ounces, with at most 6 ounces of water; exceptionally, 1 ounce of bread.

Evening.—One or 2 soft-boiled eggs, 1 ounce of bread, perhaps a small quantity of cheese, salad and fruit; 6 to 8 ounces of wine with 4 or 5 ounces of water. Thus far the indication has been to furnish less food for the patient to oxidize, and at the same time sufficient for purposes of nutrition.

The second indication is to increase the oxidation of fat in the body. This is accomplished by massage, exercise in the gymnasium, or, preferably, in the open air. The latter comprises walking, mountain-climbing, cycling, and, what is of great value when possible, horseback exercise. Turkish baths are useful to remove surplus fluids from the body, but should be employed with great hesitation if any circulatory disturbances are present. Of health resorts Carlsbad and Marienbad are most frequently chosen. Here the restricted diet, systematic exercise, and purgative waters combine to give relief. The regimen must be continued after the return of the patient to his home, else the betterment will not be permanent.

Of the drugs in popular use most are inefficient and many are harmful. It is not likely that any one drug will meet the various conditions arising from the complex processes which result in fat production and fat storage. Should these be mentioned individually, it would be merely to give their contraindications. The one which has given the best results is thyroid extract, and this must be administered with the precautions enumerated under THYROID TREATMENT (*q. v.*).

OCCUPATION NEUROSES.—A group of affections of the nervous system, characterized by the occurrence of spasm (cramp) and pain in groups of muscles in consequence of overuse or frequently repeated muscular acts. It has been noticed that many persons suffering from occupation neuroses have a family history of nervous affections.

Varieties.—Writers' cramp; piano-players' cramp; telegraphers' cramp; violin-players' cramp; dancers' cramp, etc.

The symptoms of any of the varieties named generally develop gradually and slowly, by a feeling of stiffness in the used member; the part feels fatigued and heavy, until it is impossible to use it, from the occurrence of spasmodic contractions; there is pain on using the affected muscles, often associated with tremor, and in many cases with an actual paralysis. Associated with the loss of power to follow the usual occupation are nervousness, mental worry, and often depression. There is often the sensation of prickling, and numbness in the crippled member. The electro-contractility is preserved until the atrophy of nonuse develops.

Prognosis is often unfavorable, although some recoveries are reported.

Treatment consists of rest to the part and mental quiet, with tonics and other means to improve the general nutrition. Faradism in weak applications once or twice weekly seems useful. The following combination may be of value (Hughes):

℞.	Zinc phosphid,	gr. ij
	Extract of nux vomica,	gr. x
	Iron albuminate,	gr. xxx.

Make 30 pills. One after meals.

OCULOMOTOR PARALYSIS.—See EYE-MUSCLES (Paralysis).

OINTMENTS (Unguenta).—Soft, fatty mixtures of medicinal agents with a basis of lard, petrolatum, or fixed oils, with a solid fat, such as wax or spermaceti. They are intended for application to the skin by inunction, and have a melting-point which is below the ordinary temperature of the human body. The official unguentum is prepared by fusing together 80 parts of benzoinated lard and 20 parts of white wax, and is the basis of 2 other ointments, while 9 have benzoinated lard, and 3 have lard as their basis. There are 24 official ointments.

TITLE.	PERCENT OF ACTIVE CONSTITUENT.	BASE.
Unguentum.....	White wax, 20; benzoinated lard, 80.	.....
UNGUENTUM:		
Acidi borici.....	Boric acid, 10.....	Paraffin, 10; white petrolatum, 80.
Acidi tannici....	Glycerin and ointment.	Tannic acid, 20.
Aquæ rosæ.....	Stronger rose water, 19.	Spermaceti, 12.5; white wax, 12; almond oil, 56; borax, 5.
Belladonnæ.....	Extract belladonna leaves, 10.	Diluted alcohol, 5; wool-fat, 20; Benzoinated lard, 65.
Chrysarobini....	Chrysarobin, 6.....	Benzoinated lard, 94.
Diachylon.....	Lead plaster, 50....	Olive oil, 49; oil of lavender flowers, 1.
Gallæ.....	Nutgall, 20.....	Ointment, 80.
Hydrargyri.....	Mercury, 50; oleate of mercury, 2.	Prepared suet, 23; benzoinated lard, 25.
Hydrargyri ammoniati.	Ammoniated mercury, 10.	White petrolatum, 50; hydrous wool-fat, 40.
Hydrargyri dilutum.	Mercurial ointment, 67.	Petrolatum, 33.
Hydrargyri nitratis.	Nitrate of mercury, abt., 12.5.	Lard.
Hydrargyri oxidi flavi.	Yellow oxid of mercury, 10.	Water, 10; hydrous wool-fat, 40; petrolatum, 40.
Hydrargyri oxidi rubri.	Red oxid of mercury, 10.	Water, 10; hydrous wool-fat, 40; petrolatum, 40.
Iodi.....	Iodin, 4; potassium iodid, 4.	Benzoinated lard 80; glycerin, 12.
Iodoformi.....	Iodoform, 10.....	Lard, 90.
Phenolis.....	Phenol, 3.....	White petrolatum, 97.

Title.	Percent of Active Constituent.	Base.
Unguentum:		
Picis liquidæ....	Tar, 50.....	Lard, 35; yellow wax, 15.
Potassii iodidi...	Potassium iodid, 10; potassium carbonate, 0.6.	Benzoinated lard, 80; water, 10.
Stramonii.....	Extract of stramonium, 10.	Hydrous wool-fat, 20; benzoinated lard, 65; diluted alcohol, 5.
Sulphuris.....	Washed sulphur, 15.	Benzoinated lard, 85.
Veratrinæ.....	Veratrin, 4.....	Benzoinated lard, 90; almond oil, 6.
Zinci oxidi.....	Zinc oxid, 20.....	Benzoinated lard, 80.
Zinci steratis....	Zinc stearate, 50...	White petrolatum,50.

The process of compounding an ointment or a cerate is sufficiently simple, being generally a mere matter of triturating the ingredients together in a mortar, or of their incorporation on a slab by means of a spatula. When extracts, powders, or gritty substances are ordered, the ingredients should first be pulverized into a fine powder, then triturated with a small quantity of the basis into a smooth, impalpable paste, the remainder of the basis being added gradually, until the whole is thoroughly incorporated. A warm mortar may be required for hard extracts. Soluble salts should be triturated with a little water before adding the excipient. Camphor needs a little alcohol to enable it to be pulverized, and iodin should be rubbed to a fine powder, a little alcohol then added, and finally the excipient by degrees. Sulphur iodid requires persevering work with a small portion of olive oil. Borax should be triturated with glycerin, and red mercuric oxid with distilled water. A bone or horn spatula should be used for all ointments, as steel or iron blades will injure many substances, particularly alkaloids, free acids, tannin or iodin, and several of the mercurial salts. Volatile substances should be added last, and quickly worked in, so that their evaporation may be as slight as possible.

OLD AGE.—The period of life in which the degenerative changes that set in after middle life become apparent. It does not correspond to any definite term of years, but is hastened by want, confinement, hardship, and mental anxiety, by exposure to mercurial and nitrous fumes, and the habitual use of alcohol and poisonous drugs. Some persons are old at 40, and some hardly so at 70. The normal anatomic and physiologic changes are well seen in the bones, which become more brittle and lighter, but without reduction in size, and hence fractures more readily produced, especially in the spongy portions of the bones, in the neck and trochanteric region of the femur. The cartilaginous portions of the body are thinned, slightly lessening the height. The alveolar processes of the jaw are absorbed, the teeth loosening and falling out, and the angle of the jaw is enlarged. The face is shortened and the chin protrudes. Voluntary muscles waste with ensuing loss of power and increasing difficulty in maintaining an erect carriage. The cardiac muscle shares in the general change, the heart-beat becoming weakened and often intermittent, the rate not being materially altered. The activity of the involuntary muscles diminishes. The powers of digestion become lessened, inducing constipation. The accommodation of the eyes fails; and the expulsive force of the bladder diminishes. The skin becomes wrinkled. There is shrinkage of the elastic tissues, and adipose tissue is absorbed and the cutis thinned; the hair-roots undergo atrophy, and the color of the hair is lost. The lungs, spleen, lymphatic glands, uterus, and ovaries become more or less atrophied, and the functional powers of testes diminish or cease. The brain and spinal cord shrink in size, reflex action becomes sluggish, and mental concentration and energy lessen.

Other morbid changes peculiar to old age are thickening of the walls of the arteries, atheroma, and calcification thereof. Thrombosis and embolism are not infrequent results, and cerebral hemorrhage is an imminent danger. The heart-valves are often atheromatous or calcified. Costal cartilages may calcify and impede respiratory movement. "Arcus senilis," a ring of degeneration, is often seen near the margin of the cornea, and cataract is common. The atrophy of mind may become actual dementia, and the lungs become emphysematous. Deafness and paralysis agitans are common, and joint-affections appear. Cirrhosis of the liver is seldom delayed to old age, while granular degeneration of the liver commences in old age. The prostate is liable to fibroid enlargement, causing retention of urine and the train of results dependent upon it.

Catarrhs of the air-passages are very prone to persist and extend, and to set up a form of lobular pneumonia. Wounds are liable to slough, but heal most readily. Fatality ensues in old age often from gradual enfeeblement of the powers without predominant lesion of any organ. Cerebral hemorrhage and cardiac failure are frequent modes of death, but pneumonia gives greatest mortality.

Moderate and continuous activity of mind and body, moderate and regular hours of sleep, a spare diet, little or no indulgence in alcoholic liquors, and particularly a guarded use of flesh food, are the most salient points conducing to length of life. The very aged have seldom been addicted to the use of drugs. A robust frame, a bodily and mental stature above the average, the power of sound sleep, of speedy recovery after fatigue, good reproductive power, and long retention of the hair of the scalp are criteria of capacity for prolonged life.

Serious illness lessens the prospect. The very aged are seldom found to be the offspring of immature marriages, or to have contracted such themselves. Elder children appear to have an advantage over the younger.

In the treatment of illnesses of the aged, the failing powers of digestion, of repair, and of vasomotor accommodation must be kept constantly in mind. The dietary should contain less meat and more milk and farinaceous foods than that of the young or middle-aged. Fatty matters are less

easily tolerated. Malted and predigested aliments may supplement the diet as age advances. Changes of temperature must be guarded against, and the liability to bronchitis should dictate caution in exposure to cold or damp air.

OLEATES.—Liquid solutions of metallic salts or alkaloids in oleic acid, intended for external administration. They are not definite chemical compounds, though the term is also employed in trade to designate certain solid preparations which are claimed to be chemical compounds of the same acid with various bases. There are 5 official oleates, three of which have olive oil, as well as oleic acid.

Title.	Composition.
Oleatum:	
Atropinæ.....	Atropin, 2 grams; oleic acid, 50 grams; olive oil to 100 grams.
Cocainæ.....	Cocain, 5 grams; oleic acid, 50 grams; olive oil to 100 grams.
Hydrargyri...	Yellow mercuric oxid, 25 grams; oleic acid to 100 grams.
Quininæ.....	Quinin, 25 grams; oleic acid, 75 grams.
Veratrinæ....	Veratrin, 2 grams; oleic acid, 50 grams; olive oil to 100 grams.

OLEORESINS (Oleoresinæ).—Liquid preparations consisting principally of natural oils and resins extracted from vegetable substances by percolation with acetone. They differ from fluidextracts in not bearing any uniform relation of c.c. to the gram of drug, in containing principles which though soluble in acetone are not so in alcohol, and in some instances being devoid of principles which are insoluble in acetone but soluble in alcohol. They are the most concentrated liquid preparations of drugs which can be produced. The official oleoresins are 6 in number.

Title.	Average Yield and Properties.	Dose.
Oleoresina:		
Aspidii.....	10 to 15 percent. Tæniacide.	30 grains.
Capsici.....	5 percent. Stimulant, rubefacient.	1/2 grain.
Cubebæ.....	18 to 25 percent. Diuretic, expectorant.	7 1/2 grains.
Lupulini.....	50 percent. Tonic sedative.	3 grains.
Piperis.....	5 percent. Stimulant.....	1/2 grain.
Zingiberis....	6 to 8 percent. Stimulant..	1/2 grain.

OLFACTORY DISEASE.—See Anosmia.

OLIGOCHROMEMIA AND OLIGOCYTHEMIA.—Deficiency in hemoglobin and red cells respectively. See Blood.

OLIGOHYDRAMNIOS.—See Amnii, Liquor.

OLIVE OIL (Sweet Oil, Salad Oil).—"A fixed oil expressed from the ripe fruit of *Olea europæa*" (U. S. P.). Cotton-seed oil, poppy oil, colza oil, ground-nut oil, and lard oil are used in immense quantities as substitutions for olive oil, since, with the exception of the common adulterant, cotton-seed oil, which is slightly irritating, all these varieties of oil have many of the properties in common with olive oil. By exposure to the air, olive oil soon becomes rancid. Olive oil enters into the composition of several cerates, ointments, and plasters, notably emplastrum plumbi and unguentum diachylon. Olive oil is emollient and protectant.

Carbolized oil, consisting of a 5 to 10 percent solution of carbolic acid in sweet oil, was at one time extensively used in the treatment of wounds. Since it has been shown that the amount of acid employed is ineffective, so far as any antiseptic properties are concerned, the practice has been abandoned. Sweet oil was in extensive use as a wound dressing, especially after amputation, by the older surgeons. It had the advantage of being bland and unirritating and not allowing the dressing to adhere to the cut surfaces. Olive oil forms one of the substances in repute for the preparation of instruments used in the surgery of the mucous cavities. In the treatment of unusually tight strictures of the urethra, the injection of a little sweet oil with a syringe will often prove more serviceable than anointing the instrument. As an emollient, sweet oil is largely employed in enemata. It has a special tendency to soften scybala and assist in their removal. It also serves to reduce the irritation which accompanies the presence of seat-worms. It is also used in large and frequently repeated doses in cases of biliary colic. Olive oil enters into the composition of a number of preparations employed in the local treatment of skin-diseases. Employed alone, it is useful to soften crusts and scales and to remove epithelial débris as a preliminary to more active treatment.

OMENTOPEXY.—See Liver, Cirrhosis.

OMENTUM.—The omentum forms an extremely mobile covering to the intestines, and it may glide into any part of the abdominal cavity, or communicating pouch, or hernial sac, and readily prolapses into a wound. Its displacement may be caused by the peristaltic movements of the intestines, by movements of the chest, or of the abdominal wall, or be due to gravity. At any point the omentum may become adherent, which in some cases may have a beneficial result: (1) by closing a threatened or actual intestinal perforation; (2) by encysting an infectious mass such as a diseased appendix; (3) by confining a septic peritonitis to a limited region of the abdomen. Advantage is taken of the omentum for grafting over a weak line of suture, and for establishing a venous anastomosis. On the other hand harm arises from omental adhesions; a band may be formed under which a coil of intestine slips and becomes strangulated, whether in the abdominal cavity, or in a hernial pouch; one end of the omentum being fixed, the peristaltic movement of the intestine may induce torsion of the omentum, and so gangrene; omental adhesions may furnish additional blood supply to a uterine fibroma and encourage the rapid growth of the tumor.

A **tumor of the omentum** is movable and not covered by intestine. It may consist of rolled up or matted omentum, the result of inflammation, or it may be a cyst or of a vascular, fibrous, or sarcomatous nature. *Treatment.*—An exploratory in-

cision should be made, and if the tumor is found movable the whole of the omentum should, as a rule, be excised up to the transverse colon (Spencer and Gask).

OMPHALORRHAGIA.—See UMBILICAL CORD.

ONOMATOMANIA.—Functional derangement of speech, of which 5 varieties are described: (1) A powerful effort to recall some word; (2) an irresistible impulse continually to repeat a word, by which the patient seems perplexed; (3) the patient attaches some peculiar and dreadful meaning to a commonplace word; (4) the patient attaches talismanic significance to certain words, which he repeats as a safe guard; (5) the patient is impelled to spit out some word, like a disgusting morsel. A word is a complexus of images, localized in certain centers of the cerebral cortex, the images being partly auditive, partly visual, partly motor. "Onomatomania is characterized by irregular action of one or several verbal images, resulting from some functional disturbance of the corresponding center." In *simple onomatomania* the patient is possessed with the idea of recovering a word that escapes him. The word is familiar; its significance can be given; the place where read or the time when heard can be given, but the word cannot be recalled. Articulate speech may be at fault. The patient knows the word, sees it written before him but cannot articulate it. He may utter a synonym or a similar word. In *associated onomatomania* words acquire a peculiar or preponderant meaning. See APHASIA, SPEECH DEFECTS, etc.

ONYCHIA.—See NAILS (Diseases).

OPEN-AIR TREATMENT.—In conjunction with vaccine therapy open air is advocated in empyema. It is efficacious in burns, lobar pneumonia, bronchopneumonia, inoperable cancer, pulmonary and surgical tuberculosis. It is used conjointly with X-rays to prevent recurrence after operation for carcinoma of the breast. See BURNS, TUBERCULOSIS, etc.

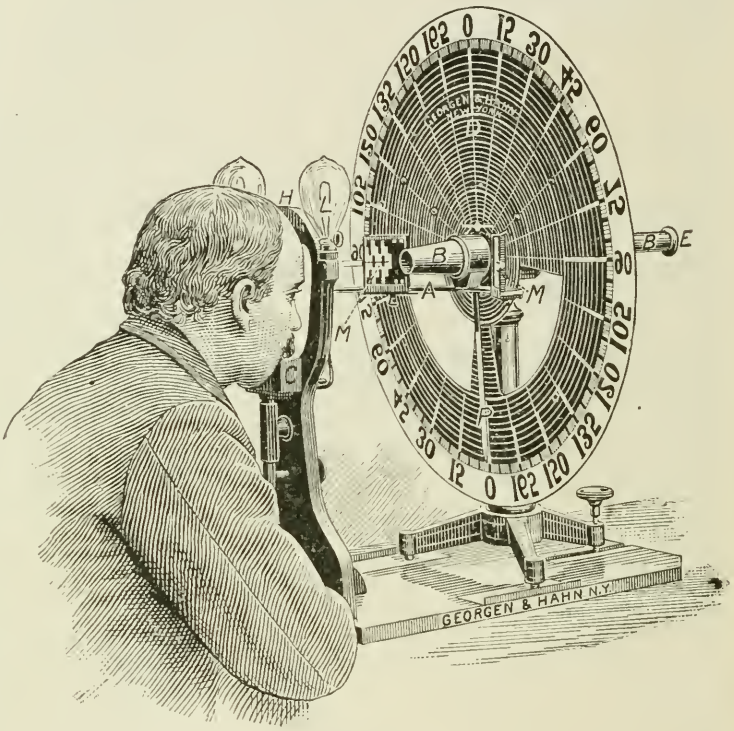
OPERATIONS IN GENERAL.—See ABDOMINAL SECTION.

OPHTHALMIA NEONATORUM.—See CONJUNCTIVITIS (Purulent).

OPHTHALMIA, SYMPATHETIC.—See SYMPATHETIC OPHTHALMIA.

OPHTHALMIC REACTION OF TUBERCULOSIS.—See TUBERCULIN.

OPHTHALMOMETER.—An instrument used for the determination of the kind and amount of corneal astigmatism. It is less exact than the retinoscope, and, moreover, it is very expensive. That of Javal and Schiötz consists of a telescope attached to a graduated arc, upon which are two objects called mires, the left one being fixed, while the right is movable. These mires are of white enamel, one quadrilateral in shape and the other the same size, except that on one side it is cut out into 5 steps. The observer looks through the tube, which contains a combination of convex lenses and a bi-refracting prism, and sees 4 magnified images in a line on the cornea under examination. He first finds the meridian of least refraction by moving the semicircular arm to the position in which the 2 central images are furthest apart. The mires are then moved together until the 2 central images on the observed cornea touch and their central black lines coincide—the lowest step of one image with the side of the other. The arm is now turned at right angles to this meridian, and the overlapping of the 2 central images is noticed; for each step overlapping there is a difference of 1 diopter between the meridians. In higher degrees of astigmatism we add 5 diopters to the number of steps protruded on the other side. At 5 diopters of astigmatism the steps exactly cover the plain quadrangular mire.



THE OPHTHALMOMETER OF JAVAL AND SCHIÖTZ.

A. The perimeter-bar. *B, B*. Telescope. *C*. Chin-rest. *D*. Disc of radiating lines and concentric circles. *E*. Eyepiece at which the observer sits. *H*. Head-rest. *L*. Lights. *M, M*. The mires, or targets. *P*. Pointer, indicating the axis by the degree numbers on the peripheral border of the disc.

The meridian of least curvature corresponds to

the axis of astigmatism. The findings of the ophthalmometer are not exact. No account is taken of the lenticular astigmatism, and even though the cornea is at fault, no rules for adapting the ophthalmometric results can be formulated. Speaking broadly, the total astigmatism is approximately equal to the amount indicated by the ophthalmometer, expressed as myopic astigmatism, combined with an *inverse* myopic astigmatism of 0.75 D; or, in other words, when there is no corneal astigmatism by the ophthalmometer, the test-lens will likely show about 0.75 D of inverse astigmatism (Bull).

Mires Exactly Approximated.

Mires Overlapping One Diopter.

OPHTHALMOPLEGIA.—See Eye Muscles (Paralysis).

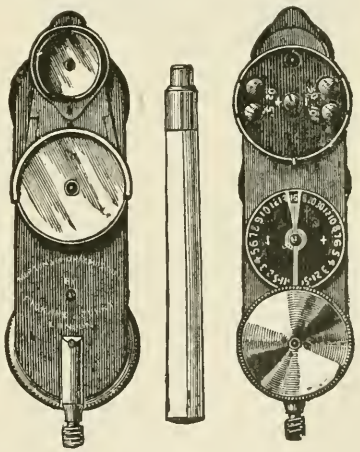
OPHTHALMOSCOPY. Theory.—It is self-evident that rays reflected from the fundus of the eye emerge from the eye in the same direction as that in which they enter it, the refractive media of the eye having the same action on light whether passing in or out. However, as ordinarily seen, the pupil is black. There is no light reflected from the patient's eye into ours, because our own eyes are not a source of light. Now, if the observer's eye is artificially made the source of light, and if he looks in the same direction as that in which the luminous rays enter the observed eye—as, for instance, through the sight-hole of a mirror—illumination renders the interior of the eye visible. This is the fundamental principle of the ophthalmoscope, and it was first explained and made practical by Helmholtz in 1851.

Description.—The simplest form of ophthalmoscope is a mirror with a hole in the center, which is held close to the patient's eye in such a manner as to reflect light from a luminous point near by into it, illuminating the interior of the eye, and revealing the details of the fundus. The ophthalmoscopes in use to-day are of more intricate mechanism, and render the examination much easier and more satisfactory. The mirror most used in this country is small, concave, oblong or round in shape, with a central aperture of from 2 to 4 mm. in diameter, and so arranged that it can be tilted or rotated from side to side, thus saving the trouble of inclining the whole instrument to reflect the light properly. By means of various ingenious appliances, a series of lenses are incorporated with the instrument in such a manner that, by turning a wheel with the finger, the convex or concave lens of the strength desired can be brought before the sight-hole in the mirror. By arranging the lenses so that they can be combined, the range may be extended from a fraction of a diopter to a lens of as high power as is ever required. The large mirrors are more useful in the indirect method, in retinoscopy, and for illuminating a large surface of the eye. In the direct method a very small mirror is as good or better than a large one. A small sight-hole gives a more distinct image, and does not necessitate so much accommodation or optic aid in examining slightly ametropic eyes. The large sight-hole is better for the accurate estimation of refraction. As the direct method is more generally employed, and refraction is not ordinarily estimated by ophthalmoscopy, and retinoscopy is usually performed with a special plane retinoscopic mirror, for all practical purposes it is better to use a small mirror with a small sight-hole.

There are many forms of ophthalmoscopes, for all of which some advantage is claimed. The model of Loring is cheap, and answers all practical purposes, but it is awkward to use, and necessitates removal from the eye and a combination of lenses to secure the higher powers. More expensive and, at the same time, more convenient are the models of Morton, Harlan, Gould, Pyle, and others.

Use of the Ophthalmoscope.—The ophthalmoscope may be used in 2 ways—by the direct and indirect methods.

Direct Method.—The patient is placed in front of the source of illumination, and to the side of the eye to be examined, the light behind him so that it shines on his temple, just touching the tips of the outer lashes. He is then told to look straight ahead to an object on a level with his eyes across the room. To examine the patient's right eye, the surgeon sits or stands, and holds his ophthalmoscope in his right hand before his own right eye.



Morton's Ophthalmoscope.

To examine the patient's left eye, he places himself to the left of the patient and holds the ophthalmoscope in his left hand before his own left eye. The ophthalmoscope is brought close to the eye under examination, the mirror of the ophthalmoscope having been inclined, and the instrument held in such position that the light from the source of illumination will be reflected directly into the patient's pupil; then, if the media are clear, a red glare, called the **fundus reflex,** is seen through the hole in the mirror. If the examiner wears glasses, he need not remove them; in fact,

if he is astigmatic, he had better accustom himself to working with his correcting lenses on.

Examination of the Media.—The reaction and form of the pupil are noticed. If a foreign body or opacity is present in the pupillary area, it appears as a dark spot on a red background. A slight corneal opacity appears only as a mere shadow. It must be remembered that spots on the cornea and lens always maintain their same relative position and are immovable, while opacities in the vitreous are usually freely movable, and can be diagnosed by their change of position as the patient turns the eye quickly in various directions and then looks straight forward. To **locate corneal or lenticular opacities,** in addition to focal illumination advantage is taken of the phenomenon of **parallactic displacement,** which is governed by the rule that opacities lying in front of the pupil move in the same direction as the patient's eye, while opacities behind the pupil move in the opposite direction to the patient's eye, and the extent of this apparent movement enables one approximatley to determine the distance of the opacity either in front or behind the pupillary plane. After having observed any anomaly of the pupil or media at a distance of from 12 to 16 inches, a strong convex lens (10 D. to 16 D., according to its location) is then wheeled before the sight-hole of the ophthalmoscope, which allows the observer to approach closer to the patient's eye, and greatly magnifies the conditions present.

Direct Method.

Examination of the Fundus.—If the media are clear, the surgeon approaches close to the patient's eye, and at once the details of the eye-ground become visible. The refractive media of the eye magnify the details of the fundus about 14 times, and by this fortunate circumstance the minute details of the eye-ground are plainly visible. Probably the first distinct object will be a retinal vessel which can be easily traced to the most prominent part of the fundus, the **optic disc.** At this point a bright whitish or pinkish reflex is seen, standing out in sharp distinction to the surrounding red fundus. By adjusting the proper lens before the sight-hole in the mirror the outlines of the disc may be brought sharply into view. The average size of the normal disc, as seen by the direct method, is nearly that of a 25-cent piece or a shilling, while to the naked eye it measures only 1.5 mm. Emerging from the disc is seen the central retinal artery and vein, dividing into inferior and superior branches. The veins may readily be distinguished from the arteries by their darker color and their size—about one-fourth larger. Pulsation of the veins is observed under normal circumstances, while pulsation of the arteries indicates a pathologic condition—either rise of intraocular tension or decrease of blood-pressure. Reflexes consisting of bright lines in the middle of the blood-vessels are seen. Frequently a depression may be seen in the disc called the **physiologic cupping,** caused by the branching of the internal fibers of the optic nerve at a lower level than the more external ones. This is white, with a surrounding zone of pink. **Pathologic cupping** includes the whole of the disc, and is characteristic of glaucoma. The form, the size, the color, and other appearances of the disc must be further studied. At the external border of the disc is often seen a black, circular *pigment ring,* bounding the opening in the choroid through which the optic nerve enters. To the outer side of this is the *white scleral ring,* which is not always distinctly circular. A white conus, or even a crescent, may be seen at the edge of the disc if there is choroidal atrophy. In high myopia this condition is noticeable. If there is distinct sign of cupping, the extent may be approximately estimated by the refractive conditions of 2 points lying at different elevations. The difference in diopters in the lenses required to distinctly focus the 2 points multiplied by 0.35 of a mm. will give the difference in depth. It is usual to select one point at the bottom of the cup, and the other near the surface.

The parallax test is based on the fact that in the indirect method, while the whole fundus seems to move along with the lateral movements of the convex lens, the floor of the excavation apparently moves in the same direction, but at a slower rate. This parallax is more marked the deeper the excavation.

The general aspect of the eye-ground is then studied, and any abnormalities in the retina, choroid, or sclera should be noted. If there is absence or deficiency of pigment between the retina and choroid, the larger choroidal vessels are seen through it, and the eye-ground is streaked with well-defined interspaces. At any portion of the fundus in which both the retina and choroid are lacking, the white, glistening sclera is seen shining through. To examine the **macular region** the patient is told to look into the light coming from the mirror, or, better, beyond it in the same direction, which movement of the eye generally brings the macula into view. This appears as a dark spot isolated in the fundus, with a small, bright spot in the center, called the *fovea centralis.* There are usually no vessels to be seen in this vicinity. The macular region should always be studied carefully, as any lesion or hemorrhage in this location has an important bearing on the vision of the patient.

Refraction by the ophthalmoscope is usually accomplished by the direct method. Refraction of the macular region is desirable, but as the intense

dazzling produced by light makes it almost impossible, the disc is usually the objective point selected. The observer first corrects his own ametropia, and as much as possible relaxes his accommodation. It is this inability to regulate the relaxation of accommodation that makes this test unreliable in simple errors of refraction, and in the lower degree of astigmatism it is comparatively worthless even in the most skilful hands. The retinoscope is a more important and more scientific instrument for the objective method of refraction. Having relaxed the accommodation and corrected his own error, the surgeon moves before the eye the lens which gives him the best outlines of the disc, and subtracts his own correcting lens from the result. In cases of astigmatism the disc is usually oval, its long diameter corresponding to the axis of astigmatism. Two vessels at right angles to each other in the principal meridians are refracted separately, and the results noted. Glasses should not be prescribed from the ophthalmoscopic refraction alone.

Indirect Method.—The indirect method is less valuable than the direct. The image is inverted and less magnified (3 or 4 diameters), but one is able to see a larger part of the fundus at a glance and is not compelled to approach so near the patient's face. It also enables the surgeon to intensify his illumination in cases of very small pupil or of cloudy media. In this country the indirect method is being less and less used. The method of procedure is usually the same as in the direct method, except that the surgeon keeps his eye a foot or more away from the patient's face and holds in front of the patient's eye a strong convex lens. However, the surgeon need use but one eye, and may stand directly in front of the patient. The lens is usually held at such a distance from the eye that the iris just disappears from view; a plus spheric 4 D. lens may be held before the opening in the mirror to enlarge the image and to replace the observer's strain of accommodation. By directing the light from the mirror through the lens into the eye, an inverted aerial image is formed in front of the lens, and it is this image that the surgeon sees. In high degrees of myopia it is easy to examine the inverted aerial image without a convex lens.

Indirect Method.

The satisfactory use of the ophthalmoscope, both in examining the fundus and approximately estimating the kind and degree of ametropia, can only be obtained after considerable practice. A normal fundus in both a light-complexioned and dark-complexioned person should be repeatedly studied, as abnormal conditions are not recognized until one is thoroughly familiar with the normal healthy fundus.

OPISTHOTONOS.—A tetanic condition of the muscles, particularly of the back, whereby there is an arching backward of the trunk, which may rest upon the head and heels. The condition is seen in poisoning from strychnin, in tetanus, hydrophobia, hysteria, and other tetanic conditions. In rare instances the muscles in front of the spine are affected, when **emprosthotonos** is the term used to describe the condition, the patient's body being arched forward. **Pleurothotonos** is the term used when the body is bent to one side or the other.

OPIUM.—The inspissated juice of the unripe capsules of the *Papaver somniferum*, or poppy, obtained by incising the capsules and collecting the milky juice which is exuded. Most of the opium in the American market comes from Smyrna, Asia Minor. Opium is a very complex substance, and contains, besides morphin and codein, a large number of less important alkaloids—narcein, narcotin, thebain, laudanin, papaverin, cryptopin, and meconin, opianin, paramorphin, and meconic, thebolactic, and sulphuric acids, in addition to a variety of extractives. Good opium should yield at least 9 percent of morphin. The dominant physiologic action of opium is the relief of pain. It also causes slowing of the respiration and pulse, contraction of the pupils, diaphoresis, and constipation; more rarely, nausea and vomiting, headache, itching of the skin, erythema; occasionally, instead of sleep, wakefulness, delirium, even convulsions.

Therapeutics.—The chief indications for the use of opium are: (1) To relieve pain from any cause except acute inflammation of the brain; (2) to produce sleep, particularly in the insomnia of low fevers with delirium, in which the combination of morphin and chloral is very efficient; (3) to allay irritation in the various forms of acute nervous erethism; (4) to check excessive secretion, as in diarrheas, dysentery, diabetes, ptyalism, etc.; (5) to support the system in low fevers and other adynamic conditions, when sufficient food cannot be retained; (6) as a sudorific, to produce sweating in coryza, etc. It is considered of especial value in any irritation of the stomach, bladder, or bronchi, in severe vomiting, both forms of diabetes, gastralgia, colic, and muscular spasm.

Superficial pain is often alleviated by the plaster or by liniments containing laudanum or some other fluid preparation. The oleate of morphin is said to be very penetrating.

Intense pain, as from the passage of calculi, is best met by the hypodermic injection of morphin sulphate in full doses (1/4 to 1/2 of a grain) with atropin sulphate (1/100 of a grain). Either the solution of morphin or the liquid preparations of opium may be given by the mouth in corresponding doses for the same purpose.

Sedative action is obtained by different preparations for different organs. The stomach is best affected by the solution of morphin in effervescing solution. The intestines may be influenced by laudanum in a starch enema, or internally by Dover's powder, powdered opium, or the pill of opium, especially the latter, with or without calomel, as an astringent when the bowel must be paralyzed, as in peritonitis, hernia, intussusception, etc. The rectum and other pelvic organs are promptly affected by a suppository of the extract of opium, 1/4 of a grain, with 1/12 of a grain of the extract of belladonna. The ovaries and the abdominal and pelvic organs generally are markedly susceptible to the analgesic action of codein in doses of 1 to 2 grains for an adult in severe pain.

To produce sleep, the most efficient preparations are the tinctures, the solution of morphin, pill of opium, and Dover's powder, in doses corresponding to the degree of insomnia and restlessness present.

Cough is relieved by the troches, the tinctures, and by the solution of morphin in small doses with the syrup of wild cherry or syrup of tolu; also by codein in the last-named syrup.

Diaphoresis is obtained by the use of Dover's powder in either of its forms.

Children bear opium badly, and for them its proportionate dosage should be much smaller than for other agents. Morphin should not be given to children less than 10 years of age, and never hypodermically to those under the age of 15. Opium given to a nursing mother will effect the child, being partly excreted in the milk.

Poisoning.—In a child 1 day old 1 minim of laudanum has caused death. A medicinal dose given to a nursing mother proved fatal to the infant. A few drops of paregoric have killed a child of 9 months. In the adult 1/6 of a grain of morphin in one case, and 4 grains of crude opium in another, have proved fatal.

A toxic dose produces at first restlessness, increased mental activity with a feeling of exhilaration, cardiac stimulation and flushed face. Then follows the stage of stupor, when the patient feels drowsy, and falls into a deep sleep. The pulse is slow and full; respirations are slow and labored; pupils are contracted ("pin-point"); the skin is warm and dry. During this stage, the patient can be aroused, but quickly goes to sleep again. The patient passes insensibly into the third stage in which coma is absolute, and which is characterized by cyanosis; respirations feeble and irregular; muscular relaxation; pulse weak and rapid; relaxed, cold, clammy skin; the pupils dilate just before death which occurs from paralysis of the respiratory center due to direct action on the medulla. Postmortem shows only congestion of the brain, congested lungs, and engorgement of the venous trunks and of the right heart.

The coma produced by opium-narcosis, when deep and when a history of the case cannot be obtained, is almost impossible of differential diagnosis from that due to alcohol, apoplexy, uremia, epilepsy, etc. The odor of breath may point to laudanum or some other preparation of opium. The pupils are very much contracted in opium poisoning. See COMA.

Treatment.—Potassium permanganate is the best antidote to opium or morphin in the stomach, given in dose about one-half greater than the quantity of morphin present, and repeated in less quantity from time to time in cases where the poison has been administered hypodermically, so as to neutralize the morphin excreted by the gastric mucous membrane. If an opium preparation has been taken, or the alkaloid morphin itself, vinegar should be added to the permanganate solution. Atropin antagonizes the cerebral action of morphin, also its action on the pupils, respiration, heart, and arterial tension; but if given too freely, it will endanger the case by substituting belladonna-narcosis for opium-narcosis; 1/120 of a grain hypodermically every 15 minutes for 3 doses is generally sufficient. It is unsafe to be guided in this respect by the pupils. Caffein is also physiologically antagonistic, and is generally used in the form of strong black coffee, frequently administered.

The chief indications in opium- or morphin-poisoning are to antidote any of the poison in the stomach and to wash out that viscus repeatedly at short intervals; to maintain respiration and keep up the circulation; and to prevent sleep by noises, flagellation, or electricity. Strychnin is an efficient antagonist to the respiratory paralysis, and may be used in lieu of atropin, or in connection therewith. Amyl nitrite should also be used when the heart shows signs of failure. Capsicum, the tincture, 1/2 to 1 ounce, by injection into the rectum, is said to give almost instantaneous results in antagonizing the stupor of opium-poisoning. For further directions, see under POISONING.

Preparations.—**O. Acetum** (*black drop*), opium-strength 10 percent, with nutmeg and sugar in dilute acetic acid. Is now 1/3 weaker than formerly, having the same strength and dose as tincture of opium. **O. Deodoratum** (*denarcotized opium*) is powdered opium free from narcotin and the odorous principles, which are supposed to cause the unpleasant after-effects of the drug. It should yield 12 to 12 1/2 percent of morphin, and is a good preparation, being a purified opium with a fixed morphin standard. The proprietary article named *Svapnia* is a similar preparation. Dose, 1/2 to 3 grains. **O. Emplastrum**—contains of extract of opium 6 parts, adhesive plaster to 100. **O. Extractum,** an aqueous extract containing 20 percent of morphin, and freed from principles insoluble in water. Dose, 1/4 to 2 grains. **O. Granulatum,** opium dried and reduced to a coarse powder. It should yield from 12 to 12 1/2 percent of morphin. Dose, 1/2 to 3 grains. **O. Pilulæ,** each pill contains about 1 grain of powdered opium incorporated with soap. Dose, 1 to 3 pills. **O. Pulvis**—opium dried at a temperature not exceeding 185° F., and reduced to a very fine powder. It should contain not less than 12 nor more than 12 1/2 percent of crystallized morphin, when assayed by the official process. Dose, 1/2 to 3 grains. **Pulvis Ipecacuanhæ et Opii** (*Dover's*

powder)—has of ipecac 10, powdered opium 10, sugar of milk 80, rubbed together into a very fine powder. Dose, 5 to 15 grains. **O. Tinctura,** *laudanum*, opium-strength 10 percent, or 48 grains to the ounce. Morphin-strength about 6 grains (equal to 7 1/2 grains of morphin sulphate) to the ounce. Ten minims equal 1 grain of opium or 1/8 grain of morphin. Sixty minims equal on the average about 120 drops. Dose, 5 to 30 minims, according to the effect desired. **O. Tinctura Camphorata,** *paregoric*, has of powdered opium 4, benzoic acid 4, camphor 4, oil of anise 4, glycerin 40, diluted alcohol to 1000. Half an ounce contains nearly 1 grain of powdered opium. It is about 1/20 of the strength of laudanum. Dose, for an infant 5 to 20 drops; for an adult 1 to 4 drams. It is an ingredient of mistura glycyrrhizæ composita. **O. Tinctura Deodorati,** an excellent liquid preparation, being freed from all the noxious and useless ingredients soluble in alcohol and ether. Opium-strength 10 percent, average morphin-strength 6 grains to the ounce. Dose, as of tincture of opium. Drops of this preparation nearly equal minims. *McMunn's elixir* is a similar preparation, so also is another proprietary nostrum named *papine*. **Tinctura Ipecacuanhæ et Opii,** has of tincture of deodorized opium 100 evaporated to 80, fluidextract of ipecac 10, diluted alcohol to 100. Is intended to represent Dover's powder in liquid form. Dose, 5 to 15 minims. **Trochisci Glycyrrhizæ et Opii,** each troche contains of powdered opium 1/12 of a grain, with extract of glycyrrhiza, acacia, sugar and oil of anise. Dose, 1 to 4 troches. **O. Vinum** (*Sydenham's laudanum*), opium-strength 10 percent, with the aromatics cinnamon and cloves of each 1 percent, in alcohol and white wine. A vinous tincture decreased somewhat in strength from the wine of 1870. Dose, as of tincture of opium. Drops of this preparation are larger than those of the tincture. See Morphin; Antinarcotic Legislation; Harrison Law.

OPIUM HABIT.—An irresistible craving for opium or its alkaloid, morphin. It is most frequently acquired as the result of long-continued administration of morphin, to relieve some suffering caused by a painful or incurable malady, or for insomnia. Heredity and a neurotic tendency are predisposing factors. Alcoholics often become morphin fiends. The chief symptom is the craving for the drug. Among other symptoms are irresolution, loss of self-control, moral obliquity, and untruthfulness. Epigastric pain or nausea, or both, are frequently complained of toward the time when another dose is due, though whether this is actual or feigned is not always easily determined. Mental depression is a more constant and characteristic symptom, associated with insomnia, intense anxiety, restlessness, and a sense of impending evil, all relieved for a time by the dose. Diarrhea rather than constipation is not infrequent.

Treatment.—Successful treatment is scarcely possible outside an institution, and even within one serious difficulties beset the way, chief of which is the deception practised by the patient. Patients should be divested of their own clothing and put to bed in hospital garb, because in this way alone can we be sure that morphin is not concealed about the person. In the case of women, whenever possible, a separate nurse should be assigned to each case. The latest testimony favors complete and sudden withdrawal of the drug as furnishing a short struggle, though a severe one. Such treatment is usually followed by diarrhea, vomiting, and insomnia. Some counsel even that no adjuncts should be employed, but certainly there can be no harm in the employment of general tonic treatment and remedies directed to the irritability of the stomach and torpor of the liver. A calomel purge is useful at the start. It is a well-established fact that, as in alcoholism, the patient should be well nourished, given such food as milk, cream, beef-juice, or beef peptonoids, rich broths, and beef-teas. When there is great asthenia, aromatic spirit of ammonia, strychnin, and digitalis may be given as directed under Alcoholism (*q. v.*). If possible, an occupation of an absorbing kind should be furnished. In most cases it is impossible to secure the consent of the patient to sudden and complete withdrawal, when the gradual plan must be adopted. The success of either plan depends on securing effectual control of the patient, and if this cannot be obtained, all efforts fail (Tyson).

Chloralamid is probably the best hypnotic. It is not easy of administration, because of pungent taste and difficult solubility. Ten or twenty grains are a moderate dose, and are easily soluble in a fluidram of a mixture of 2 parts alcohol and 1 part glycerin. Of this solution 2 teaspoonfuls should be given in a glass of sherry wine or 4 tablespoonfuls of milk at the ordinary temperature. Trional and sulphonal or somnal may be given in 15- to 20-grain doses dissolved in hot water. Hyoscin in doses of 1/96 of a grain may also be tried. Chloral itself may be used in doses of from 10 to 30 grains. If there is cardiac weakness, the dose should not exceed 10 grains. Chloralose may be given in 5-grain doses in wafers or in hot milk. See Lambert Treatment for Narcotic Addiction.

OPOTHERAPY.—See Organotherapy.

OPSONINS. OPSONIC INDEX.—See Serum Therapy and Vaccine Therapy.

OPTIC NERVE ATROPHY. Causes.—The vast majority of cases are postneuritic—that is, following some inflammation of the optic nerve. Most cases are due to some disease of the brain or spinal cord, especially of syphilitic origin. Of the cerebral diseases might be mentioned disseminated sclerosis, progressive paralysis, and general paralysis; of the diseases of the spinal cord, locomotor ataxia is a prominent cause. Mechanic pressure from tumors, traumatism, embolus in the central artery, cutting off the blood supply, and the toxic agents, causing retrobulbar neuritis, lead to optic atrophy. Blindness, or amblyopia following severe hemorrhages, is supposed to be due to atrophy of the optic nerve. Sexual abuse, "catching cold," physical and mental excesses, have all been set down as causes.

Symptoms and Diagnosis.—The patient notices an early disturbance of vision, consisting of diminution of the central acuity, concentric contraction

of the visual field, both for white and colors, and irregular scotomas. There is no pain, and seldom photophobia. Of the colors, green is first lost, and blue last; light-sense is longest retained. The ophthalmoscopic appearances vary with the cause. If the atrophy is subsequent to papillitis, the disc is increased in size, and there is more or less obliteration of its outline and distention of the veins. In simple atrophy instead of the rosy, healthy hue of the normal disc, the papilla may be grayish-blue or quite white. The outlines have a striking sharpness, which give the shining disc its characteristic appearance. The disc appears sunken and excavated, and allows the network of the lamina cribrosa to be seen through the spaces left open by the disappearance of the nerve-fibers. The vessels diminish in size, and the capillaries of the papilla are no longer visible.

Prognosis is serious. The probability of retaining the vision yet left is small, and the result is usually total blindness.

Treatment should be directed to the cause; constant, increasing doses of strychnin should be given, orally or hypodermically, and the continuous electric current should be applied until it is found to be of no avail. Good results have recently been reported from the combined use of mercuric chlorid and nitroglycerin.

OPTIC NEURITIS. Synonyms.—Choked disc, papillitis, neuroretinitis. **Choked disc** is so called on account of the interference of return of blood through retinal veins by pressure from swelling at this point. **Papillitis** generally describes an inflammation limited to the intraocular head of the optic nerve, although in all probability, in the majority of cases, the nerve is affected throughout its entire length. There is less swelling than in choked disc, the visual disturbance appears earlier, and the disease leads to atrophy and blindness more frequently than does choked disc. **Neuroretinitis** and **papilloretinitis** are terms used to describe an inflammation which involves the retina as well as the optic nerve. It is characterized by hemorrhages, patches of fatty degeneration that appear as white spots, deposition of pigment, etc., similar to the changes in albuminuric retinitis.

Causes.—The condition often called choked disc may be due to traumatism, but is usually the result of a brain tumor, and is commonly bilateral. Tumors of the cerebellum and those at the base of the brain pressing upon the sinuses are most likely to be followed by choked disc. Some form of optic neuritis is said to accompany 90 percent of all cases of brain tumor. If unilateral, the disease is probably caused by a tumor in the orbit. Other intracranial diseases causing inflammation of the optic nerve are: Tuberculous basilar meningitis of children, epidemic cerebrospinal meningitis—in fact, meningitis from other infectious diseases or from any suppurative origin. Infectious diseases, syphilis, lead-poisoning, and other systemic affections may directly cause optic neuritis. Tumors or diseases of the orbit may have the same effect. Traumatism and inflammation of surrounding tissues are also causes.

Pathologic Anatomy.—Cerebral tumors interfere with the circulation and distribution of subarachnoid fluid in the lymph-spaces. The sheath of the optic nerve becomes much swollen and pyriform. It is supposed that the bacilli of the causative meningitis act directly upon the nerve-head.

The line of distinction between retinitis and neuroretinitis is so slight that we can probably associate closely the causes of the former with those of the latter; however, in albuminuric neuroretinitis the greatest changes are in the retina rather than in the nerve-head, and the urinary tests are quite indicative. Cases of inflammation of the optic nerve in which the cause is unknown are sometimes seen. Occasionally, several members of a family—the males particularly—and of apparently healthy parents, are attacked between the eighteenth and twenty-fourth years by a bilateral optic neuritis. In other cases, "catching cold," suppression of the menses, lactation, etc., are given as causes. In such cases there must be a suspicion that there was latent inflammation which became prominent under the conditions mentioned, and was not directly due to them.

Symptoms and Diagnosis.—The systemic condition is often simultaneously affected. The principal ocular symptom is impairment of vision, gradually passing into total blindness. In the early stages of choked disc vision is not markedly impaired. Particularly typical are diminution of central visual acuity, unsymmetric contraction of the visual field, and impaired color-sense. The ophthalmoscopic appearance of choked disc is a swelling and opacity in the disc and its immediate neighborhood. That the papilla is larger than normal and projects into the vitreous may be proved by the parallax test. The papilla, while undergoing inflammation, has what has been called a woolly appearance, together with swelling and congestion. The same vessels of the disc are dilated, so that many of them are visible, unless masked by excessive edema. There may be numerous capillary hemorrhages in the nerve-head. The retinal arteries are diminished in size, and the veins are swollen and tortuous. The edges of the disc are lost, and a striated flame-like or grayish haziness spreads over the disc into the adjoining retina, nearly equal on all sides. In severe forms there are diffuse retinal hemorrhages and, perhaps, macular changes resembling albuminuric retinitis. In addition to the presence of choked disc, the discovery of hemianopsia and the use of Wernicke's sign will aid in the diagnosis of cerebral growth.

In the interstitial or descending neuritis the disc is not swollen as in choked disc; it is dull and edematous looking. Vision is usually more and sooner affected, owing to the greater length of nerve structure involved.

Prognosis.—The course is usually chronic, finally ending in optic nerve atrophy. Of course, the prognosis is affected by the cause. Cerebral tumors are usually fatal in a short time. The various forms of meningitis are always serious. Restoration of vision is doubtful; there is little hope of regaining lost visual power. However, cures, with restoration of normal visual acuity,

and cures of amblyopia of every degree, have been reported.

Treatment is naturally directed to the cause. If the cerebral tumor can be located, surgical interference may be of value. A syphilitic gumma will yield to mercury and potassium iodid. If no cause is discernible, diaphoresis, the mercurials and iodids, and tonics may be tried. Blood-letting from the temporal region has been reported of value. Possibly mild cases recover spontaneously. If there is reason to suspect that the neuritis is orbital in origin, systemic treatment will prove of little value; and in well-defined malignant orbital disease immediate enucleation is imperative.

OPTIC NEURITIS, RETROBULBAR.—Inflammation of the optic nerve beyond the eyeball, in which the disc is not involved at first, papillitis arising in the advanced stage.

Causes.—Acute retrobulbar neuritis is caused by exposure to cold, acute infectious diseases, sudden cessation of the menses, and any condition which leads to a sudden exudation into the sheath of the optic nerve. The most common cause of the chronic form is excessive use of tobacco and alcohol, although lead-poisoning, syphilis, quinin, and other toxic agents may produce it. As a rule, both tobacco and alcohol are simultaneously used to excess, and act conjointly. The disease is often called *tobacco* or *alcohol amblyopia*, or *toxic* or *intoxication amblyopia*, although many authors distinguish between intoxication amblyopia and retrobulbar neuritis from other causes. It has recently been suggested that the central amblyopia is due to primary rather than to secondary macular disease—that is, that the disease starts in the macula and ascends the central fibers of the optic nerve.

Symptoms.—In the acute disease total blindness results in a few days, and there is often pain in the eye, increased by movement or pressure. The ophthalmoscope reveals a papillitis of moderate severity. In the more common chronic disease the chief symptom is slowly diminishing central vision. The patient complains that he sees indistinctly, especially in bright light, and that his vision improves at sundown. This is explained by the dilatation of the pupil as day light fades, and consequent stimulation of the unaffected perimacular region by the increased illumination. Examination with the perimeter shows a central scotoma, at first for color, and finally for light. At the onset the field of vision remains nearly normal, and only begins to be obliterated when fixation becomes impossible, and nystagmus results. With the ophthalmoscope there is first seen slight hyperemia of the disc, and later a grayish-white discoloration of the temporal halves of the papillæ. The outlines are obscured, the veins are enlarged, and the arteries are diminished in size.

Prognosis may be considered favorable if the disease has not progressed to atrophy, and if the patient can be made to stop drinking and smoking; but relapses are likely to occur whenever the abstinence is suspended.

Treatment.—In the acute form general blood-letting, active diaphoresis, and other antiphlogistic measures are indicated. In chronic cases abstinence from tobacco and alcohol must be enforced, and strychnin administered in increasing doses. If syphilitic, the disease yields to the mercurials and iodids. Any other discoverable cause should be treated according to the indications.

OPTOCHIN.—This is ethyl-hydrocuprein, and is a derivative of quinin. It is used in pneumococcus infections, chiefly of the conjunctiva.

ORANGE.—See Aurantium.

ORBIT, DISEASES.—**Periostitis** is an inflammation of the periosteal lining of the orbit, particularly prevalent in scrofulous and syphilitic patients. The inflammation may be so extensive as to involve the frontal sinuses and produce necrosis of the underlying bones. A blow or a fall is usually the exciting cause.

The symptoms are dull pain, swelling and edema of the skin surrounding the orbital edge, and, if necrosis has taken place, a fistula discharging foul pus and bony débris. Cicatrization of the fistula may lead to ectropion. The eyeball is rarely involved.

Treatment consists of leeches to the temple, cold compresses, and, if the patient is syphilitic, the administration of mercurials and iodids. If the disease reaches a suppurative stage, antiseptic poultices, incision, and drainage are indicated.

Orbital cellulitis, or inflammation of the connective tissue of the orbit, is due to periostitis or to any suppurative or inflammatory process in the vicinity of the eye; even inflammation about the roots of the teeth may cause it. Erysipelas, anthrax, and pyemia may result in metastatic orbital abscess; and, finally, infection after injury to the orbit or its contents is a cause.

The symptoms are pain, fever, general prostration, swelling and redness of the lids, edema and increased tension of the conjunctiva and lids, exophthalmos, fixation of the eyeball in a straight or deviating position, causing visual disturbance, and, after the pus escapes, a discharge from the orbit. In unfavorable cases panophthalmitis may ensue. Metastatic abscesses generally lead to death. Extension into the cranium is always to be feared.

Treatment consists in prompt incision—preferably at a spot showing signs of pointing—drainage, and antiseptic irrigation.

Injuries to the orbit may cause fracture of the bony wall or laceration of the soft parts. Foreign bodies may be received and retained in the orbit for varying periods of time. They may escape into the nasal cavities, or they may cause orbital inflammation, and even death. Luxation of the globe is generally produced by a wedge-shaped foreign body crowding between the eyeball and the orbit. Formerly, what was called "gouging" was resorted to by contestants in brutal fights, the object being to dislocate the eyeball from its socket with the point of the thumb. The danger is blindness from laceration or overstretching of the optic nerve.

Fracture of the orbit may be detected by palpation. If the neighboring sinuses are opened, there will be much emphysema about the lids, made

worse by blowing the nose. There is late appearance (2 or 3 days) of extravasation and ecchymosis of the lids. If the optic foramen is involved, there is, sooner or later, blindness from pressure or injury of the optic nerve. When fracture of the orbit produces enough hemorrhage to cause exophthalmos, the prognosis is grave.

Treatment.—After orbital injuries the affected parts should be thoroughly disinfected and foreign bodies removed. The proximity of the brain to the orbit renders the prognosis doubtful in extensive fractures or infected wounds. Rest and cooling compresses are indicated. In luxation vision may be lost through stretching of the optic nerve, but may return after reposition of the eyeball and retention with a pressure-bandage. If the lids are closed tightly behind the globe, preventing replacement, the external canthus should be divided at once. The longer the eyeball is dislocated, the worse the effect upon vision.

Tumors of the orbit cause exophthalmos in the direction of pressure. The other symptoms are disturbance of motility and vision and pain, all of which vary according to the size and malignancy of the tumor. The chief tumors are osteoma and encephalocele of the orbital wall; tumors of the optic nerve; and sarcoma, cysts, and vascular tumors arising in the neighboring cellular tissue. A genuine orbital sarcoma is extremely rare, and carcinoma never originates in the orbit proper. All orbital tumors of any considerable size or malignancy should be removed after enucleation of the eye. There is little hope of cure of encephalocele.

ORCHITIC EXTRACT.—See TESTICULAR EXTRACT.

ORCHITIS.—See TESTICLE (Inflammation).

ORGANOTHERAPY.—The treatment of diseases by the administration of animal organs, or extracts prepared from them. Although organotherapy has existed in some form since the most ancient times, the method as now practised is of recent origin. Brown-Séquard, in 1889, suggested the employment of testicular juice in the treatment of the mental and physical deterioration incident to old age. Experiments which he had made upon himself had, he reported, yielded the most brilliant results. Physicians in different parts of France subsequently tested the properties of Brown-Séquard's extract, and found its dynamogenic action beneficial in diseases attended with debility, especially in senile changes, in pulmonary tuberculosis, leprosy, locomotor ataxia, general paralysis, and anemia. Paul, in 1892, under the name of "nervous transfusion," advocated the hypodermic use of an extract of sheep's brains in conditions of neurasthenia. The method of preparation of the various extracts as employed in France is that suggested by d'Arsonval. The organ is removed, with all possible antiseptic precautions, and is cut into small pieces of about 1 c.c. The segments are covered with pure glycerin and allowed to macerate for 24 hours. Before filtering, 2 or 3 parts of distilled water are added. Sterilization is accomplished by means of carbonic acid gas under pressure. The first step toward a rational application of the method of organotherapy was the subcutaneous transplantation of pieces of thyroid gland in cases of myxedema and cachexia strumipriva by Horsley and Kocher, and later the employment of extract of sheep's thyroid in myxedema, the credit of which belongs to G. R. Murray, of Newcastle, England. Since Murray's announcement, in 1891, the method has been extensively tested in England and elsewhere; many cases of myxedema have been reported as improved, and not a few cured. Gratifying results have also been achieved in sporadic cretinism, and in psoriasis and other chronic affections of the skin. Various preparations of the thyroid gland have been employed—*e. g.*, glycerin extracts, dry extracts in powder, and, finally, the uncooked or partially cooked gland has been used. In the particular case of myxedema neither the kind of preparation nor the mode of administration seems to be of much importance. The results have been practically the same whether a liquid extract was given by hypodermic injection, or a dry extract was administered by the mouth. The fresh gland, slightly fried and seasoned, has also been used, and at present is preferred by many. The success attending thyroid therapy in myxedema has led to the employment of many other organic extracts in diseases of corresponding organs. Extracts have been prepared from nearly every organ in the animal body; thus there are on the market: *Cerebrin*, from the brain; *medullin* or *myelin*, from the cord; *cardin*, from the heart; *musculin*, from muscles; *ossin*, from bones; *renin*, from the kidneys; *gastrin*, from the stomach; *pancreatin*, from the pancreas; *ovarin*, from the ovary, and *testin*, from the testis. Pituitary extract has sometimes proved beneficial in acromegaly. Splenic extract has been used with some success in exophthalmic goiter, and in insanity due to physical exhaustion. Thymus extract appears beneficial in leukocythemia, chlorosis, anemia, pernicious anemia, "status thymicus." Brain-extract has been reported as beneficial in various organic and functional diseases of the nervous system, such as locomotor ataxia, bulbar palsy, general paralysis of the insane; also in epilepsy, neurasthenia, migraine, hysteria, hebephrenia, and other conditions. Heart-extract is recommended for cases of nervous prostration. It is said to raise the blood-pressure, augment the quantity of urine, and increase the number of red blood-corpuscles. In diseases of the muscular system muscle-extract is also reported as of value. Extract of pancreas, containing the active ferments of the gland, has been administered with doubtful success in certain cases of diabetes mellitus, which disease, as is well known, is sometimes dependent upon morbid changes in the pancreas. Of all the extracts, that of the thyroid gland is still the one most successfully employed. Its use is not confined to the two diseases mentioned—myxedema and cretinism; it seems to be an efficient galactagog and is useful in promoting consolidation of obstinate fractures; it has also proved useful in diseases of the skin, in leukemia, and affections of the nervous system, both organic and functional,

endometritis, menorrhagia, uterine fibroma and carcinoma, lupus, ozena, obstinate leg ulcers, progressive myopathy, simple goiter; in exophthalmic goiter, and diabetes mellitus and cases presenting much emaciation it is contraindicated. See THYROID TREATMENT.

ORPHOL.—Bismuth beta-naphtholate. An intestinal antiseptic. Dose, 5 to 20 grains in honey or milk. See BISMUTH.

ORRHOTHERAPY.—See SERUM THERAPY.

ORTHOFORM.—It has no chemical relation to cocain which it resembles only in its action on the sensory nerve terminations. It occurs as a white, crystalline, odorless and tasteless powder, almost insoluble in water. It is efficient as a local anesthetic only when it comes in contact with exposed sensory nerves, and has been used chiefly as a dusting powder or ointment for painful abrasions, ulcers or burns. Applied in powder to raw surfaces, as burns, and excoriated nipples, it has frequently produced local gangrene. Internally it has been given in doses of 8 to 15 grains for the pain of gastric ulcer and cancer. It does not relieve the pain of simple gastralgia, and hence it has been employed as a test for gastric ulcer. A saturated solution in collodion may be used as a paint, and an emulsion in glycerin is employed during operations within the uterus. The hydrochlorid is more soluble in water and may be used for internal administration or urethral injection, but is too acid for hypodermic injection or eye application. Its *incompatibles* are antipyrin, bismuth subnitrate, and silver nitrate.

ORTHOPEDIC SURGERY.—See GENU, HIP-JOINT DISEASE, TALIPES, etc.

OSLER'S DISEASE.—See ERYTHREMIA.

OSMIDROSIS.—See BROMIDROSIS; SWEAT-GLAND.

OSMIUM TETROXID (Osmic Acid).—Obtained by the action of nitrohydrochloric acid on osmium. In persistent neuralgia it is injected into the nerve in doses of 1/2 to 1 c.c. of a fresh 1 to 2 percent solution. The cure is rarely permanent. It is contraindicated in renal disease.

OSTEOARTHRITIS.—See JOINTS (Diseases).

OSTEOARTHROPATHY, HYPERTROPHIC PULMONARY.—A disease first described by Marie, characterized by a bulbous enlargement of the terminal phalanges of the fingers and toes, a thickening of the articular ends of the bones, a peculiar curvation of the nails, and an enlargement of the lower jaw. According to Marie, the condition is usually associated with disease of the lungs or pleura, and results from the absorption of toxic products from the diseased foci. The disease is not allied to akromegaly. See BONE (Diseases), JOINTS (Diseases).

OSTEOCLASIS.—See GENU VALGUM.

OSTEOMA.—A bony tumor; exostosis. See TUMORS, BONE (Diseases).

OSTEOMALACIA.—Softening of bone from loss of its earthy constituents, occurring in adults, especially in females and in the course of pregnancy. The true cause of the disease is not known; by some it is considered to be infectious, but this view is not proved. See BONE (Diseases).

OSTEOMYELITIS.—See BONE (Diseases).

OSTEOPERIOSTITIS.—See BONE (Diseases).

OSTEOSARCOMA.—See BONE (Diseases).

OSTITIS.—See BONE (Diseases).

OSTITIS DEFORMANS (Paget's Disease).—A rare senile disease characterized by kyphosis of the spine, marked enlargement of the cranial part of the head, enlargement and deformity of the clavicles, and of the long bones of the extremities due to a rarefying ostitis. The abdomen protrudes; the ribs fall in and cause dyspnea; neuralgic pains are present; and there is some muscular atrophy, but the bones of the face, hands, and feet remain practically normal.

OTITIS.—See EAR (Diseases).

OTOSCOPE.—An instrument for examining the ear. What is ordinarily called and used as an otoscope is a rubber tube, one extremity of which is inserted into the ear of the subject, and the other extremity into the ear of the examiner, a current of air being passed by means of a Politzer bag and a eustachian catheter through the middle ear. In case of tympanic perforation the rushing sound made by the passing air is audible to the examiner. See EAR (Examination).

OVARIAN EXTRACT.—The substance of the ovaries has been administered with some benefit in the nervous manifestations and pathologic conditions which occur when the ovarian functions are partially or wholly arrested, as in cirrhosis or malignant disease thereof, or after the operation of ovariotomy. It is said to be of use in cases of depression or other mental disturbance coincident with the climacteric, to relieve ovarian congestion and neuralgia, and to be efficient in the treatment of delayed or scanty menstruation. See ORGANOTHERAPY.

OVARIOTOMY.—The removal of the ovaries and Fallopian tubes. This operation is usually effected through an incision in the abdominal wall. Some operators, under certain circumstances, prefer the vaginal route.

The operation is performed for diseased conditions of the tubes and ovaries; for extrauterine pregnancy; for cysts and tumors of the ovary; and for cysts of the parovarium. See FALLOPIAN TUBES; OVARY (Diseases).

The removal of the tubes and ovaries was formerly advised in certain cases of fibroid tumors of the uterus to bring about a premature menopause, but at present the operation is rarely if ever done for that purpose. See UTERUS (Fibroid Tumors).

OVARY, DISEASES. Hernia.—Descent of the ovary into the inguinal canal, or even into the labium majus, has been noted occasionally. There may be no symptoms present, or there may be pain, which is much increased at the menstrual period. The characteristic sickening pain on pressure, the increase in size at the menstrual period, and bimanual examination will confirm the diagnosis.

Treatment should consist in replacing the ovary and sac, after which it should be kept in place by a properly applied truss. If the ovary is diseased, it should be removed.

Prolapse.—Downward displacement of the ovary without displacement of the uterus and

tubes. For displacement of the ovary accompanying displacement of the uterus, see Uterus.

The principal **cause** of prolapse of the ovary is some condition which increases its weight, such as prolonged congestion, inflammation, and subinvolution. Elongation and stretching of the ligaments of the ovary may result in prolapse. It sometimes occurs as the result of a violent strain or sudden effort.

The symptoms of ovarian prolapse are usually well marked and occasionally severe. Pain is the most constant symptom. It is increased by any movement or straining effort, such as walking or defecation. It is always more severe at the menstrual periods. The pain is dull and aching in character, and usually extends down the thigh. Associated with the pain are frequently found such symptoms as nausea and indigestion, headache, and nervous disturbances. Bimanual examination will usually reveal the ovary in its abnormal position. It is enlarged and excessively tender, the slightest touch causing intense pain. Occasionally it may be pushed in place by the examining finger, when it will remain there until the patient assumes the erect posture, or until she coughs or strains.

The treatment of ovarian prolapse will depend upon the condition which causes it. Prolapse of the ovary accompanying displacement or subinvolution of the uterus will usually be cured by restoring the uterus to a normal condition. In uncomplicated cases of ovarian prolapse the patient should be advised to assume the knee-chest position 2 or 3 times daily; the vaginal orifice should be opened so that its walls may be distended by air, and the woman should remain in this position for 5 or 10 minutes if possible, after which she should lie in the lateroabdominal position for a time. This restores the ovary to its normal position, and, in time, if efforts are made to reduce the size of the ovary and to secure contraction of its ligaments, it may remain there.

Return of the ovary to its normal size may be secured by relieving pelvic congestion. This is best accomplished by the use of saline laxatives; by frequent vaginal douches of hot water; by painting the vaginal vaults and cervix with tincture of iodin, and by the use of glycerin or glycerin and ichthyol tampons. If the ovary is diseased, or if it is bound down in its abnormal position by extensive adhesions, it will have to be removed. Occasionally, if the ovary is healthy, the abdomen should be opened and the ovary fixed in its proper position. Sometimes this may be accomplished by shortening the round ligaments or by ventrofixation. In other cases the infundibulopelvic ligaments should be shortened or the outer end of the ovary should be attached to the broad ligament at its upper posterior part. However, the ovary is ordinarily diseased.

Acute inflammation of the ovary (oophoritis) is usually the result of extension of inflammation from the tube. It is particularly apt to occur as the result of gonorrheal salpingitis or puerperal sepsis. It may occur as a complication of the eruptive fevers.

The symptoms of acute oophoritis are pain in the ovarian region, accompanied by rise of temperature and rapid pulse. There may be nausea and vomiting. Bimanual examination will reveal the enlarged tender ovaries.

The treatment consists of rest in bed, vaginal douches of hot water, hot fomentations over the lower abdomen, and free purgation. If the symptoms increase in severity and if suppuration occurs, laparotomy must be performed and the diseased structures removed.

Chronic inflammation of the ovary occurs in two forms. The follicular part of the ovary may be particularly involved, giving rise to the formation of numerous little cysts underneath the capsule, when it is called cystic oophoritis; or there may be an increase in the connective-tissue element of the ovary, diminishing its size and rendering it paler and harder, when it is called cirrhotic oophoritis. Chronic oophoritis is usually bilateral. The condition may persist after an acute attack, or it may be chronic from the beginning as the result of a mild form of infection transmitted from the tubes. Prolapse of the ovary, excessive sexual connection, and celibacy may be mentioned as less important causes.

Symptoms.—The most important symptom of chronic oophoritis is pain. It is worse just before the menstrual period, and is usually relieved after the flow is well established. The pain is exaggerated by the erect posture and by exercise or movement of any kind. Associated with the pain are commonly menorrhagia and reflex nervous disturbances. Bimanual examination will reveal the altered condition of the ovary. Accompanying it there will usually be found displacement of the uterus and disease of the tubes.

The treatment of chronic oophoritis is palliative or operative. Palliative treatment may prove successful when there is no accompanying disease of the tubes or uterus. It consists of prolonged rest in bed, mild purgation, hot vaginal injections, applications of tincture of iodin to the vaginal vaults and cervix, and the use of glycerin tampons. It may be necessary to begin the treatment by the repair of a lacerated cervix or perineum, or by a thorough curettage. Sexual connection must be prohibited during the treatment. If there is accompanying disease of the uterus and tubes, or if, after the foregoing treatment, the pain should persist or return, oophorectomy should be performed.

The relief afforded by palliative treatment is rarely permanent when this plan is pursued to tide the woman over the menopause. Palliative treatment is only applicable to women who can afford to be chronic invalids.

Cystic Tumors.—There are 3 classes of cystic tumors of the ovary:

1. *Oophoritic cysts*, which arise from the parenchyma of the ovary—the oophoron.

2. *Paroophoritic cysts*, which arise from the hilum of the ovary—the paroophoron.

3. *Parovarian cysts*, which arise from the parovarium.

Cysts of this last class while they do not arise

directly from the ovary, have so close a connection with it that they may properly be classed as ovarian cysts.

Oophoritic cysts may be subdivided into (1) cysts of the Graafian follicles, (2) cysts of the corpus luteum, and (3) multilocular cysts.

Cysts of the Graafian follicles arise from distention and coalescence of the ovarian follicles. Such cysts may consist of a number of distended follicles or of one large follicle. They rarely attain a large size, usually ranging from that of a walnut to an egg. The wall of the cyst is thin and smooth, and is lined with epithelium, either columnar or stratified. It is filled with a straw-colored serum, having a specific gravity from about 1005 to 1020.

The condition is usually due to thickening of the capsule of the ovary, which prevents rupture and discharge of the Graafian follicle. These cysts are, therefore, retention cysts. Occasionally hemorrhage will take place in the cyst, when it will be found filled with a dark, chocolate-colored fluid.

Cysts of the corpus luteum are a variety of follicular cysts. They have a peculiar light-yellow color, and almost never exceed a walnut in size. They are caused by degeneration and distention of a corpus luteum.

The symptoms of the two varieties of cysts just described are not marked. There is usually some ovarian pain, and there may be menorrhagia or metrorrhagia.

The diagnosis must be made by a bimanual examination, which will reveal the enlargement of the ovary.

Unless the pain is intense, palliative *treatment* is indicated. Should the patient suffer severely, the ovary and probably the corresponding tube should be removed. If there is but one cystic cavity in the ovary, it should be incised, its contents evacuated, and the severed edges whipped over with fine catgut. It should be remembered that these cysts are limited in growth, and will never give rise to dangerous symptoms.

Multilocular cysts are cysts of unlimited growth. They are supposed to originate in a degeneration of the ducts of Pflüger. The wall of these cysts is thick and strong, and is composed mainly of fibrous connective tissue. It has usually 3 layers, which are most distinct in the neighborhood of the pedicle. These cysts are intraperitoneal in growth, and are attached to the ovary by a distinct pedicle, through which it obtains its nourishment. As these cysts increase in size, the septums between the loculi may be absorbed, so that, although the cyst is always multilocular at first, it may finally become unilocular. Traces of these septums are, however, always visible.

These cysts may vary in size from that of a fetal head to a tumor weighing as much as 200 pounds. The contents are usually syrupy in consistency and light in color, and may be dark brown or black. The specific gravity is always above 1010. If the lining membrane is epithelium, the tumors are known as simple multilocular cysts; if mucous membrane, they are called glandular cysts; if presenting the characteristics of the skin and its appendages, they are known as dermoid cysts.

Paroophoritic cysts are also called papillary cysts of the ovary. They arise from the hilum of the ovary, and probably originate in the remains of the Wolffian body. Since they grow from the hilum, or attached portion of the ovary, they are usually extraperitoneal, forcing their way between the layers of the broad ligament. As a rule, these cysts are not attached by a distinct pedicle.

The lining membrane is cylindrical epithelium, sometimes ciliated. Upon the interior of the cyst are scattered warty or papillary growths, from which it derives its name. These growths are usually pink in color and are very vascular, bleeding upon the slightest touch. They show a marked tendency to perforate the cyst wall, causing secondary papillary growths to appear on any organ with which they come in contact. The contents are usually a clear, watery serum, with a specific gravity of from 1005 to 1040.

These cysts are rarer than the multilocular cysts; they do not grow so rapidly, nor do they become so large; and they are frequently bilateral.

Parovarian cysts may be subdivided into (1) cysts of Kobelt's tubes and (2) cysts of the vertical tubes. They originate in the parovarium, the remains of a fetal structure lying in the mesosalpinx between the tube and ovary. Cysts of Kobelt's tubes are small pedunculated cysts about the size of a pea. They originate in the outer series of tubules of the parovarium. They are not important pathologically, since they cause no disturbance. They resemble very much the hydatid of Morgagni.

Cysts of the vertical tubes are of unlimited growth. They develop between the layers of the broad ligament, and are therefore extraperitoneal. The layers of the broad ligament are widely separated, and the fallopian tube is greatly elongated. The ovary is not affected unless the cyst becomes large. Cysts of the vertical tubes may be either simple or papillary. The papillary varieties are rare, and present the same characteristics as the cysts of the paroophoron. The wall of the parovarian cyst is thin, and its contents are a clear serum with a specific gravity below 1010.

These cysts are small in size, slow in growth, and are almost invariably unilocular and unilateral. The following tables will recall the classification and characteristics of the cystic tumors of the ovaries:

CYSTIC TUMORS OF THE OVARY

I. Cysts of the oophoron.	1. Cysts of the Graafian follicle.	Blood cysts.
	2. Cysts of the corpus luteum.	
	3. Multilocular cysts.	(*a*) Simple. (*b*) Glandular. (*c*) Dermoid.
II. Cysts of the paroophoron; Papillary cysts of the ovary.		
III. Cysts of the parovarium.	1. Cysts of Kobelt's tubes.	
	2. Cysts of the vertical tubes.	(*a*) Simple. (*b*) Papillary.

Multilocular Cysts of the Ovary.	Papillary Cysts of the Ovary.	Cysts of the Vertical Tubes.
1. Intraperitoneal.	1. Extraperitoneal.	1. Extraperitoneal.
2. Pedunculated.	2. No pedicle.	2. No pedicle.
3. Multilocular.	3. Unilocular.	3. Unilocular.
4. Ovary destroyed.	4. Ovary normal.	4. Ovary normal.
5. Tube normal.	5. Tube normal.	5. Tube elongated.
6. Unilateral.	6. Bilateral.	6. Unilateral.
7. Specific gravity of contents above 1010.	7. Specific gravity of contents not diagnostic.	7. Specific gravity of contents below 1010.
8. No papillary growths.	8. Papillary growths.	8. Rarely papillary growths.

The symptoms of ovarian cysts are not at all diagnostic. There may be some menstrual disturbance, usually menorrhagia; pain may or may not be present. The pain of ovarian cysts is due to pressure, and is largely dependent upon the direction of growth of the tumor. Cysts growing into the pelvis between the layers of the broad ligament usually cause the greatest disturbance. Most frequently, if the cyst is intraperitoneal, the patient complains of no symptoms until the tumor has grown to sufficient size to distend the abdomen. Later she loses weight and strength, the general health fails, and her features assume a characteristic pinched expression, which has been called *facies ovariana*.

The physical signs of ovarian cysts are usually more distinct. Inspection may reveal a localized or general enlargement of the abdomen. Palpation will reveal a tense resisting tumor, usually smooth and regular in outline, which will give a distinct wave of fluctuation. Percussion shows dulness over the face of the tumor, with resonance above it and in the loins. The dulness does not change when the position of the patient is changed.

Bimanual examination will reveal the uterus normal in size, and usually displaced by the weight of the tumor. The lower segment of the tumor can generally be felt by the vaginal finger. Ovarian cysts may be mistaken for ascites, pregnancy, fibroid tumors of the uterus, and a fat abdominal wall with tympanitic distention of the intestines.

The prognosis is favorable if operation is performed. Ovarian cysts are not malignant in character, yet they frequently cause death by their rapid growth and great size. Pressure upon the uterus, with resulting kidney-disease, is another frequent cause of death. Other causes of death may be the various complications to which cysts are liable, such as inflammation and suppuration, torsion of the pedicle, hemorrhage, and rupture. Papillary cysts are particularly dangerous on account of their liability to rupture, with the formation of secondary papillary growths.

The treatment of ovarian cysts is operative. Even though the tumor has given no symptoms, it should be removed. Serious complications may arise at any time which will render its removal difficult, or which will destroy the patient in a few days. Tapping should not be resorted to on account of the many dangers which attend it.

Solid Tumors.—Solid tumors of the ovary are rare. They are found in about 5 percent of all cases of ovarian tumors. The most important are fibroma, myoma, sarcoma, carcinoma, and papilloma.

The treatment is removal as soon as diagnosed.

OVERLYING.—An accident which not infrequently happens to young children, and in which they are suffocated. It is usually the fault of drunken parents who, in sleep, roll over their infants. Evidence that a child has really died from this cause is afforded by (1) the postmortem appearance of death from asphyxia; (2) the absence of any other mortal disease, and (3) absence of evidence of any cause of asyphxia other than overlying. The statement that a child has been overlain should be received with caution. It is reasonable to suppose a child would escape from a suffocating position beneath bedclothes, or the body of another, or succeed by crying or struggling in awaking the nurse or another. A medical witness must consider all points before charging carelessness in this, or, on the other hand, allowing an act of wilful murder to pass under the guise of accidental death.

OXALIC ACID $(COOH)_2$.—A colorless, crystalline solid, occurring in many plants as potassium oxalate. It is soluble in 9 parts of water and more soluble in alcohol. It is a respiratory depressant in 1/2 grain dose, and is a violent poison in large dose. It is serviceable in amenorrhea, in 1/2 to 3/4 grain dose, and it is classified as a direct emmenagog. It is commonly known as "salts of lemon" or of "sorrel," and is used for removing ink-stains; when taken internally, it results in poisoning. If a person immediately after swallowing a solution of a crystalline salt which tasted purely and strongly acid is attacked with burning sensation in the throat and then in the stomach, vomiting, particularly of bloody matter, imperceptible pulse, and excessive languor, and dies in half an hour, or still more in 20, 15, or 10 minutes, there is strong reason to believe that oxalic acid has been taken. The antidotes are the calcium carbonate or hydrate in such forms as lime-water, chalk, whiting or wall-plaster in water, or magnesia. Potassium and sodium carbonates and bicarbonates are to be avoided. Bland mucilaginous drinks should be given, and warm poultices should be applied to the abdomen. Cerium oxalate is official. See Cerium.

OXALURIA.—A term used to indicate the presence of calcium oxalate in the urine in an undue amount. There is a white deposit on standing. It occurs in the urine of hypochondriac and depressed patients, and in that of gouty patients. Excessive venery and masturbation will produce it, as will the ingestion of certain foods, as rhubarb. See Urine (Examination).

OX-GALL.—See Fel Bovis.

OXYGEN.—Oxygen is inhaled as a therapeutic agent in diseases of the respiratory organs and blood. It is essential to respiration, blood-formation, nutrition and tissue change, in fact to life itself; its combination with the tissues yields heat and other energy. Combustion is also dependent upon it, consisting of a rapid oxidation, with the

evolution of heat and light. It exists also in an allotropic form known as Ozone (*q. v.*). See also Hydrogen Dioxid.

OXYTOCICS or ECBOLICS, agents which stimulate the muscular fibers of the gravid uterus to contraction, and may therefore produce abortion. In small doses the same remedies are as a rule **emmenagog** (*q. v.*). Their mode of action has not been clearly made known, but it is generally believed to be due in some cases to direct stimulation of the uterine center in the cord, in others to congestion of the uterus producing reflex stimulation. The principal are: Ergot, ustilago, savin, potassium permanganate, hydrastis, borax, cotton-root bark, oil of rue, pilocarpin, viscum flavescens, strong purgatives.

Any drastic purgative, or gastrointestinal irritant, may produce abortion by reflex action. The *volatile oils* act in this manner, also *colocynth* and many other agents used by women to produce abortion, as *tansy, pennyroyal,* etc., all of which are dangerous to life in doses sufficient to excite the action of the gravid uterus.

OXYURIS.—See Worms (Round-).

OZENA.—A chronic inflammation, with subsequent atrophy, of the mucous membrane of the nose, accompanied by the formation of dry crusts and by a very offensive odor. The great difficulty in dealing with ozena is the removal of the crusts and thickened secretions upon which the fetor depends. While the secretions remain, decomposition is present, and the diseased surface is never in condition for healing. The treatment, therefore, may be summed up in the words absolute cleanliness. The persistent use of the nasal douche should be continued until every trace of thickened secretion is removed. At first, or in neglected cases, hot fomentations and steam inhalations may assist in the removal. When the dried discharge adheres to the roof of the nasal cavity, a syringe may be used to wash it out, or it may be mopped out by pledgets of cotton-wool twisted around a probe. A solution of sodium bicarbonate may be used at first, and when crusts are removed, an antiseptic solution should be substituted. Potassium permanganate, zinc chlorid, zinc sulphate, carbolic acid, solution of chlorinated soda, potassium chlorate, silver nitrate, sulphurous acid, powdered alum, boroglycerin, glycerite of tannin, tincture of iodin, boric acid, chloral hydrate, and perchlorid of mercury may all be used locally in aqueous solution.

Cotton tampons may be saturated with:

℞.	Beta-naphthol or naphthol,	gr. xij
	Tincture of quillaja,	ʒ jss
	Distilled water, enough for	℥ j.

The interior of the nose may be painted with balsam of Peru, and tampons, saturated with the same drug, may be left in contact with the deeper parts of the cavity. This effectually destroys all fetor. Powders of boric acid, bismuth, camphor, tannin, calomel, and iodoform have been used, but they are less satisfactory than liquid applications. As a rule, ulcers heal readily under constant irrigation by weak saline or antiseptic solutions. When diseased bone is present, it must be removed before healing can begin. Curettage is often very successful. Syphilitic ozena requires local treatment with mercuric chlorid in solution of 1:5000 to 1:10,000. Calomel may be insufflated with advantage. Constitutional treatment is of great importance in ozena, and is especially required in strumous and syphilitic cases. See Nose (Caries), Rhinitis (Chronic).

OZONE.—An allotropic form of oxygen, its molecule having the structure O_3. It is present in the atmosphere in small quantities, being produced constantly by the evaporation of water, by electric discharges, and in the growth of chlorophyll-containing plants. It is also formed during the slow oxidation of phosphorus, turpentine, and other essential oils. In the sickroom it may be produced by dissolving in water a mixture of manganese dioxid, potassium permanganate and oxalic acid. It is an active oxidizing agent, possessing bleaching and antiseptic properties. It has been recommended in cases similar to those in which oxygen is used; also in infectious diseases, as diphtheria. See Oxygen.

P

PACHYMENINGITIS.—See Meningitis.

PACK.—A blanket wrapped about the body. A **cold pack** is a blanket wrapped about the body after having been wrung out of cold water. A **half pack** is one limited to the trunk. A **hot pack** is a blanket wrung out of hot water and wrapped around the body. A **wet pack** is a blanket wrung out of warm or cold water, and wrapped about the body or a part, and surrounded by dry blankets. It may be used as a means of reducing temperature (cold pack), or to produce sweating (hot pack).

PAGET'S DISEASE.—See Breast (Diseases); Ostitis Deformans.

PAIN.—Bodily or mental suffering. Distressing or agonizing sensation. It is usually due to irritation of sensory nerves, although there are said to be pains of central origin.

The qualifying terms applied to pain are: **P., Boring,** severe pain in bones of a boring character. **P., Electric.** See Pain (Fulgurant). **P., Fulgurant, P., Fulgurating,** the intense shooting, cutting pains affecting principally the limbs of patients suffering from locomotor ataxia. **P., Girdle,** a painful sensation as of a cord tied about the waist; it is a symptom of organic spinal-cord disease. **P., Growing,** a popular term for the soreness about the joints in young persons at puberty. Some attribute these pains to increased vascularity of the epiphyses of long bones; others believe them to be rheumatic. **P., Jumping,** the pain peculiar to disease of joints when the bone is exposed by ulceration of the cartilage. **P., Lancinating.** See Pain (Fulgurant). **P., Lightning.** See Pain (Fulgurant). **P., Osteocopic,** bone-tiring pains; a symptom of ostitis, periostitis, and secondary syphilis. **P., Shooting.** See Pain (Fulgurant). **P., Starting.** Synonym of Pain (Jumping).

General Diagnosis.—As an aid to diagnosis, the kind of pain and its location are often of higher value than any other symptoms. Thomson divides pain into 6 different forms: (1) That due to inflammation; (2) that due to pressure; (3) that due to stretching; (4) neuralgic pain; (5) subjective pain; (6) cutaneous reflex pain.

An investigation should begin with a request that the patient describe just where the pain is felt most, and where it first began. While he is doing so, the gestures which he uses should be carefully noted.

When the pain is due to inflammation, if external, as in a joint, the patient will avoid pressure upon the most painful part. If deeper seated, the gestures are often expressive of the varying kinds and distribution of the pain, according to the texture inflamed. Thus, the diffused soreness of a mucous-membrane inflammation causes the gesture of bronchitis to be made with the whole hand laid on the sternum, and then passed over and across the chest. A similar movement of the hand across the abdomen never implies peritonitis, but catarrhal intestinal inflammation. With pleurisy and peritonitis, on the other hand, the tips of the straightened fingers are used to indicate the stabbing nature of the pain. In the localized pain of commencing appendicitis the open hand is used, as with an inflamed joint. In pleurodynia the whole hand is pressed firmly to the side to prevent movement of the ribs. In rheumatic fever the pointing by the patient to the epigastrium or to the xiphoid cartilage, especially if followed by a movement from the precordium up the neck or into the left arm, is significant of cardiac inflammation. So also the gesture in gastritis, whether acute or chronic, is wholly different from that in colic. Inflammatory pains about the head may have very characteristic gestures. The use of one finger-tip to localize it on the scalp is strongly significant of intracranial syphilis. The finger-tips passing up the side of the face and stopping on the scalp an inch below the sagittal suture indicates pain ascending from a tooth, and should not be mistaken for trigeminal neuralgia. In conjunctivitis the hand is laid over the eye. In iritis the finger is pointed toward it, not touching it, and then passed up the forehead to the inner side of the nose or to the malar process. In glaucoma the gesture may be reversed, as if the pain were emerging from the orbit. All these gestures differ entirely from those of head pains not inflammatory. Meningitis, whether cerebral or spinal, is significantly indicated by absence or suppression of gesture, for reasons to be noted further on. There are exceptions to this in some cases of tubercular meningitis. But the gesture of myelitis, with both hands passed from the back across the abdomen to describe the cord- or band-like sense of constriction, is almost pathognomonic.

On the other hand, the gestures indicating the seat of greatest pain produced by pressure, as by tumors, abscesses, etc., or cramps, markedly contrast with those of inflammatory pains in showing no apprehension in touching or in moving the part. Here the locality indicated at first by the gesture is of importance to note, and whether, on repeating the question, the same place is again started from, because the patient's hand then moves in a fashion expressive of the extension or radiation of the pain from the original focus, although he may describe the pain as equally present at some distance from the spot first pointed out. Hence his unconscious repetition of the sign with which he commenced is of much significance. Thus, a patient with a growth springing from the lumbar vertebræ always first pressed the point of two fingers deeply into the abdomen below the umbilicus, while the fingers of the other hand moved over the sacrum, where he insisted his pain was chiefly. A fixed pain in the back caused by an aneurysm is often indicated by the extended thumb, and likewise the

pain preceding herpes zoster, but no spinal inflammatory pain will elicit such a gesture, nor will the pains of so-called spinal irritation. In stretching pains, such as in biliary or renal colic, or cramps, as in lead colic, the contrast to inflammatory pains is shown by the forcible grasp or pressure which the patient makes on the abdomen, while the characteristic radiations of the different varieties may be very plainly represented. Even when the pain has ceased, the gestures descriptive of what he has experienced may be equally conclusive as to their nature (Thomson).

Inflammatory pains have three great characteristics. The first is that pain is elicited by pressure upon, or by handling, the inflamed part; and the rule is that pressure produces the maximum amount of pain at the site of the inflammation. This fact is useful in diagnosis, both positively and negatively. Thus, an inflammatory pain in the leg may be due to peripheral neuritis, to sciatica, to hip-joint disease, to gouty arthritis, to rheumatic arthritis, to muscular rheumatism, or to spinal meningitis, and each one of these may be distinguished from the others by appropriate palpation. In peripheral neuritis pain is most complained of on pressure upon the skin and superficial structures much more than when one lifts the whole limb in the hands or moves its joints. Sciatica is diagnosed by the special tenderness on pressure at the sciatic notch, along the course of the nerve down the back of the thigh, or deep in the popliteal space, or between the heads of the soleus in the calf; hip-joint disease by pressing the head of the bone against the acetabulum.

The second great characteristic of inflammatory pain is that it is increased by any form of movement of the inflamed part, not excepting its own proper functional movements. The inflamed part, therefore, is both voluntarily and involuntarily kept at rest as much as possible. This is done by muscular action, the afferent impression of this pain being reflected to all the associated muscles of the part to restrain their action, and even to muscles which, though not usually connected with the function of the part inflamed, may yet disturb it by their movements. Examples of the first kind are seen in the fixity of joints by the contraction of their muscles whenever and as long as the joints are inflamed, while the latter is shown by both the local or general rigidity of the abdominal muscles, according to the local or general state of inflammation underneath. Thus, comparative palpation made by both hands in the iliac fossæ is of help in the early diagnosis of typhoid fever. In appendicitis, from the commencement of the irritation, the muscular resistance over the cecum may give the impression of a solid tumor much before there has been time for exudation or pus-formation.

The third great characteristic of inflammatory pain is that it is accompanied by disturbance of the normal function of the injured part. This does not happen with the other varieties of pain—at least, as a characteristic of them. Neuralgic headache, for example, is not accompanied by delirium, or, ordinarily, by intolerance of light or of sound, as the headache of meningitis is. Neuralgic pains in the spine, in the arms, or in the legs do not produce stiffness nor fetter the movements of those parts whose chief functions are to execute movements, as do inflammatory pains. So the diagnosis between pleurisy and pleurodynia lies in the fact that the pain on movement of the ribs in pleurisy causes the functional symptom of cough, while that of pleurodynia does not, for the seat of the pain is not in the pleura at all.

Besides these three great characteristics of inflammatory pains, the sensation itself often varies in kind, according to the tissue involved. The rule is, the softer the texture, the more acute the pain; so that it may be described as only dull and heavy, as in inflammation of the liver or in pneumonia which has not involved the pleura. In inflammations of mucous membranes the pain, if moderate in degree, is more like a diffused soreness; if severe, it may be termed burning. Whenever griping or bearing-down sensations develop, it is because the inflammatory irritation has extended from the mucous membrane to the muscular coat of the wall of the canal or viscus which the membrane lines. Pain of inflamed serous membranes is much more acute than in the case of mucous membranes, and is likely to be lancinating or stabbing, as is indicated by the patient's gesture. Pain of inflamed fibrous tissues, such as muscular fascia, nerve-sheaths, periosteum, dura, etc., if moderate, is of a dull, aching character; but if severe, is very violent on account of the unyielding nature of the tissue. A serviceable indication of the seat of the inflammatory process is afforded by the susceptibility of patients with any form of fibrous-tissue inflammation to changes in the weather. In health there is a perfect adjustment between the centrifugal pressure of the circulation and the centripetal pressure of the weight of the atmosphere. Changes in the latter, as indicated by the fall in the barometer on the approach of a storm, are promptly compensated for by the nerve-fibrils being readily removed in the softer tissues from unbalanced intravascular pressure, but not so in the denser fibrous tissues. Hence the good, but inconvenient, barometers which a gouty man has in his toes, that may ache worse while the sky is yet clear, but which he knows, from experience, means that the clouds are on their way. It is well, therefore, to ask whether a headache complained of grows worse just before a storm, when you have reason to suspect that it is no mere functional trouble, but a cephalalgia of syphilitic origin (Thomson).

Referred Pains.—These are made clear by the illustrations, the following sections, and the table at the end of the article.

Local Significance.—**Pain in the head,** when continuous, dull, aching, and increased on lowering the head, may be due to rheumatism. When of like character and limited to the forehead, it may be dependent on gastric derangement or eye-strain. It is likely to be neuralgic when limited to one spot of the head or face, and darting from spot to spot and sharp and paroxysmal. When accompanied by nausea, vomiting, and giddiness, it is called migraine, but is probably due to eye-strain. Cerebral

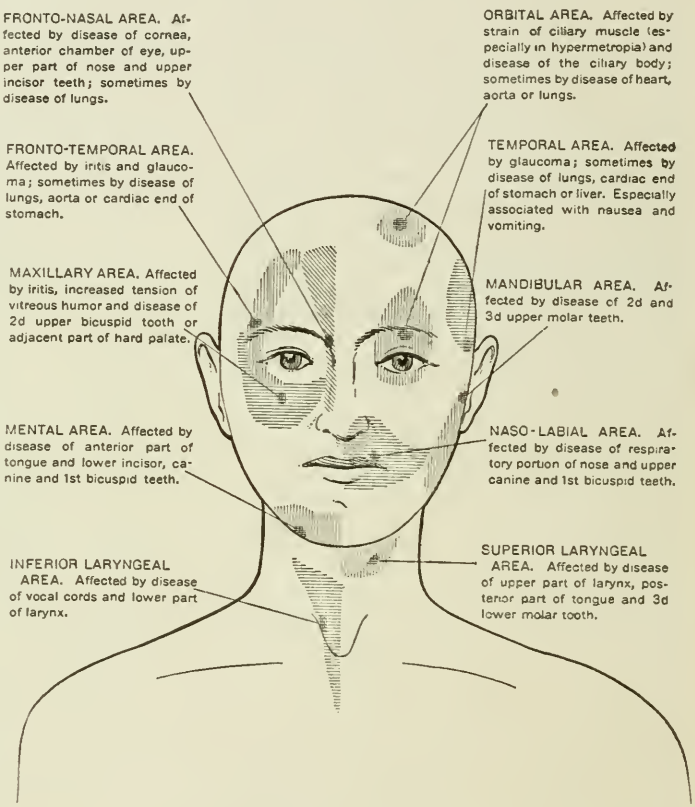
disturbance may be productive of like pains, but in this case they are continued for more than a day or two. The ophthalmoscope may help to differentiate here between migraine and cerebral trouble or Bright's disease. Tumor, aneurysm, abscess, hemorrhage, or meningitis are forms of intracranial disease accompanied by pain in the head, vomiting, giddiness, squint, or some other evidence of localized paralysis of a cranial nerve. A more or less variable amount of pain in the head will remain after recovery from hemiplegia. The pain in the head from Bright's disease is likely to attack the back of the head. The pain in the head from glycosuria is more or less continuous, with violent exacerbations. Generally speaking, persistent pain in the head, in one unaccustomed to it, should call for the use of the ophthalmoscope and urine analysis, particularly in females. Lead-poisoning may also be responsible for headaches. When chlorosis exists, the pain in the head is fixed in one spot, and is piercing. The pain of hysteria often simulates it. Pains in the head are often due to ocular disturbance other than abnormalities of refraction: as, for instance, weaknesses or imbalance of certain eye-muscles. The pains in the head in locomotor ataxia are of a darting, shooting character. See HEADACHE.

Pain in the neck may be due to rheumatism, which generally affects the large muscles; to uric acid excess, or some equivalent, which excites a subacute inflammation of severe type; to neuralgia; to caries of the spine; to rheumatoid arthritis of the cervical vertebræ; or to herpes zoster.

Pain in the chest may be referred to the chest-wall or to the interior of the cavities. When due to muscular rheumatism, syphilitic periostitis, intercostal neuralgia, or to the encroachment of aneurysm or tumor, the pain is probably superficial. The first cause would probably be indicated by an absence of febrile action and the dependence of the pain upon movement. Syphilitic periostitis would be distinguished by the finger outlining a node upon the clavicle, sternum, or ribs, and by the history or other symptoms. The character of the pain would indicate an intercostal neuralgia, especially when coupled with the history of previous neuralgic attacks in other portions of the body.

Physical examination will detect or exclude aneurysmal tumor. Pleurisy causes particularly well marked pain or coughing. It may be confounded with intercostal neuralgia or muscular rheumatism. Continued deep and dull pain in the chest points to intrathoracic growth, aneurysm, or abscess. See CHEST.

Pain about the heart may be caused by beginning pericarditis or endocarditis. Purely nervous debility is often attended by a dull and more or less constant pain about the heart, and cardiac palpitation and hysteria are often accompanied by a somewhat sharp pain just under the mamma. The pain of angina pectoris is not confined to the heart, but extends to the left arm and various parts of the chest. Pains in the chest also accompany the various diseases of the lungs and pulmonary tubes. See HEART (Pain).

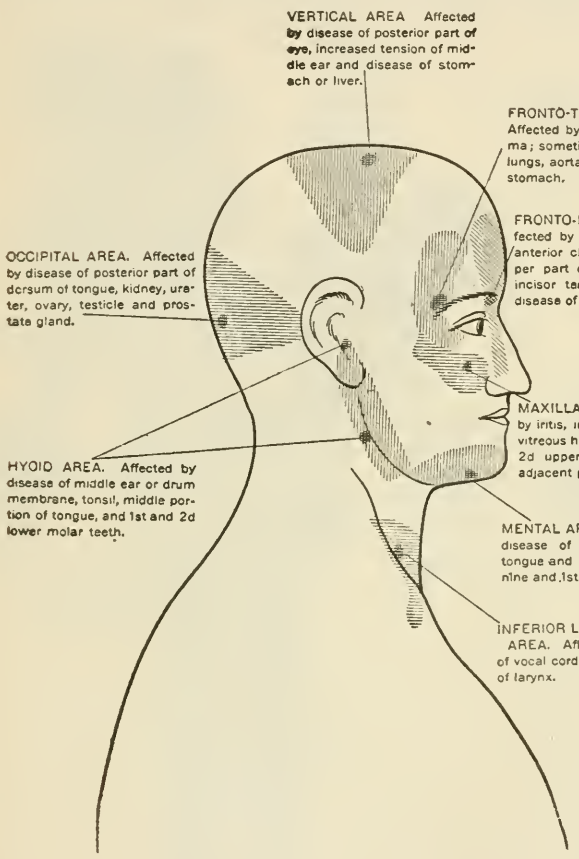


AREAS OF REFERRED PAIN.—(*From Head.*)

Pain in the spinal column is commonly indicative of a state of nervous exhaustion, rather than of disease of the spinal cord. Diseases of the cord do not usually give rise to such pain, unless attended by disease of the spinal vertebræ. Spinal meningitis gives pain only on movement. Myelitis is attended by an encircling pain—as of a band in the wall of the chest or abdomen—and when accompanied by a "bloated feeling," is a serious symptom. Aneurysm and malignant growth resemble this condition, but the pain in the two last instances is often constant and excessive, with a good deal of tenderness of the surface of the spine. A "stinging" pain of the chest is often

complained of in beginning caries of the vertebræ. Heavy pressure on the spine will cause a like pain, and the acts of stooping, or of lifting weights, or of jumping to the ground will cause complaint of pain in the spinal column in this disease. See Locomotor Ataxia, Spinal Cord.

Pain in the abdomen may be in the wall or cavity. Inflammation, abscess, neuralgia, herpes, overstrain, or fatigue may be responsible for pain in the wall. Pain in the cavity of the abdomen may be dependent on internal strangulation of the bowel, strangulated hernia, peritonitis, the false pains of labor, enteritis, appendicitis, tympanites, fecal accumulations, colic, biliary or renal calculi, and on hysteria. See Abdomen (Pain).



Areas of Referred Pain.—(*From Head.*)

Pain in the loins and back may arise from congestion of the kidneys or nephritis, renal calculus, abscess or morbid growth, flatulent distention of the bowels or retained feces, tumor of the bowel, abscess of the rectum, an undiscovered hernia, flexions and morbid growths of the uterus, ulcerations of the cervix, the approach of the catamenial period, retention and overdistention of the bladder (which also gives pain in the hypogastric region), or to Lumbago (*q. v.*). Lumbago depends upon rheumatism of the muscles, or subacute inflammation of the connective tissue between the muscles. When the pain in the back is stabbing, paroxysmal, or independent of muscular movement, it is probably neuralgic in character. Contrary to the popular idea, chronic nephritis is not usually associated with pain over the kidneys.

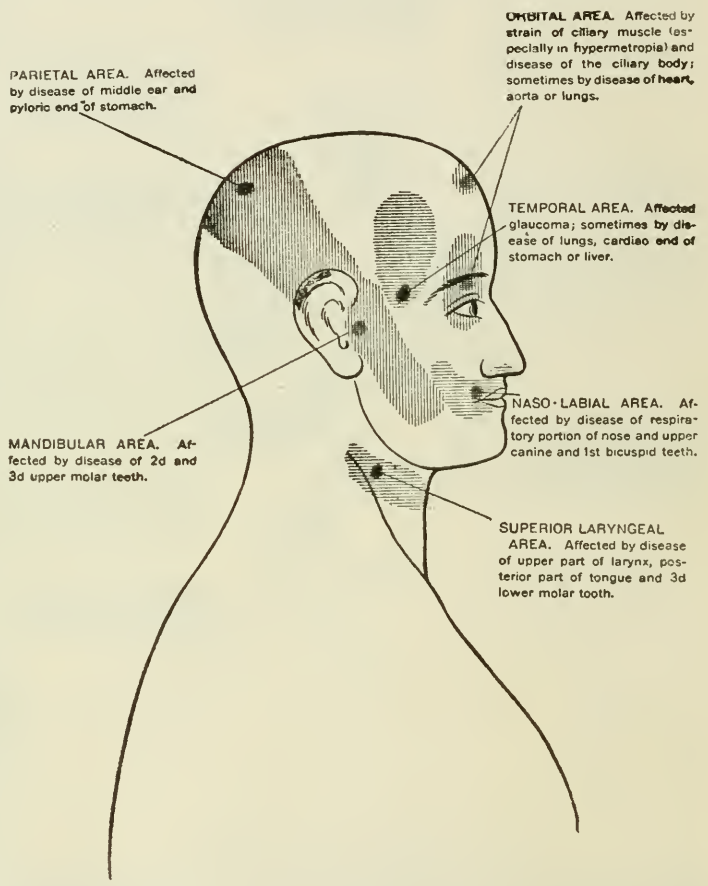
Pain in the extremities may be due to neuralgia. When paroxysmal in character—sudden, sharp, lightning-like, darting through one or more limbs and severe enough to make one cry out—the pains are probably due to the early stage of locomotor ataxia. They will occur in paroxysms, lasting hours, days, or weeks, and subside as quickly as they came. Rheumatic pains, gnawing and aching pains occupying the joints in acute inflammations, also affect the extremities.

The treatment of pain is always primarily directed to its causation. As a rule, pain should be relieved temporarily, since its continuance is exhausting and mischievous to the nervous system. However, when it constitutes a vital point in diagnosis, the administration of narcotics is ill-advised. Rest is essential, while local applications, as counterirritants, poultices, sinapisms, or anodyne liniments are most ready means in many cases. Superficial pain is often relieved by a plaster or extemporaneous liniments containing laudanum or some other fluid preparation. The oleate of morphin alone is said to be penetrating, but it is doubtful whether such applications are of direct value. Intense pain, as from the passage of a calculus, is best treated by the hypodermic injection of morphin sulphate (1/4 to 1/2 grain) with atropin sulphate (1/100 grain), while the preparations of opium may be given by the mouth for the same purposes. Severe pain enables the system to resist the action of opium. Opium is the most efficient and universally used drug for relieving pain, and morphin is its most analgesic alkaloid. A single injection is sometimes curative in sciatica and other neuralgias. In combination with antipyrin it is more efficient than when used alone. Codein is another opium derivative, having special action over abdominal and ovarian pain, and is not liable to give rise to the drug-habit.

The treatment of inflammatory pains is that of the inflammation itself, and, hence, often different from, if not the reverse of, the treatment of other kinds of pain. The first indication is rest, including the position which assures most complete rest

After rheumatic carditis the patient had better stay in bed 3 or 4 months if he still has cardiac pains and a quickened pulse. Nothing is more serviceable sometimes in the later stages of pleurisy than to limit, as much as possible, the movements of the ribs by firmly strapping the whole affected side of the chest. But the instances in which this principle can be applied are too numerous to mention here. In many acute inflammations the vascular sedative action of topical blood-letting is often remarkably effective in relieving the pain. On the other hand, with the pains of chronic inflammations the stimulant effect of counter-irritation is preferable, according to the rule that the indications in the treatment of chronic inflammations are the opposite of those for acute inflammations. In traumatic lesions both the pain and the inflammation are generally treated best by local application of ice-bags, but cold is useless when the inflammation is due to a general cause in the blood, as in rheumatic and gouty arthritis. Cold applications should be discontinued at once if they cause a neuralgic pain to take the place of an inflammatory pain. Many internal inflammatory pains are best relieved by the sedative properties of moist heat applied to the surface, as by poultices, etc., according to the general law that the cutaneous sensory nerves are always in association with the vascular nerves of the parts underneath. The best drug for inflammatory pain is opium. Next comes aconite, especially in serous membrane and cardiac inflammations. The coal-tar analgesics, so valuable in the other kinds of pain, are comparatively useless in inflammatory pains.

The following list, taken from Potter's "Therapeutics, Materia Medica and Pharmacy," contains the agents most employed in the treatment of pain: **Opium** is the most efficient of all analgesics and is universally used to relieve pain from any cause except acute inflammation of the brain; opiates soon lose their power in any particular dose, and require increasing dosage to sustain their analgesic influence, hence in chronic cases all other means should be exhausted before resorting to them. **Morphin** is the most analgesic alkaloid of opium; hypodermically in the vicinity of the nerve it is efficient when not so by the stomach; the morphin-habit must be kept in mind; a single injection thereof is sometimes curative in sciatica and other neuralgias; the conjoined administration of morphin and antipyrin is much more efficient in pain than the use of either agent alone. **Codein** has a special influence over abdominal pain and that of the ovaries, and is not liable to give rise to a drug habit. **Dionin** in 4 to 7 percent solution locally is the best analgesic for the eye. **Belladonna** is the best remedy for every kind of pain in the pelvic viscera. **Atropin,** hypodermically in local pain, neuralgia, sciatica, glaucoma; when it succeeds, has more lasting effect than morphin; for sciatica, tic douloureux; has little value unless the pain be due to spasm or some cause situated so that the remedy can be brought into direct contact with sensory nerve-endings. **Duboisin** may be used instead of atropin. **Cocain,** as a local anesthetic to mucous surfaces, or hypodermically for minor operations involving a small area, as circumcision, eye operations, has no equal; a 4 percent solution is generally employed; also as a general anesthetic by spinal subarachnoid injection. **Eucain** is fully as efficient as cocain and much less toxic; in medicinal doses is harmless and does not affect the heart. **Antipyrin** is a most efficient analgesic in doses of 10 to 15 grains, being



Areas of Referred Pain.—(*From Head.*)

especially adapted to neuralgia, migraine and the pains of gouty and rheumatic origin, but is of no value in pain due to a local inflammation; it may be used hypodermically. **Acetanilid** is highly efficient in doses of 4 to 7 grains for the pains of locomotor ataxia and those of rheumatic origin, also locally as a dry dressing for painful wounds, ulcers, etc.; it is the active ingredient in a host of recent proprietary remedies against pain. **Acetphenetidin,** efficient in 10-grain doses, for neuralgia, hemicrania; is largely used for the relief of pains of the character for which antipyrin is employed. **Phenocoll hydrochlorid,** in doses of 12 to 15 grains, is a good analgesic in the neuralgic pains of influenza, and in gouty and rheumatic pain. **Lactophenin** is analgesic and nontoxic; a feeling of comfort follows its use. **Chloroform** by inhalation as a general anesthetic; internally for the pain of colic, even that of lead colic, and externally as liniment with other substances for chronic neuralgic or rheumatic pains; the vapor to the raw surface of cancers, to the photophobic eye, etc. **Ether** as spray for local anesthesia, by inhalation for general anesthesia; anesthetics should be

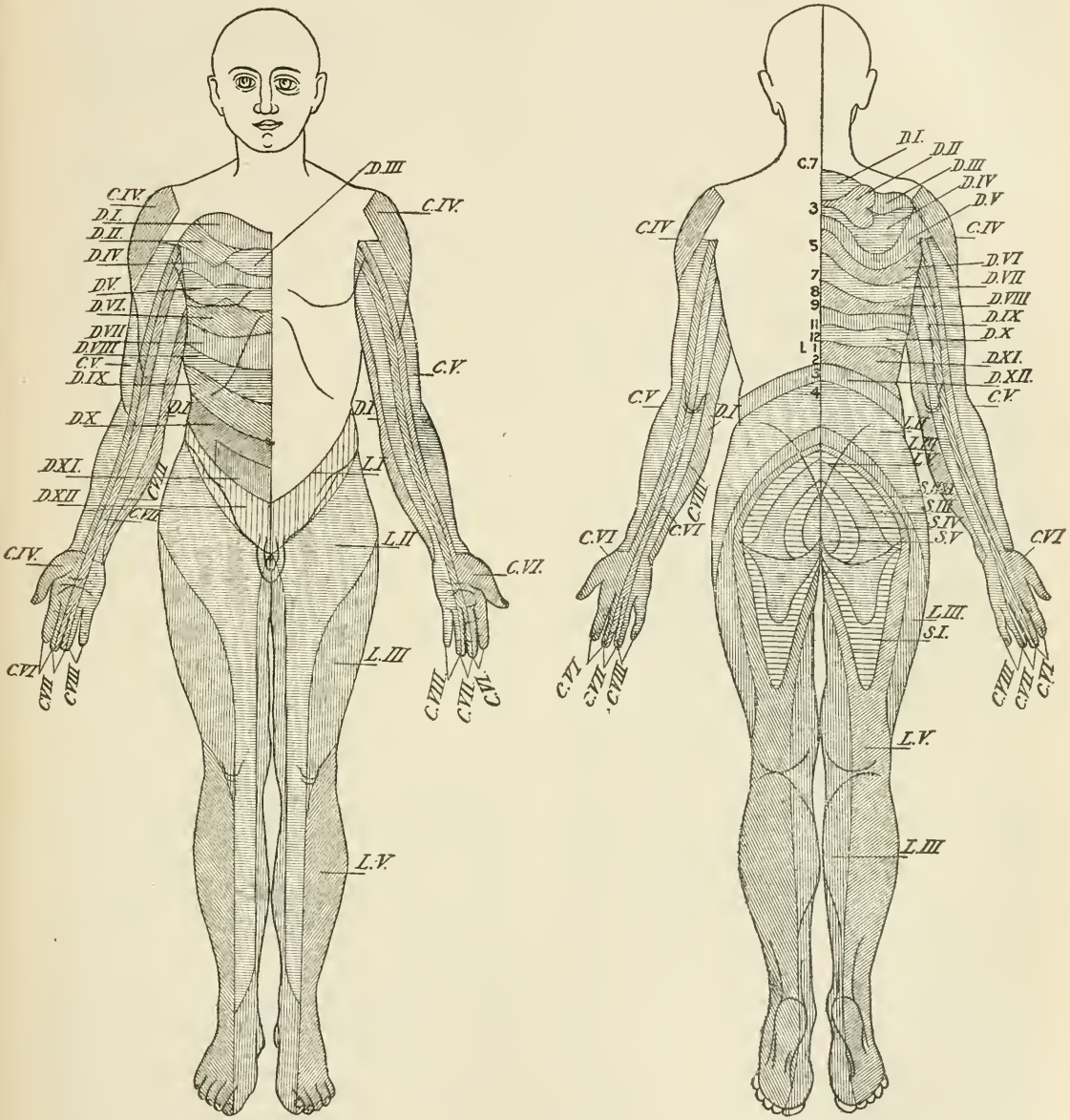


Diagram of Skin Areas Corresponding to Different Spinal Segments.—(*From Tyson, Starr and Head.*)

employed only when pain is exceedingly severe and transient. **Hydrated chloral** is analgesic only in large and dangerous doses; sometimes relieves neuralgia, chronic rheumatic pains, colic, gastralgia, etc. **Aconite** was formerly much used for neuralgic pain; aconitin locally is one of the most certain and powerful palliatives in neuralgic, rheumatic and gouty pains; especially in trigeminal neuralgia. **Veratrin** as ointment locally for neuralgia, is readily absorbed through the skin and is more dangerous than useful. **Guaiacol,** locally or by hypodermic injection, 1 part in 10 of olive oil, or mixed with equal part of glycerin for painting on the surface, is an efficient local anesthetic, and is used successfully in orchitis, in neuralgic pains of tuberculous subjects, also in sciatica and rheumatism; a few drops rubbed in gently give immediate relief in many superficial pains, also in labor-pains. **Phenol** pure, is a local anesthetic, but has been supplanted by cocain. **Creosote** locally is efficient for the pain of an exposed dental nerve. **Ichthyol** locally is analgesic against inflammatory pain; hypodermically is analgesic, less so than morphin and less dangerous. **Amyl nitrite,** also nitroglycerin and other nitrites, are effective usually against cardiac pain; especially when arterial spasm exists as in angina pectoris. **Cannabis indica** is inferior to opium, but may be tried when the latter is contraindicated for any reason. **Salicylates** are efficient in rheumatic and gouty pain, also in rheumatic neuritis. **Mesotan** locally for superficial rheumatic pain. **Iodoform** in suppository for painful disease of the rectum or bladder; as a local analgesic in painful ulcers, hemorrhoids, anal fissures, etc. **Iodids** are magical for syphilitic nocturnal pains of the head; ammonium iodid (3 grains in 1 ounce of olive oil), with friction causes the disappearance of nocturnal syphilitic pains. **Cimicifuga** relieves many kinds of pain, as neuralgia of fifth cranial nerve, rheumatic headaches, ovarian neuralgia, dysmenorrhea; inferior to ergot in labor-pains or after-pains; ʒj doses of the tincture. **Conium,** in cancer, rheumatism, neuralgia, ovarian pain, also for the fulgurant pains of locomotor ataxia, chronic alcoholism, sciatica, phthisis, doses of ♏ x of a fluidextract of the unripe fruit every 1/2 hour, well watched. **Iron,** with belladonna, for the wandering pains of anemia, in which morphin is dangerous and bromids are useless. **Oil of peppermint** locally is sometimes very effective in relieving pain; has been long used in China for neuralgia and subacute rheumatism. **Menthol** freely rubbed on for superficial neuralgic pain of peripheral origin. **Rhatany** relieves the pain of ulcers, burns, and blisters. **Methylene-blue** relieves neuralgic and rheumatic pains; has some analgesic action, but is uncertain, and has no advantage over the newer anilin derivatives. **Electricity,** the galvanic current for neuralgia; it is powerless against pain of phlegmonous inflammations; galvanism of the affected nerve gives certain relief; the positive pole on point of emergence, negative over superior ganglion of cervical sympathetic. **Heat,** if pain is without fever or inflammation, warm injections soothe the pain of cystitis, prostatitis and abdominal pains generally. **Hot water,** as bath, relieves pain most wonderfully; **cold,** when pain is inflammatory in origin. **Phototherapy,** the ultra-violet rays are very effective in relieving acute muscular pain, especially if obtained with iron-carbon electrodes.

Organ Diseased.	Spinal Segments whose Sensory Areas are Painful.	Cranial Areas in which Pain may also be Felt.
Heart	1, 2, 3 dorsal (angina pectoris).	Orbital.
Lungs	3, 4 cervical, 1, 2, 3, 4, 5 dorsal.	Frontonasal, orbital, frontotemporal, temporal.
Ascending aorta	1, 2, 3, 4 dorsal	Orbital, frontotemporal.
Arch of aorta	5, 6 dorsal	Frontotemporal.
Stomach, cardiac	6, 7 dorsal	Frontotemp., temporal.
Stomach, pyloric	8, 9 dorsal	Vertical, parietal.
Liver and appendages.	7, 8, 9, 10 dorsal	Temporal, vertical, parietal, occipital.
Intestine	9, 10, 11, 12 dorsal.	Parietal occipital.
Kidney and ureter.	10, 11, 12 dorsal	Occipital.
Prostate	10, 11, 12 dorsal, 5 lumbar, 1, 2, 3 sacral.	Occipital.
Ovary or testicle	10 dorsal	Occipital.
Rectum	2, 3, 4 sacral	
Epididymis	11, 12 dorsal	
Oviduct	11, 12 dorsal, 1 lumbar.	
Bladder, mucous membrane and neck.	1, 2, 3, 4 sacral.	
Bladder, over-distention and ineffectual contraction.	11, 12 dorsal, 1 lumbar.	
Uterus, in contraction.	10, 11, 12 dorsal, 1 lumbar.	
Uterus, os	1, 2, 3, 4 sacral (5 lumbar very rarely).	

PALATE, DISEASES.—The affections of the palate are mostly surgical. The diseases of the palate are: (1) Congenital malformations; (2) inflammation; (3) ulcers; (4) necrosis; and (5) tumors.

Congenital malformations (see Cleft Palate) may be simple or phlegmonous, of the soft parts, or involve the hard palate, affecting the periosteum and bone.

Ulcers.—The principal forms of ulceration are those of syphilitic, tuberculous, or epitheliomatous origin. Injury gives rise to simple ulcers, which present no special feature of interest. Syphilitic ulcers are common, in the early secondary stages of the disease being superficial, while deep ulcers occur in the tertiary stage and appear late—5 to 8 years after the primary lesion. They are generally single, have the usual characters, and may spread to the base of the cranium. Tubercular ulcers, most usual in childhood, are associated with tubercular disease elsewhere. Small tubercles, projecting slightly above the surface, first appear, break down the erosions, coalesce into irregular ulcers of little depth, with festooned borders and a yellowish base covered with pale granu-

lations. They may become serpiginous. Epitheliomatous ulcers are rare.

Tumors.—The glandular tumor is the most common. It is often found on the hard palate, is usually soft and elastic to the touch, painless, and causes no symptoms beyond the encroachment upon the buccal cavity. Erectile tumors are confined to the hard palate. Papilloma is infrequent and sarcoma is rare. Epithelioma rarely develops primarily in the soft palate. Cysts—mucous and dermoid—fibroma, enchondroma and osteoma, myxoma, lipoma and adenoma, and tumor growths of the palate, while inflammatory, and tubercular and gummatous swellings occur.

Treatment of diseases of the palate must, as a rule, be directed to the particular disease affecting the palate in common with other adjacent structures. Local antiseptic, astringent, and caustic treatment is of value. Surgical operations are often of the greatest service.

PALMAR ABSCESS.—See HAND.

PALPITATION.—Any spasmodic fluttering or tremor, especially the abnormally rapid beating, of the heart, of which the person is conscious. It is often associated with a choking sensation in the throat. It may be due to organic disease or to functional disturbance of the heart; very often it is caused by disorders of the stomach. See HEART-DISEASE (Functional).

PALSY.—See PARALYSIS.

PANARITIUM.—See MORVAN'S DISEASE.

PANCREAS, DISEASES. Relations of Pancreas.—The pancreas is a compound racemose gland, consisting of a broad, slightly curved portion called the head, while the left extremity terminates in a pointed end denominated the tail, and the middle portion forms the body. The pancreas is from 6 to 8 inches in length, extending transversely across the posterior wall of the abdomen, occupying the epigastric and left hypochondriac regions. The head of the pancreas is in close relation with the duodenum and common bile-duct, the body being covered by the posterior wall of the stomach and the transverse colon, while the tail is placed over the left kidney and impinges upon the concave border of the spleen.

Pancreatic Apoplexy.—Hemorrhage into the pancreas is generally the result of venous engorgement, traumatism, or atheromatous condition of the blood-vessels. The hemorrhage may be excessive, producing a rapid enlargement of the organ, with sudden pain, great tenderness, and a sense of fulness in the affected region, and accompanied by vomiting, paleness of the face, cold extremities, rapid and feeble pulse, and evident symptoms of sudden collapse. Death usually occurs within from 3 to 7 days.

Acute Pancreatitis.—Acute inflammation of the pancreas.

Etiology.—Septic infection through the medium of the pancreatic ducts, caused by such organisms as the colon bacillus, pyogenic cocci, typhoid bacillus, etc. See COLON BACILLUS INFECTION.

Pathology.—The pancreas is enlarged from excessive amount of blood in the part, and the infiltration of the tissues with red blood-cells and leukocytes. In some cases the process is a rapid one, leading to fatty degeneration, giving rise to abscess (suppurative pancreatitis) or gangrene (gangrenous pancreatitis).

Symptoms and Clinical Course.—In acute inflammation of the pancreas the onset is marked by tenderness in the region of the pancreas, enlargement of the organ, slight fever, vomiting, and gastric distress.

If the process is a suppurative one, or if gangrene supervenes, all the symptoms become more pronounced, with sweat and chills, paleness of face, cold extremities, rise of temperature at first, then sudden decline, with evident symptoms of collapse. In the latter forms death usually occurs within 4 to 6 days.

Prognosis is unfavorable.

Treatment is the same as that for PERITONITIS (*q. v.*).

Chronic interstitial pancreatitis may be the result of cholelithiasis or biliary obstruction, or of the simple form of hemorrhagic pancreatitis. The resulting sclerosis then causes constriction of the common bile-duct and so gives rise to jaundice and a variable distention of the gall-bladder, accompanied by wasting and paroxysmal attacks of pain and ague-like seizures. The pulse may then be rapid, and so differs from the pulse in ordinary jaundice. If such symptoms arise in patients under forty, chronic interstitial pancreatitis may be suspected, since cancer of the head of the pancreas is rare until after that age. A hard lump may be felt in the region of the head of the pancreas, and if there is also fat in the feces, sugar in the urine, and bronzing of the skin, a diagnosis may be arrived at. A special test for glycerin products of fat decomposition by Dr. Cammidge should give a positive reaction. The treatment is cholecystenterostomy together with the removal of any gall-stones met with. The result may be a good and lasting recovery. Some cases of pancreatic diabetes appear to have been secondary to this form of chronic pancreatitis, and the possibility of warding off diabetes is a further recommendation for cholecystenterostomy.

The Cammidge reaction in the diagnosis of pancreatic disease, while it is not pathognomonic, is still believed by some physicians to be highly suggestive.

Technic of the Improved Method.—A 24 hour specimen of urine must be freed from albumin and sugar. To 40 c.c. of filtered acid urine are added 2 c.c. of concentrated hydrochloric acid and the mixture is boiled 10 minutes, cooled and to it added water up to 40 c.c., then also 8 grams of lead carbonate and it is then cooled again. After filtering the filtrate is treated with 8 grams of tribasic lead acetate to remove the glycosuric acid. The precipitate is removed by filtering and to the filtrate is added 4 grams of powdered sodium sulphate, the mixture heated to the boiling-point, then cooled and carefully filtered. To 10 c.c. of the filtrate made up in a flask to 17 c.c. with distilled water, are added 0.8 gram of phenyl hydrazin hydrochlorid, 2 grams of sodium acetate and 1 c.c. of 50 percent acetic acid and the mixture boiled 10 minutes. While hot it is filtered and the fil-

trate made up to 15 c.c. with hot water and allowed to stand. In several hours a yellow precipitate forms which is observed under the microscope to consist of yellow crystals arranged in sheaves and rosettes.

Carcinoma of the Pancreas.—The disease is usually primary and of the scirrhous variety. The seat is usually at the head of the organ. It may be secondary to carcinoma elsewhere, as in the stomach or intestines.

Pathology.—The carcinomatous infiltration invades the tissues of the organ; there is great multiplication of cells, which become packed together and form dense nodules. If the process continues, the common bile-duct becomes occluded from the pressure, and jaundice follows. Metastasis may occur, and the process extend to the duodenum, liver, stomach, or peritoneum.

Symptoms and Clinical Course.—Jaundice, tenderness in the epigastric region, and the presence of a nodular immovable tumor are the three most common symptoms. Together with these symptoms there are fever, emaciation, fatty or greasy stools, and often glucose in the urine.

Diagnosis.—From cancer of the stomach it may be distinguished by the fact that if the stomach is involved, the tumor is more superficial, is movable, and there is hematemesis and absence of free hydrochloric acid in the gastric contents one hour after a test-breakfast. In aneurysm of the aorta the tumor is not lifted up and down with each pulsation, as in cancer of pancreas, and in the former there is a thrill on palpation, a bruit sound on auscultation, and jaundice is absent.

Prognosis.—The disease is always fatal.

Treatment is merely palliative. The diet may be the same as that used in cancer and ulcer of the stomach.

Cysts of the Pancreas.—These are usually retention cysts, the result of impaction of calculi in the pancreatic ducts. These cysts may attain considerable size.

Symptoms and Clinical Course.—There is a slightly movable tumor in the left side of the epigastric region, containing a brownish or chocolate-colored fluid. Occasional attacks of colic and fatty stools may help distinguish the disease, although a diagnosis is often impossible.

Treatment is purely surgical.

PANCREATIC EXTRACT.—The pancreas, both in substance and extract, has been administered as a remedy for diabetes, but the results have been negative. A few instances are recorded in which its use was followed by some temporary amelioration of the symptoms of the disease. See ORGANOTHERAPY.

PANCREATIN.—A mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog, or the ox, and consisting principally of amylopsin, trypsin, and steapsin; and proved to be capable of converting not less than 25 times its own weight of starch into substances soluble in water. Dose, 3 to 15 grains.

Pancreatin digests albuminoids and converts starch into sugar and proteids into peptones, also emulsifies fats in the presence of an alkaline solution. Prolonged contact with mineral acids renders it inert. It is digested by pepsin, and hence probably never passes into the duodenum in its own character. Pancreatin is used to partially digest (peptonize) milk, gruel, soups, and other foods, before their administration in cases of great digestive debility. These peptonized foods may be administered by the stomach or the rectum, and are valuable in intestinal dyspepsia, wasting diseases, and convalescence from acute affections. See also ORGANOTHERAPY.

PANNUS.—Vascularization of the cornea, usually due to the irritation of trachoma granulations. See CORNEA (Diseases), TRACHOMA.

PANOPHTHALMITIS.—Inflammation of all the tissues of the eyeball. It is a purulent iridochoroiditis resulting in abscess formation. There is protrusion of the eyeball and perforation of the coats.

PANTOPON.—A preparation said to contain all the alkaloids of opium in the form of chlorids; dose one quarter of a grain.

PAPAIN.—A proteolytic ferment obtained from papaw-milk, the juice of *Carica papaya*, a tree native to South America. It has the digestive properties of pepsin, but is far more active, dissolving fibrin in neutral, acid, or alkaline liquids. It is an excellent solvent of false membranes. *Papayotin* and *caricin* are other names for the ferment. Dose, 1 to 3 grains.

PAPAVER.—The poppy, the juice and extracts of which possess narcotic properties. Opium is obtained from *P. somniferum*. See OPIUM.

PAPAVERIN.—An alkaloid found in opium. It is narcotic, and produces primarily muscular relaxation; later, convulsions. It stands midway between morphin and codein in its action on the central nervous system, but it is a comparatively weak poison.

PAPAW.—See PAPAIN.

PAPAYOTIN.—See PAPAIN.

PAPER.—Paper has been introduced into surgery as a substitute for lint on account of its cheapness. Porous varieties resembling blotting paper, and capable of absorbing a large amount of fluids, have been manufactured; hence, it is suitable for applying wet dressings, as lead-water and laudanum, etc. When once saturated, owing to its friable character, it cannot be reapplied. Waxed paper, made by immersing sheets of tissue paper in hot wax or paraffin, which, when cooled, forms a thin coating that makes it impervious to water is universally employed in hospital practice as a substitute for oiled silk; owing to its cheapness it can be destroyed after each application. Because of its extreme thinness it is advisable to use several layers, otherwise the moisture soon makes its way through. Parchment paper has been introduced as a substitute for mackintosh in the Lister antiseptic gauze dressing. When first removed from the package, it is soft and pliable, but on drying becomes crisp. The paper, when applied over wet dressings to prevent the escape of moisture, appears to fulfil all purposes for which oiled silk has served.

Paraffin paper is employed as a dressing in some

forms of skin-disease accompanied by crusting and exfoliation, with the object in view of macerating the skin and thus loosening the products of disease. In other cases it is employed as a protector. Paper is valuable in applying ointments and moist dressings. It is superior to rags and cloths. The paper is to be cut into pieces of the appropriate size, spread with the selected ointment, and closely applied to the surface, being kept in place by a bandage. In affections of the fingers and toes, as well as the limbs generally, paraffin paper is easily adapted to the inequalities of the skin surfaces. The fact that it soon becomes friable and torn is an advantage, as it insures more frequent change of dressings, and consequent cleanliness.

Blotting paper rolled between the fingers and introduced into the nostrils is recommended by Sajous for removal of secretion from nasal passages in young children. It has been suggested also as a material for making tampons for arresting nasal hemorrhage.

Before soaking in a solution of nitrate of potash, paper should be cut in strips 3 inches long by 1/2 inch broad. It is next dipped in the solution in a cylindric vessel 4 inches high and 2 inches in diameter. The paper should thed be ignited and the smoke inhaled by repeated deep inhalations. Nitrated papers, according to Lefferts, should be kept in tin-foil or prepared in small quantities, as required. See Potassium Nitrate, Chartæ.

PAPILLITIS.—Inflammation of the optic disc or papilla of the eye. The old terms, choked disc, descending neuritis, etc., implied unproved theories of causation, and have been replaced by the adoption of the better term, papillitis. Intracranial diseases, as tumors, meningitis, abscess, etc., are the most frequent causes. See Optic Neuritis.

PAPILLOMA.—A term loosely employed to include corns, warts, horns, and certain nævi. Papillomata stand midway between true tumors and inflammatory growths; a papilloma is any growth on the skin or mucous membrane based upon, or resembling, a normal papilla. A hard papilloma is a form in which the connective-tissue framework is denser and the cells fewer than usual. It grows chiefly from the skin. A soft papilloma is one growing from mucous membranes, especially in the uterus, rectum, and bladder. See Corn, Tumors, Warts.

PAQUELIN CAUTERY.—See Cautery.

PARACENTESIS.—Piercing or tapping a cavity of the body, such as the chambers of the eye, the membrana tympani, the abdomen, or the thorax, for the evacuation of fluid. See Ascites, Cornea (Operation), Ear, Pericarditis.

PARADOXIC CONTRACTION.—See Nervous Diseases (Examination).

PARALDEHYD. $C_6H_{12}O_3$.—A polymeric form of acetaldehyd. It is a colorless liquid of repulsive odor and unpleasant taste. It is a reliable hypnotic, and is diuretic. It is valuable in delirium tremens, mania, tetanus, and other nervous affections. Dose, 20 minims to 2 drams. It will dissolve trional, and this solution forms a powerful hypnotic.

Paraldehyd Habit.—The morbid addiction to the use of the drug gives rise to symptoms similar to delirium tremens. Emaciation, anemia, weakness and irregularity of the action of the heart, gastric derangement, costiveness, general tremulousness, especially in the tongue, facial muscles, and hands, feebleness and unsteadiness of gait, general restlessness, paresthesia, insomnia, mental anxiety and agitation, mental confusion, mental excitement, temporary loss of memory, incoherence of speech, hallucinations, delusions. The odor of paraldehyd may be appreciable in the breath. Treatment requires about 3 months in an inebriate asylum.

PARALYSIS.—Loss of the power of voluntary motion. **Paresis** is simple weakening of such motor power.

By **monoplegia** is meant isolated paralysis of one part of the body, as an arm or leg. By **hemiplegia** is meant paralysis of the entire half of the body, including half of the face, one arm, and one leg, also known as unilateral paralysis. By **paraplegia** is meant simultaneous paralysis of corresponding halves of the body. Paralysis of the two arms is spoken of as **superior paraplegia,** of the two legs as **inferior paraplegia,** while the word paraplegia alone is often used for the latter condition. **Diplegia** is paralysis with spasm of all the extremities.

Impairment of voluntary muscular power must be the result of structural change in the motor area of the cortex, in the great motor tract of the brain or cord, or impairment in the integrity of the efferent nerves, or it may be more rarely, in the muscle itself, "myopathic palsy;" or the power of the will may be abrogated. In diseases of the peripheral nerves, when the paralysis is called peripheral, it is limited to the region of distribution of the affected nerves, whether one or many. It may be said in general that hemiplegia is the usual form of cerebral paralysis, while paraplegia is the expression of spinal paralysis. Monoplegias are usually due to lesions of the cortex or are peripheral palsies.

In all hemiplegias caused by lesions above the pons, the palsy, including face and extremities, is on the side opposite the lesion, but in most lesions in the pons there is **crossed paralysis**—that is, there is paralysis of the extremities on one side and of the face on the other side, because the fibers of the facial nerve cross much higher than the fibers to the extremities. The result is a paralysis of the face on the same side with the lesion, and of the extremities on the other. If the lesion is higher up, above the decussation of both the facial and pyramidal tracts, the paralysis is on the side opposite the lesion, in both face and extremities. Other nerves may substitute the facial in this crossed paralysis, as the hypoglossal or abducens. In rarer instances there may be lesion at the very decussation of the pyramid, cutting the motor fibers of one extremity before they cross, and those of another after crossing, producing the very rare condition of paralysis of an arm on one side and leg on the other (Tyson). See Brain, Muscles, Nerves, Spinal Cord.

PARALYSIS, ACUTE ASCENDING (Landry's **Paralysis**).—A rare disease characterized by paraly-

sis appearing suddenly in the feet and ascending rapidly to the other muscles of the body, and finally involving the medulla. The paralysis is ordinarily preceded by a prodrome including anorexia, malaise, fever, pain in the head and back and tingling in the extremities. There are no pain and no trophic changes; the knee-jerk is usually diminished; sensation is generally preserved, but there may be hyperesthesia and muscular tenderness; the special senses are unaffected; the sphincters are uninvolved. The spleen may be enlarged. The paralysis is a flaccid one, the muscles are relaxed but do not atrophy or yield reactions of degeneration because of the rapidly fatal termination. The pathology is obscure, and the malady is a very fatal one, usually terminating in death within a week, although it may continue for 3 or 4 weeks. Recovery, however, has occurred in some cases. Males are more frequently attacked than females, and the affection occurs chiefly between the ages of 20 and 40 years.

Diagnosis.—Acute myelitis is distinguished from Landry's paralysis by the wasting, anesthesia, electrical changes, early involvement of the sphincters. In multiple neuritis there are marked sensory disturbances.

Treatment.—Rest in bed is essential. Dry or wet cups should be applied to the spine and counterirritation kept up by a mustard plaster. Paquelin's cautery may be tried. Ergotin (10 to 20 grains a day), salicylates, perchlorid of iron, iodid of mercury, are all recommended.

PARALYSIS AGITANS (Shaking Palsy; Parkinson's Disease).—An affection marked by tremor or alternate contraction and relaxation of the muscles of the part involved.

Symptoms.—The movements are regular and rhythmic (in distinction from insular sclerosis), and begin usually in one hand. They almost never affect the head. They persist during rest, and are little influenced by voluntary movement. Later in the disease there is a typical gait, known as *festination* or *propulsion*. It consists in a progressive increase in the rapidity of the gait until the patient breaks into a run, which grows faster and faster until he either falls or seizes some support. This peculiar gait is ascribed to the bent position of the trunk, which throws the head so far forward as to bring the center of gravity beyond the line of the feet. Rarely the movement is backward; this is called *retropulsion*. It may be to one or the other side—*lateropulsion*. The speech is slow, monotonous, and high-pitched. The face is fixed and expressionless. In advanced stages there is an almost statue-like rigidity of the body. The hand assumes a peculiar position, as if rolling a small body between the thumb and the fingers, but later the position becomes constant, similar to that in which the pen is held—hence, the term of *writing hand*. The knee-jerk may be exaggerated. Flushing and heat are sometimes complained of. Paralysis agitans is most common in males over 40 years of age.

Diagnosis.—*Disseminated sclerosis* exhibits a tremor, but only of voluntary movements—intention tremor. There are also scanning speech and ataxic gait, with mental enfeeblement, as shown by an unnatural contentment with the physical condition and surroundings.

Chorea displays a tremor, but the movements are general, and particularly involving the muscles of the face. Again, chorea is a disease of children and young adults. See CHOREA.

The course is of long duration, the disease at times lasting 20 or 30 years.

The lesion is probably a diffuse sclerosis of the brain and spinal cord.

Treatment.—The patient should receive rest, bodily and mental. Nutritious food, cod-liver oil, hypophosphites, or arsenic should be administered. Hyoscyamin sulphate, 1/30 to 1/10 grain, 3 times daily, is a valuable remedy. Good results have followed the use of hyoscin hydrobromid, 1/200 to 1/100 grain, 3 times daily. Mild galvanism, 2 or 3 times a week, acts as a nerve-stimulant.

PARALYSIS, BELL'S.—See FACIAL PARALYSIS.

PARALYSIS, BULBAR, ACUTE.—This paralysis is the result of hemorrhage into the medulla or pons, or of thrombosis or embolism of the vessels supplying these centers. The symptoms are sudden; in addition to those of the progressive or chronic type there may be loss of consciousness, deranged cardiac and respiratory action, high fever. If the motor tract is involved there is the peculiar crossed paralysis that usually accompanies hemorrhage into the pons—paralysis of the face on one side and of the extremities on the other.

PARALYSIS, BULBAR, ASTHENIC (Erb's Disease, Myasthenia Gravis, Hoppe-Goldflam Symptom Complex).—A chronic disease characterized by progressive loss of muscular power affecting first the muscles of the eye, face, neck, tongue, larynx. The muscles involved become rapidly fatigued on effort, but regain power temporarily after rest. A similar effect obtains on faradization of the muscles (Jolly's myasthenic reaction).

Treatment consists in prolonged rest, massage, galvanization of muscles, liquid food, tonics.

PARALYSIS, BULBAR, PROGRESSIVE (Glossolabiolaryngeal Paralysis, Atrophic Bulbar Paralysis).—A form of paralysis due to a degeneration of the nuclei of origin of the nerves (facial, glossopharyngeal, vagus, spinal accessory, and hypoglossal) arising in the oblongata. Bulbar symptoms may precede or follow spinal symptoms. A similar condition affecting the eye muscles is called progressive ophthalmoplegia.

Etiology.—The condition is sometimes a sequel to exposure to severe cold; it may be caused by morbid growths or by syphilis. Rheumatism, gout, and neck traumatisms are also causes.

It is usually confined to the latter half of life, and its prognosis is bad.

Symptoms.—At first only the muscles of the lips, tongue, and pharynx are affected. The disease is marked by difficulty in mastication, deglutition, respiration, phonation, and articulation, and by wasting of the muscles concerned in the performance of these functions.

Treatment is entirely symptomatic. Galvanism is the most promising remedy. Stabile applications, the electrodes on the mastoid processes and

in the opposite direction, galvanization of the sympathetic, and applications to the lips, tongue, and fauces should be persistently used. Anti-syphilitic remedies should be administered in all suspicious cases. General tonic and hygienic treatment is indicated.

PARALYSIS, CEREBRAL.—See BRAIN (Hemorrhage, Tumors, etc.).

PARALYSIS, DUCHENNE'S.—A chronic disease characterized by progressive muscular weakness, associated with an apparent hypertrophy of the affected muscles. There is an interstitial fibrous overgrowth of the muscles, frequently accompanied by an accumulation of fat and atrophy of the true muscle-fibers. The disease usually begins in the muscles of the calf, and spreads over the body, the muscles of the hand almost always escaping. There are marked lordosis and a characteristic gait, with wide separation of the legs and swaying of the body from side to side. The characteristic symptom is the manner in which the patient rises from the floor—he "climbs" up on his legs, on account of the weakened state of the extensor muscles of the back. The disease is essentially a chronic one, but the patient becomes absolutely helpless long before death. It is most common in young male children, usually under 10 years of age. The disease is entirely myopathic, no adequate nerve-lesion having as yet been discovered.

PARALYSIS, GENERAL, OF INSANE (Paretic Dementia).—An organic disease of the brain, characterized by progressive loss of power and by a deterioration of the mental faculties, ending eventually in dementia and death. The duration varies from a few weeks or months to three or more years, being, on the average, longer in females than in males, and in the well-to-do than in the poor.

Etiology.—The affection is most common in males between the ages of 30 and 60. It is induced by overwork and mental and physical strains, intemperance, syphilis, and lead-poisoning.

The lesion is essentially a meningoencephalitis, with thickening of the cerebral meninges and wasting of the cortical substance.

Symptoms.—In most cases mental symptoms precede distinct motor ones. General paralysis does not supervene in ordinary insanity. The mental symptoms occur in the most varied possible time and mode of sequence. The moral feeling, perturbed at first, rapidly undergoes disintegration and decay. After a preliminary despondency, the emotional state tends to be gay; later, to be depressed, morose, or peevish, and finally to die out. More or less dementia is present in all cases from the early stages, is irregularly progressive, and often very extreme toward the close.

Three stages are marked: (1) A period of mental alienation, associated with fibrillar tremblings, noticeable in the tongue and facial muscles; (2) a period of chronic mental failure and bodily decay; (3) a stage of complete mental ruin, in which there is failure of motor, sensory, and nutritive functions.

In the first stage there is much difficulty in deciding as to the nature of the disease, there being some alteration in the moral nature before friends notice any bodily defect, so that a gradual alteration in character may take place. The principal mental symptoms are alterations in demeanor, conduct, temper, and disposition, enfeeblement of memory and loss of power in the highest acquirements, especially if the latter demand much skill and originality.

The principal body signs and symptoms in the early period are some defect of sight, hearing, or smell. The onset may take any clinical form, as maniacal, melancholic, stuporous, or of the nature of dementia. Delirium of exaltation is a very frequent symptom. Whatever the form of onset, dementia is the natural tendency of the disease, and, therefore, loss of memory and filthy habits are likely to occur with much greater frequency than in ordinary melancholia.

The characteristic motor signs may be masked, and usually consist of increased difficulty of speech, stoppage or stuttering, or great effort to enunciate, associated with marked twitching of the lips or face. Great loquacity exists in the expansive forms, but amnesia is most often seen. A loss of expression in the lower part of the face, the lines being smoothed out, is found; the tongue is protruded with difficulty, or is jerked out and sucking; swallowing or masticatory movements are common.

In the second stage physical signs become more marked and speech more incomprehensible, the appetite is voracious, face expressionless, gait feebler, and the general condition worse.

In the third stage the extreme of mental and physical deterioration is reached, and the patient is bedridden.

Severe cases may end in death in a week, but the average duration is over 2 or 3 years, some cases lasting 10 to 15 years; is longer in females than in males, and in quite demented cases and in those of hereditary tendency.

Diagnosis.—General paralysis is frequently overlooked. Moral perversions are common, but distinct change in character in a man in middle life, especially if he has been active in business, should excite suspicion. From ordinary acute mania or other forms of insanity the diagnosis is difficult in the early stages, but made certain by the occurrence of motor symptoms. Acute mania from alcoholic excess may resemble general paralysis at the onset, especially if associated with exaltation and tremors. Syphilitic disease of the brain or meninges may simulate the demented forms of general paralysis. From the monomania of grandeur, the speech, and other motor symptoms, the more changeable nature of the exaltation and the course of the disease, differential diagnosis is made. Intracranial tumors sometimes cause simulation of the demented form of this disease. Disseminated sclerosis, dementia associated with hemiplegia or other paralyses, and paralysis agitans may possibly be confused with general paralysis. Epileptiform seizure frequently marks the onset of general paralysis, but true epilepsy is said never to be followed by the latter. Plumbism and excessive

use of bromids may give rise to conditions simulating general paralysis.

Prognosis.—The disease is practically incurable when the characteristic symptoms have developed.

Treatment.—In the earliest stage complete cessation of all causes of emotional or mental strain may act beneficially, but instead of rest, attempts to stimulate to cheerfulness are usually made. No drugs appear to have any effect in cutting short the disease. Antisyphilitic remedies may be tried in appropriate cases. General paralytics are very susceptible to powerful drugs, and such should be used with caution. A return to home-life accelerates the final break-down, especially if followed by attempts at sexual intercourse or indulgence in any form of excess.

PARALYSIS, INFANTILE CEREBRAL. Synonyms.—Spastic hemiplegia, diplegia, or paraplegia.

Infantile Spastic Hemiplegia.—In most instances this paralysis is of the acute, acquired type, developing at any time after birth but usually before the fifth year.

Etiology.—It may be due to abnormal conditions or accidents or disease (especially syphilis) of the mother during pregnancy; it may be the result of lesions during delivery. After birth it may be caused by traumatism, embolism, scarlet-fever, pneumonia, measles, diphtheria, variola, mumps, typhoid fever, meningitis. It is very often brought on by pertussis. Convulsions may be the cause or the result of the lesion.

Pathology.—There may be hemorrhage, embolism or thrombosis. The main lesions found at autopsy are sclerosis and atrophy.

Symptoms.—The onset is sudden with convulsions, which are usually repeated, and coma. In exceptional cases the hemiplegia may come on suddenly in apparently well children. Fever is usually present, with delirium and vomiting. As the child recovers consciousness the paralysis is discovered usually complete though sometimes it is at first only paresis. If the face is involved, it soon recovers. Power is gradually restored in several weeks to the leg though in most cases a persistent halt remains, but the arm recovers so slowly that contractures are apt to develop in several years and moderate atrophy ensues. There is more or less rigidity as a rule, lessened during sleep and increased by excitement and attempts to overcome the spasm. Aphasia is common in right hemiplegias and is found too in left. Electrical reactions are usually normal. Disturbances in sensation are slight and transient. Posthemiplegic chorea or athetosis is often found. The mental condition is often defective though it may be normal. Epilepsy is a frequent sequel.

Infantile Spastic Diplegia. Synonyms.—Bilateral infantile spastic hemiplegia; Little's disease; spastic rigidity of the new-born; birth palsies.

Etiology.—The causes are the same as of infantile hemiplegia. Most cases date from birth and are due to lesions during delivery. The lesions are bilateral and involve practically only the motor areas of the cortex. Usually the primary cause of cerebral birth paralysis is meningeal hemorrhage. From the resulting blood-clot or from meningo-encephalitis, sclerosis or porencephalous defect follows.

There may be convulsions, often a series, after birth. In mild cases, however, the first symptom, limpness of the muscles, may be noticed only after 6 or 8 months. This flaccidity is often mistaken for rickets. Some rigidity of the legs and exaggerated knee-jerks will be found later. Athetoid or choreic movements are seen frequently. Mental defect is usually present.

Infantile Spastic Paraplegia.—Etiology is the same as in the preceding types, with the additional factor premature birth.

Symptoms.—The spastic paralysis of the lower extremities dates from birth or the first years of life. There is talipes equinus or equinovarus, adductor spasm, rigid gait and no muscular atrophy. There may be slight or no mental defect.

Diagnosis.—Infantile cerebral paralysis must be differentiated from infantile spinal paralysis (see below). Spastic diplegia and paraplegia are distinguished from pseudoparalytic rigidity and tetany by the history—existing from birth; the parts involved: the legs almost to exclusion of arms; by the painless character of the spasm; and by the continuous duration.

Prognosis.—This is grave in diplegia and paraplegia. The majority of these due to intrauterine or birth lesions die in infancy, the rest usually are feeble-minded and helpless. The outlook is brighter in hemiplegia; the onset being later the brain is less apt to be injured seriously. The residual paralysis may be so slight that there may be no suspicion of a previous paralysis until the occurrence of epilepsy.

Treatment.—The stage of convulsion should be treated by chloral, absolute rest, ice to the head. The established paralysis is for the most part intractable, but baths, hygiene, gymnastics, good food, manipulations, surgical appliances, electricity, may be used. If mentally deficient, the child should be placed in an institution for the feeble-minded.

PARALYSIS, INFANTILE SPINAL. Acute Anterior Poliomyelitis; Acute Atrophic Paralysis.—An acute infectious disease characterized by a rapidly developed inflammation of the anterior horns of the gray matter of the cord, occurring suddenly in children, occasionally in adults—acute spinal paralysis of adults—characterized by mild fever, muscular tremors and twitchings, and paralysis of groups of muscles, followed by more or less atrophy.

Etiology.—The disease is due to a filterable virus. It is essentially a disease of early life, from the second month to the third or fourth year, but it may rarely be observed in adults. The affection is more common during the summer months, and males are most often attacked. It occasionally appears in epidemic form. Exposure to cold and damp, dentition, injuries, and the infectious fevers may act as predisposing causes. The nasopharynx is supposed to be the portal of entry as well as the place of exit; and the disease is conveyed by the secretions of the nose and bronchi as well as by

food, dust and flies. Coughing, sneezing and kissing are possible means of dissemination; and the existence of "carriers" must be remembered.

The disease may occur in adults, under thirty, though rarely. When it does, the symptoms are the same as in children; care, however, should be taken not to confound it with multiple neuritis.

Pathology.—Infantile spinal paralysis is due to an inflammation of the gray matter of the anterior portion of the spinal cord. The early changes are: Medullary hyperemia, vascular exudation, and inflammatory softening, although the naked eye may not recognize any changes. Microscopic examination reveals inflammatory softening of the anterior horns of the gray matter. Among other constant lesions are atrophic degeneration of the multipolar ganglion-cells and of the anterior nerve-roots. The changes noted as occurring in the cord are usually limited to the dorso-lumbar and cervical enlargements. The virus has been found in the central nervous system and in the cerebrospinal fluid. The tonsils and lymph glands are enlarged.

As a direct result of the changes in the trophic centers and the nerve degeneration of the muscular fibers supplied, there ensue changes in the bones and joints, leading to great deformities.

Symptoms.—The onset of the affection varies; it may be acute, subacute, or chronic; it is usually sudden, with an attack of mild fever of a remittent type, of a few days' duration, on recovery from which it is noticed that the child is paralyzed. There is often pain or soreness at the beginning of the disease. Rarely, the paralysis may be preceded by convulsions.

The paralysis may affect both arms and both legs, the legs alone, or only one of the four extremities; it may, very rarely, be a hemiplegia. As a rule, however, the leg suffers more frequently than the arm; in paralysis of the leg the muscles below the knee suffer more severely than those above. The bladder and rectum are not affected, or, if so, only temporarily, and anesthesia or numbness cannot be detected. The temperature of the paralyzed limb is low and the part is cyanosed in appearance. After a few days there is a slight improvement in the paralyzed parts, although the muscles show a rapid wasting, which is progressive until all muscular tissue is gone. The reflex movements are impaired or abolished.

The electro-contractility by the faradic current is abolished in the paralyzed parts.

The *nerves* affected show: (1) Nuclei swollen and granular; (2) the white substance of Schwann is broken up; (3) the axis cylinders are broken, and (4) the nerve substance becomes a fibrous cord. The *muscles* show: (1) Great increase in fibrous tissue; (2) presence of granules; (3) atrophy of muscular fibers; and (4) disappearance of the transverse striæ.

Sequels.—Among the deformities resulting from the paralysis are the different forms of talipes.

Talipes equinus, the result of paralysis of the antero-external muscular group of the leg.

Equino-varus, the result of paralysis of the antero-external muscular group of the leg, together with the adductors of the foot.

Talipes calcaneus, the result of paralysis of the muscles of the calf of the leg.

Talipes cavus—"pes cavus"—characterized by the hollowing of the sole of the foot, with prominence of the instep, the result of paralysis of the calf muscles with contraction of the long flexor of the toe or the long peroneus—the foot flexors.

Diagnosis.—The recognition of acute poliomyelitis is not always possible at the onset or during the early days of its course, as localized paralyses are difficult of detection in children, but *immobility of one leg or arm* in children with febrile symptoms, or following convulsions is always an indication of poliomyelitis. After the initial stage has passed, the presence of paralysis, wasting, presence of R.D. (reactions of degeneration), loss of reflexes, and the absence of anesthesia, render the diagnosis very easy.

Hemiplegia from acute cerebral affections in children can be distinguished from infantile paralysis by the disorders of intelligence and the special senses, and the perseverance of the normal electro-contractility.

Paralysis of myelitis occurs in older persons, and is associated with disturbances of the genito-urinary organs and bed-sores.

Pseudo-muscular hypertrophy, with paralysis, begins gradually, becoming progressively worse with increase in the size of the limbs.

Prognosis.—Except in cases in which the onset is very severe, the outlook as regards life is generally regarded as good; but in some epidemics the death rate is high. More or less paralysis with muscular wasting and deformities always results, but by its early recognition and prompt treatment the extent may be greatly lessened.

Treatment.—During the febrile stage the patient should be placed at rest in bed and all the secretions rendered free. If the affection is suspected at this period, the limbs should be wrapped in cotton-wool and ergot administered to lessen the spinal congestion. The nose and throat must be kept as clean as possible; gargling with 2 per cent solution of hydrogen peroxid is useful. Counterirritation is unnecessary. As soon as the febrile reaction has subsided and the paralysis becomes manifest the child should be well fed and taken out-doors once daily. Urotropin, in doses of 5 grains every 3 or 4 hours, has been recommended. Gentle friction should be applied to the affected muscles at first, followed later by the hot spinal douche and mild galvanism. Internally, quinin, belladonna, ergot, and potassium iodid may be of value. Later, as improvement takes place tincture of nux vomica, ♏j to iij, three times daily, or hypodermic injections of strychnin sulphate, gr. 1/16 to 1/100, according to the age, twice a week, and faradism to the paralyzed muscles are to be used. Means should be taken to prevent deformities. It must be borne in mind that the recovery of paralyzed parts and the restoration of lost muscular power and function is a process which extends over a very long period of time—months, and even years.

PARALYSIS, PSEUDOHYPERTROPHIC MUSCULAR.—See Muscles (Progressive Dystrophies).

PARALYSIS, SPASTIC SPINAL.—See Lateral Sclerosis.

PARAMYOCLONUS.—The convulsive tremor of Friedreich, a functional neurosis marked by the sudden shock-like character of the muscular contractions, their bilateral symmetry, and the freedom of the extremities. There is no ataxia, paralysis, or anesthesia; electric irritability is normal; consciousness is unimpaired; the convulsive movements are usually in abeyance during sleep. The disease generally occurs in males, and manifests itself both in children and in adults. It is supposed to be caused by fright or physical overstrain.

Paramyoclonus multiplex is an affection characterized by clonic contractions, chiefly of the muscles of the extremities, occurring either constantly or in paroxysms. It occurs usually in males, and follows emotional disturbance, fright, or straining. The contractions are usually bilateral, and may vary from 50 to 150 a minute.

PARANOIA (Monomania).—A chronic mental disease, characterized by fixed logical or systematized delusions of persecution, unseen or impossible agencies, or of self-exaltation, the emotions and memory being only paroxysmally defective, while, however, the life of the individual is dominated by the delusions. The term paranoia, as it is now commonly used—to cover a group of insanities which are degenerative in origin, chronic in course, and characterized by systematized delusions, with little impairment of the emotional faculties—is not generally accepted as a synonym for monomania. There is generally a hereditary predisposition to insanity in monomania or paranoia. The exciting cause may be the result of an acute mania or melancholia, or the result of alcoholism or of malnutrition in those who have had a struggle to keep their position in the world; extreme worry in individuals with mental instability; following primary or acute delusional insanity.

Symptoms.—The course of monomania is essentially chronic, the delusions becoming perfectly fixed and unchanging upon one particular subject or set of subjects, which in turn dominate the life of the individual. Most commonly these systematized delusions are delusions of persecution or suspicion, delusions of exaltation or of pride, and delusions of unseen agencies.

Diagnosis.—In the diagnosis of monomania there are three points to keep in mind: (1) The duration: the fixed, systematized delusions must have existed over one year. (2) The absence of symptoms of mania or melancholia. (3) The presence of systematized delusions affecting the personnel of the individual.

Monomania is an incurable disease. Unless tuberculosis develops within a few years, dementia results.

Treatment is symptomatic. The best hygienic conditions are demanded. See Mania.

PARAPHIMOSIS.—Retraction and constriction of the prepuce behind the glans penis. See Penis.

PARAPLEGIA, ATAXIC (Posterolateral Sclerosis, Gowers' Disease).—Degeneration of the posterior and lateral columns of the cord. The etiology is unknown. Syphilis, heredity, neurotic tendency seem to be factors. It is always associated with general paralysis of the insane. The symptoms resemble spastic paraplegia in the loss of power and muscular rigidity and tabes dorsalis in the marked incoordination. The reflexes, however, are exaggerated, incuding ankle clonus and knee-jerk. The sphincters are sometimes involved. Treatment is chiefly symptomatic. See Paralysis.

PARASITES.—Parasitism is essentially a condition of infestment of some form of life by another living organism, usually of lower type. The parasite is the invading form, whether animal or vegetable, and is spoken of as either an *ectoparasite*, if living upon the surface, or as an *endoparasite*, if inhabiting some part of the internal structures of the invaded organism. The latter is spoken of as the *autosite*, or *host;* and when in the life of the parasite there are special stages in its cycle, the host of the fully developed organism is spoken of as the *primary* or *definitive host*, the one or more hosts accommodating the intermediate stages of the parasite being denominated the *secondary* or *intermediate hosts*. Parasites of man are *animal* and *vegetable*.

There are three kinds of parasitism: (1) *True Parasitism*. In this condition the parasite does harm to the host, and derives all the benefit of the association; example, the hook-worm infecting man or animals. (2) *Mutualism*. In this there is mutual benefit to each party of the association; example, the presence of colon bacilli in the intestines, where the bacillus is furnished a suitable habitat and in return protects its host against strictly pathogenic bacteria. (3) *Commensalism*. Here there is benefit to the parasite, but no injury to the host; example, the trichomonas vaginalis which lives in the vaginal mucus, but, so far as is known, does no injury to the host.

Animal Parasites

The *effects of animal parasitism* may be practically *nil* according as the numbers of parasites present are small or the influences of the parasites are slight, or according to the part of the host affording accommodation to the parasites in question. On the other hand, pathogenic influences are exerted and anatomical changes and symptoms of variable intensity are produced by animal parasites just as in case of infection by pathogenic bacteria. The irritation caused by the presence and by the movements of the parasites, with consequent inflammatory effects, as well as the possibility of tissue destruction, pressure atrophy, and secondary degenerations, must be taken into consideration. The possibility of obstruction of more or less important channels, as the occlusion of blood or lymph vessels by the ova of blood flukes or the embryo filarial worms, as well as a large number of similar possible disturbances in other parts of the body by one or other form of parasites, must from time to time be reckoned with. The abstraction of food-stuff from the economy of the

host by the parasite cannot be looked upon as of serious import in itself, but the possibility of loss of valuable matter, as in blood destruction by the malarial hematozoon or the loss of blood by hemorrhage from the wounds in the intestinal mucosa through lesions caused by hook-worms and other sucking parasites, may constitute serious factors of disease for the host. Moreover, there unquestionably are toxic influences generated in one or other manner in animal parasitism which may exert marked and deleterious influences upon the infested organism, as doubtless in malaria, in uncinariasis, bothriocephalus disease and a number of other similar affections.—(*Tyson.*)

The important classes of animal parasites in man are the PROTOZOA (*q. v.*), the WORMS (*q. v.*), and the arthropods. Of the arthropods the important ones are (1) the *acarina* (mites, ticks), to which species belong the acarus scabiei (the itch mite), the leptus autumnalis (the harvest bug), and the demodex folliculorum (the comedo mite); (2) the *pediculidæ* (lice); and (3) the *diptera*, to which belong the fleas and flies. *Myiasis* is a condition due to the deposition of the larvæ of flies in open sores, or in the nose, ears, eyes, pharynx, or vagina.

Insects and Communicable Disease.—Recent studies in communicable diseases have shown that certain insects are essential to the propagation of some maladies, and incidentally are of importance in others. In malaria the mosquito is certainly the most important if not the only means by which the disease is spread; in this affection the sexual cycle of the plasmodium is completed in infected mosquitos. It is generally conceded that the mosquito is necessary to the propagation of yellow fever, the immediate cause of which is not known. In malaria and filariasis the animal parasites undergo definite cycles of evolution in the interior of the insect. In trypanosomiasis the tsetse-fly inoculates the disease from animal to animal, but, so far as at present known, the flagellate parasite has no definite cycle within the insect. There are reasons for believing that relapsing fevers can be transmitted by bedbugs, and that the bites of fleas coming from plague-stricken man or animals may induce the disease. In another group of diseases, including cholera, typhoid, tuberculosis, plague, and infections of the types indicated, the germ causing the disease may be deposited upon the food, and in that and similar ways be conveyed from sources of infection to the healthy.—(*Coplin.*)

Vegetable Parasites

The chief forms are the schizomycetes (fission fungi) or BACTERIA (*q. v.*); the blastomycetes or YEASTS (*q. v.*); and the hyphomycetes or *molds*. The mold fungi are made of filaments, hyphæ, so interlaced that they form a network, the mycelium. They reproduce by sporulation. Pathogenic molds are the direct agents in the production of the following diseases: favus (achorion Schönleinii); thrush (oïdium albicans); actinomycosis (actinomyces, ray fungus); mycetoma (streptothrix madura, one of the actinomyces group). The large-spore fungus or small-spore fungus to which ringworm is due has been shown to be not a common mold, but a specific fungus. Tinea versicolor is due to the microsporon furfur; erythrasma is caused by the microsporon minutissimum; pinta is due to several fungi of the class aspergillus; to this class *otomycosis* and *myringomycosis* are believed to be due. Sticker has found 16 cases of pulmonary disease to be caused by the aspergillus fumigatus—*aspergillomycosis*. The leptothrix—a long segmented fungus—is abundant in the lungs in pulmonary gangrene and may cause the formation of patches on the tonsil simulating diphtheritic membrane—*pharyngomycosis leptothrica*. The *leptothrix buccalis* is thought to play a significant rôle in the production of caries.

PARATYPHOID FEVER.—An infectious fever exactly simulating typhoid clinically, but due to a bacillus intermediate between the bacillus typhosus and the bacillus coli, called the paratyphoid or paracolon bacillus. The Widal reaction is negative, but the serum reacts upon fresh cultures of the paratyphoid bacillus.

Diagnosis is based solely on the paratyphoid agglutination test.

Treatment is the same as that of enteric fever except that obviously the paratyphoid bacillus or its product is used in specific treatment.

PAREGORIC.—The camphorated tincture of opium. It is of especial service in the treatment of diarrhea, because it contains a volatile oil and camphor, and it is a most common ingredient of cough mixtures.

In bronchitis:

℞.	Paregoric,	℥ ss
	Tartar emetic,	gr. j
	Potassium nitrate,	ʒ ij
	Bitter-orange water,	℥ xij.

Give 1 teaspoonful every hour when needed for the cough.

In diarrhea:

℞.	Paregoric,	ʒ iij to iv
	Dermatol (bismuth subgallate),	ʒ ij
	Chalk-mixture, add enough to make	℥ iij.

Give 1 teaspoonful every hour until relief is obtained.

PAREIRA (Pareira brava).—The dried root of *Chondrodendron tomentosum*, a plant of South America. It is diuretic and laxative, and tonic to the mucous membrane of the genitourinary organs. It is valuable in cystitis, gonorrhea, and leukorrhea, and is used internally and locally for the bites of poisonous serpents, etc. **P., Flext.** Dose, 10 to 45 minims. **P., Infus., unof.** Dose, 1 to 2 ounces.

PARESIS.—See PARALYSIS (General).

PARIS GREEN.—A preparation of copper, chemically known as cupric acetoarsenite, and used as a pigment for wall-paper coloring and as an insecticide. It is highly poisonous; and for treatment of the poisoning by Paris green see ARSENIC.

PARONYCHIA (Whitlow).—An abscess of the thumb or fingers.

The superficial whitlow consists of inflammation of the surface of the skin of the last phalanx, with burning pain or effusion of a serous or bloody fluid; it is generally seated immediately around and beneath the nail; it is attended by great pain and throbbing, and suppuration at the root of the nail, which may come off. The deep-seated variety, or *tendinous whitlow*, as it is called, is attended by severe, throbbing pain, exquisite tenderness, light but tense and resisting swelling, and very great constitutional disturbance. It may lead to suppuration, the pus extending along muscles and tendons from the fingers to the palm, and even to the forearm, causing sloughing of the tendons, with severe irritative fever, sometimes placing life in danger, and frequently leaving the limb stiff and useless.

If purgatives and fomentations do not speedily bring relief, the finger must be freely laid open. The knife, used early, should be carried deep enough to feel the resistance of the bone or tendon; the sheath of the latter should be thoroughly laid bare. If the matter has extended to the hand, an opening should be made until complete drainage is established. See NAILS (Diseases).

PAROÖPHORITIC CYSTS.—See OVARY (Diseases).

PAROTID DUCT, DIVISION.—See FACE (Injuries).

PAROTITIS.—Inflammation of the parotid gland, commonly called MUMPS (*q. v.*).

PAROVARIAN CYSTS. See OVARY (Diseases).

PARRESINE.—See PETROLATUM.

PARSLEY.—A biennial plant, from the fruit of which is extracted apiol, a nonvolatile, oily liquid, of green color, acid reaction, and pungent taste; it is often found in commerce as an impure oleoresin. See APIOL.

PARTURITION.—See LABOR.

PARULIS.—See ALVEOLAR ABSCESS.

PASTEURIZATION.—See MILK (Pasteurized).

PASTILLES.—See TROCHES.

PATELLA.—See KNEE-JOINT (Injuries).

PATHOLOGIC TECHNIC.—In this epitome, much of which is founded on the admirable work of Mallory and Wright on "Pathologic Technic," there are given very briefly the fundamental practical points. The subject is elaborated more fully under such special headings as BACTERIOLOGY, BLOOD (Examination), FECES (Examination), MICROSCOPE, POSTMORTEM EXAMINATION, SPUTUM, URINE (Examination), etc. In addition special pathologic technic is discussed under the headings of certain diseases, as GONORRHEA, TUBERCULOSIS, TYPHOID FEVER, etc.

Examination of Fresh Material

This may be examined after being teased apart or in sections.

Teased Preparations.—Place a small section on a glass slide, and cover with a normal salt solution, and tease apart by means of two sharp needles.

Sections of Fresh Specimens.—Freeze the specimen by the evaporation of ether, and shave off a small section by means of the blade of a carpenter's plane, allowing the specimen to fall into a normal saline solution. It should be spread out on a slide while remaining in the solution, then dried by blotting paper, and immediately examined. If it is desired to stain the specimen, add a few drops of Loeffler's alkaline methylene-blue solution, wash in water, and examine. Oil or fat in the fresh specimen may be demonstrated by means of a 1 percent solution of osmic acid.

Cover-glass Preparations.—Such preparations are usually made in examining blood, sputum, or other fluid or semifluid substance. In the case of sputum a tiny mass is placed on a cover-glass, another is pressed gently down upon this, and the two glasses are separated by sliding one over the other, the object being to secure a thin, even film on each glass. The film may also be spread with the edge of a cover-glass or with a platinum spatula. The preparations are then left to dry in air, or they may be dried by exposing them to a temperature of 120° F. for 20 minutes, or by passing them quickly 3 times through the flame of a spirit-lamp or Bunsen burner. When dry, they are ready to stain. To obtain a cover-glass preparation of blood, cleanse the finger, prick the tip, wipe off the first drop of blood that exudes, touch the apex of the second drop with a cover-glass, spread in the manner described, and dry in air.

Injection Masses.—On account of improvements which have been made in general pathologic technic within recent years, injections are not so essential as they were formerly, and are not generally used. If the specimen is well stained, the vessel and vessel walls are sufficiently prominent to be studied without being injected.

There are two kinds of injection masses—(1) cold and (2) hot. If the hot method is used, the fluid is injected into the tissue heated to the same temperature as the injection mass. The instruments are a syringe with various sized cannulas. Blood-vessels should first be washed out with normal salt solution.

Cold Injection Mass:

Soluble Berlin blue,	1
Water,	20.

Warm Injection Mass (Carmin Gelatin).—The warm injection mass is better to use. Place 2 to 2.5 grams of best carmin in about 15 c.c. of water containing enough ammonium hydroxid to dissolve it. Filter and place over a water-bath, and add a concentrated solution of gelatin, stirring constantly. Gradually add acetic acid until a bright red shade is produced. Care must be exercised in order to prevent too much acid from being used, otherwise the mass will become worthless, owing to the precipitation of carmin.

Fixing Reagents.—These reagents are used for the purpose of preserving intact the tissues, cells, and especially the nuclei. When the fresh specimen is obtained, it is immediately placed in the fixing reagent and afterward embedded and stained. A good fixative penetrates and kills tissues quickly, preserving the tissue elements. The choice of a

proper fixing reagent for a given tissue depends largely on the nature of the pathologic lesions present or suspected, and upon the object for which the tissue is preserved. For bacteriologic study of tissues, and for many valuable and chemic reactions, alcohol is best as a fixative reagent. For finer histologic work Zenker's or Orth's fluid is to be preferred. Flemming's solution is recommended for renal tissue when there is fatty degeneration. Tissues fixed in alcohol or in a solution of formaldehyd may remain as long as desired. Tissues hardened in most of the other fixatives must be transferred, after thorough washing in water, to alcohol for preservation. It is best to pass the specimen successively through alcohol of different strengths, as 30, 60, 90, and 96 percent, allowing it to remain from a few hours to a day in each strength. For general purposes the specimen may be transferred from water to alcohol of 70 to 80 percent, in which it may remain until it is desired to embed it.

Alcohol is used in the laboratory in 95 to 96 percent strength. The exposed surface of the tissues become shrunken and extremely hard when placed in alcohol. Tissue to be placed in either absolute or 95 percent alcohol should be cut into thin sections, 1/2 cm. thick. The volume of alcohol to be used should be 15 to 20 times as great as the specimen, and it should be changed after 3 or 4 hours. The tissue should be kept in the upper part of the alcohol by means of absorbent cotton, or the jar may frequently be inverted and the alcohol thus kept of even strength.

For general purposes it is best to place tissues at first into 80 percent alcohol, which should be replaced in 2 to 4 hours by 95 percent alcohol. In this way less shrinkage is caused and the surface of the tissues is not made so hard.

Zenker's Fluid:

℞.	Potassium bichromate,	2.5 gm.
	Sodium sulphate,	1 gm.
	Mercuric chlorid,	5 gm.
	Glacial acetic acid,	5 c.c.
	Water, enough to make	100 c.c.

This solution is practically Müller's fluid, saturated with mercuric chlorid and 5 percent of glacial acetic acid.

On account of the evaporation of the acid, it is probably best not to add all the acetic acid to the stock solution, but only in the proper proportion to the part selected for hardening.

Directions for Use.—(1) Fix the tissues in the solution for from 1 to 24 or 48 hours, according to thickness; (2) wash in running water 12 to 24 hours; (3) preserve in 80 percent alcohol until used.

Zenker's fluid penetrates quickly so that tissues do not require to be so thin as in the case of other fixatives. They should not, however, exceed 1/2 cm. in thickness. Occasionally there is a precipitation of mercury, which may be removed by adding a small quantity of tincture of iodin (up to 1/2 of 1 percent) to the alcohol in which the specimens are preserved. As soon as the color of the iodin disappears on account of its forming a colorless soluble compound with mercury, more iodin must be added, until the alcohol remains stained faintly yellow. Tissues hardened in Zenker's fluid stain best with alum hematoxylin. Good results are also obtained with eosin, followed by Unna's alkaline methylene-blue solution. Fuchsin and safranin stains are also useful. Nuclear figures, red blood-corpuscles, and protoplasm are all preserved by this fixative method.

Orth's Fluid:

℞.	Potassium bichromate,	2 to 2.5 gm.
	Sodium sulphate,	1 gm.
	Water,	100 c.c.
	Formaldehyd (40 per-cent solution),	10 c.c.

The formaldehyd should be added only at the time of using, otherwise the solution will become darker in 2 days, and a crystalline deposit will occur. The tissue should not be over 1 cm. in thickness. The specimens should be washed thoroughly in running water for from 6 to 24 hours, and then placed in 80 percent alcohol.

Mercuric Chlorid.—Use a saturated solution (made by heat) in normal salt solution. The addition of 5 percent of glacial acetic acid is sometimes advisable. (1) Harden thin pieces of tissue (2 to 5 mm. in size) for 1 to 6 hours; (2) wash in running water for 24 hours; (3) preserve in 80 percent alcohol. Tissues fixed by this method may be stained by nearly all solutions. With the Heidenhain-Biondi triple stain it yields good results.

Müller's Fluid:

℞.	Potassium bichromate,	2 to 2.5 gm.
	Sodium sulphate,	1 gm.
	Water,	100 c.c.

Harden the tissues for from 6 to 8 weeks. Change the fluid daily during the first week; once a week thereafter. Ordinary tissues are then washed in running water overnight before being placed in alcohol. Nervous tissue is transferred directly from the fluid to the alcohol. This fluid hardens tissues slowly without shrinkage, but is a poor nuclear fixative, and is gradually being displaced by more rapid methods.

Formalin.—The gas, formaldehyd (H.COH), is soluble in water to the extent of 40 percent formalin). The best strength of formaldehyd to use for fixing tissues is a 4 percent solution—that is, 10 parts of the aqueous 40 percent solution (formalin) to 90 parts of water—or, better, normal salt solution.

Sections of ordinary tissues not over 1 cm. thick are hardened in 24 hours. They may then be transferred to alcohol or may remain indefinitely in the formal in solution. Thin pieces are sufficiently hardened in 3 hours, when they may be frozen and cut, washed in water, then in alcohol, and stained.

Chromic Acid.—Used in aqueous or alcoholic solution in strengths varying from 0.1 to 2 percent. Weaker solutions are used for nerve tissue. Wash out several hours in running water. If the object is preserved in alcohol, it must be protected

from the light, or a precipitate will be thrown down on its surface. The brownish-green color of objects fixed in chromic acid may be removed by treating them with hydrogen dioxid. A 0.02 percent solution is recommended for macerating nerve tissue and nonstriated muscle tissue, a cube of 5 mm. requiring about 24 hours' immersion in 10 c.c. of the medium.

Flemming's Fluid (first formula):

Chromic acid,	0.2 gm.
Glacial acetic acid,	0.1 c.c.
Water,	100 c.c.

This is especially recommended for fixing the achromatic spindle-fibers in nuclei.

Second formula:

One percent chromic acid,	45 c.c.
Two percent osmic acid,	12 c.c.
Glacial acetic acid,	3 c.c.

This fixes small pieces (2 to 3 mm. thick) in from a few to 24 hours, and is useful for fixing the figures in cell-division and for many other purposes.

A weaker solution is also used:

One percent osmic acid, Glacial acetic acid,	each, 10 c.c.
One percent chromic acid,	25 c.c.
Water,	100 c.c.

The second formula is the one generally known as Flemming's fluid.

Decalcification

Tissues to be decalcified should be cut into thin slices of proper sizes (from 2 to 3 mm. thick), for embedding in celloidin. Softer tissues need not be thinner than 4 to 6 mm.

Steps in Decalcifying.—(1) The tissues must be thoroughly hardened, the three most useful reagents being alcohol and Zenker's and Orth's fluids. After using either of the two last reagents, the tissues must be washed thoroughly in water and placed in alcohol for at least 24 hours. They will then be ready for decalcification. (2) The decalcifying fluid should be used in large amounts, and, if necessary, be frequently changed. (3) After decalcification the tissues are to be thoroughly washed in running water for 24 hours, to eliminate every trace of the acid. (4) The tissues finally must be hardened again in alcohol.

The principal **decalcifying agents** are nitric acid, hydrochloric acid, chromic acid, and picric acid.

Directions for Using Nitric Acid.—(1) Decalcify in large quantities of a 5 percent aqueous solution of nitric acid, changing the solution every day for 1 to 4 days. (2) Wash for 24 hours in running water, to remove every trace of the acid. (3) Harden in 80 percent and then 95 percent alcohol. Embed in celloidin.

Phloroglucin and Nitric Acid.—Phloroglucin is not a decalcifying agent, but is added to nitric acid to protect the tissues, while allowing a stronger solution of the acid to be used than would otherwise be possible. The solution is prepared by dissolving 1 gram of phloroglucin in 10 c.c. of nitric acid. Solution takes place quickly, with the generation of considerable heat. The fluid is reddish-brown at first, but becomes yellow in the course of 24 hours. Dilute with 100 c.c. of a 10 percent solution of nitric acid. This gives nearly a 20 percent solution of nitric acid. The process of decalcification in this fluid is extremely rapid—a few hours only, as a rule, are required.

Picric Acid.—A saturated aqueous solution containing an excess of crystals is sometimes used for decalcifying. It has no injurious action on tissues, but is extremely slow, frequently requiring months. Fresh tissues may be placed directly in the solution, which hardens and decalcifies at the same time. Instead of being washed out in water, in which they would macerate, the pieces of tissue are placed directly in 70 percent alcohol to remove the acid.

Embedding Processes

Sections may be cut by means of the razor or Microtome (*q. v.*). Two substances are now principally used for embedding: they are celloidin and paraffin. Celloidin methods are preferred for general pathologic work and for histologic work, while paraffin sections should be reserved for the finest details or for the study of special tissues.

If large sections are desired, celloidin is preferable; if small sections are desired, paraffin is used.

Embedding in Celloidin.—Allow the section to macerate from 24 hours to several days in 2 different solutions of celloidin. The two solutions are spoken of as thin and thick solutions. To make a *thick* celloidin, 30 grams of the dry celloidin are dissolved in 500 c.c. of a mixture of equal parts of ether and absolute or 95 percent alcohol. This gives a 6 percent solution.

Diluted with an equal amount of ether and alcohol solution, it forms *thin* celloidin.

The steps of the embedding process are as follows (Mallory and Wright): Pieces of tissue which have been properly fixed and finally preserved in 80 percent alcohol are first to be cut with great care. They should rarely be over 4 to 8 mm. thick; for most purposes 2 mm. will be sufficient. Pieces of this thickness will furnish several hundred sections, will embed more quickly than larger masses, and will be more rigid when mounted on a block. They should never be broader or longer than is necessary to show the whole of the process under study. Very thin celloidin sections cannot usually be obtained with tissues over 1 1/2 or 2 cm. square, and smaller dimensions are preferable. Beginners usually embed larger pieces than are necessary.

The trimmed pieces of tissue are first hardened and dehydrated for 24 hours in 95 percent alcohol; then macerated in equal parts of alcohol and ether for the same length of time, to prepare them for the thin celloidin. In the latter they remain at least 24 hours, preferably for a number of days if at all thick, for in this solution occurs most of the in-

filtration with celloidin. Finally, the pieces are macerated 24 hours or more in thick celloidin. They are then mounted on blocks of vulcanized fiber, exposed to the air for 2 or 3 minutes until the surface hardens a little, and placed in 80 percent alcohol for 6 to 24 hours to allow the celloidin to harden.

Summary of the Different Steps in Celloidin Method.—(1) Place in 95 percent or absolute alcohol for 24 hours; (2) then in ether and 95 percent or absolute alcohol (equal parts) for 24 hours; (3) in thin celloidin for from 24 hours to 1 or more weeks; (4) in thick celloidin for from 24 hours to 1 or more weeks; (5) mount on blocks of vulcanized fiber; dry for 1 or 2 minutes in the air; (6) harden the celloidin in 80 percent alcohol for from 6 to 24 hours.

In cutting, the microtome knife should be held very obliquely, and covered with 80 percent alcohol. Celloidin sections may be stained by nearly all methods without removing the celloidin. It can be removed, however, by placing the sections in absolute alcohol, in oil of cloves, or in equal parts of alcohol and ether for 5 to 10 minutes, then passing the sections back through absolute into ordinary alcohol.

To Transfer Sections to the Slide.—Transfer the section from water to a slide and dry with cloth and press down firmly with filter-paper or blotting paper before it becomes dry. It may also be transferred in the following manner: Place in 95 percent alcohol and transfer to the slide; at the same time allow the vapor of ether to soften the section, when it may be smoothly fixed to the slide; wash with 80 percent alcohol to harden the celloidin.

Embedding in Paraffin.—This method is very useful, especially when thin sections are desired. The pieces of tissue should be small, soft, and of uniform consistency. In pathologic work it is better to cut the sections and to stain them after they are fastened to the slide than to stain in the mass beforehand, because a variety of stains may be used, which is a distinct advantage. The first step in the preparation of hardened tissues for the paraffin bath is to cut them into small, thin, square or rectangular pieces not over 1 cm. square, preferably not over 2 to 3 mm. thick. The pieces of tissue are then thoroughly dehydrated by macerating first in 95 percent and then in absolute alcohol. From alcohol they are put in some substance, such as chloroform or oil of cedar, which has the property of mixing with alcohol and of dissolving paraffin. From chloroform they are transferred to a saturated solution of paraffin in chloroform, and then passed through 2 or 3 separate baths of the melted paraffin to get rid of every trace of chloroform. If oil of cedar is used, the specimens are transferred directly from it into the melted paraffin.

Summary of Different Steps in Paraffin Method.

Method No. 1.

1. Ninety-five percent alcohol,	6 to 24 hours.
2. Absolute alcohol,	6 to 24 hours.
3. Chloroform,	6 to 24 hours.
4. Chloroform saturated with paraffin,	6 to 24 hours.
5. Paraffin bath, 3 changes,	1 to 6 hours.
6. Embed and cool quickly in cold water.	

Method No. 2.

1. Ninety-five percent alcohol,	6 to 24 hours.
2. Absolute alcohol,	6 to 24 hours.
3. Oil of cedar, 2 changes,	6 to 24 hours.
4. Paraffin, 3 changes, until no odor of oil of cedar,	2 to 8 hours.
5. Embed and cool quickly in cold water.	

In the second method instead of oil of cedar, xylol, equal parts of oil of cloves and turpentine, or oil of cloves and xylol may be used.

For embedding the specimens, metallic boxes, or paper boxes made of stiff writing-paper, may be used. Melted paraffin is poured into the paper box to the depth of about 1 cm. The pieces of tissue are placed in the box with that side down from which sections are preferred. Several pieces of tissue are thus placed in the melted paraffin when the box is placed upon cold water. After the paraffin has hardened, the paper is removed, and the paraffin is divided up according to the pieces in it.

One of the blocks is fastened to the object-holder by heating the latter in a flame until it will just melt the paraffin when the block is held in proper position against it. The holder is then quickly cooled in cold water. Trim off the overlying paraffin until the specimen is reached, and adjust in the paraffin microtome. To get the best specimens the temperature of the room must be so regulated that the sections are ribbon-shaped.

The sections are laid on the surface of a large dish of warm water, about 44° C., and, if necessary, gently stretched so as to remove wrinkles. Paint the surface of a slide with a thin layer of Mayer's glycerin albumin mixture (equal parts of white of egg and glycerin); wipe off excess with a towel so that a faint layer is left; dip the slide under the sections; arrange them in order; life the slide, and drain off the water. The slide is then placed in a slanting position until dry, when it is put in the thermostat for from 2 to 12 hours at a temperature of 54° to 60° C. To get rid of the paraffin in the sections they are treated with 2 or 3 changes of xylol, and then with absolute alcohol, followed by 95 percent alcohol.

If the celloidin and oil of cloves mixture is used, the paraffin is removed by means of xylol, followed by oil of origanum or oil of bergamot, and finally by 95 percent alcohol, because absolute alcohol will dissolve the celloidin (Mallory and Wright).

Serial Sections by the Celloidin Method.—The specimen is embedded, mounted on vulcanized

fiber, and hardened in 80 percent alcohol. Moisten the knife of the microtome with 95 percent alcohol. As the sections are cut they are drawn upon the surface of the knife and arranged in the proper order by means of a camel's-hair brush. Place the slide against the back of the knife and transfer the section by means of the camel's-hair brush. The section is then fastened to the slide by allowing a few drops of ether to be poured upon it, after which all the edges are smoothed down very carefully. The slides are then numbered, and may be kept in a jar of 80 percent alcohol.

Serial Sections by the Paraffin Method.—Cut ribbons a yard long, if necessary, and place them on sheets of paper in proper order. They may then be divided into short series with a needle, and fastened to the slide by means of Mayer's albumin mixture.

Staining Solutions

Aqueous Alum-hematoxylin Solution:

Hematoxylin in crystals,	1
Saturated aqueous solution of ammonium-alum,	100
Water,	300
Thymol,	a crystal.

Dissolve the hematoxylin in a small quantity of hot water. The combined solution is then exposed to light in a bottle tightly stoppered with a plug of cotton. The solution will be ready for use in about 10 days, after which time it should be kept in a tightly stoppered bottle. It is very easily prepared and gives excellent results.

Delafield's Hematoxylin:

Hematoxylin in crystals,	4 gm.
Alcohol, 95 percent,	25 c.c.
Saturated aqueous solution of ammonium-alum,	400 c.c.

Add the hematoxylin dissolved in the alcohol to the alum solution, and expose the mixture in an unstoppered bottle to the light and air for 3 or 4 days. Filter, and add—

Glycerin,	100 c.c.
Alcohol, 95 percent,	100 c.c.

Allow the solution to stand in the light until the color is sufficiently dark, then filter and keep in a tightly stoppered bottle. The solution keeps well and is very powerful. So long as it is good, the solution has a purplish tinge.

Alum-carmin:

Carmin,	2 gm.
Alum,	5 gm.
Water,	100 c.c.

Boil 20 minutes, adding enough water to make up for that lost in evaporation. When cool, filter and add a crystal of thymol to prevent the growth of mold.

Methylene-blue.—A saturated solution in 95 percent alcohol or absolute alcohol should be kept in stock to be used in making other solutions. This can be used as a stain by adding 1 part to 9 parts of water.

Loeffler's Alkaline Methylene-blue Solution:

Saturated alcoholic solution of methylene-blue,	30 c.c.
Solution of caustic potash in water (1 : 10,000),	100 c.c.

This solution keeps well for long periods of time.

Gabbett's Methylene-blue Solution:

Methylene-blue,	2
Sulphuricacid,	25
Water,	75.

Used as a decolorizer and contrast stain for tubercle bacilli.

Fuchsin.—A saturated alcoholic solution to be kept in stock. See FUCHSIN.

Ziehl-Neelsen's Carbol-fuchsin:

Saturated alcoholic solution of fuchsin,	10 c.c.
Five percent carbolic acid water,	90 c.c.

This solution stains quickly and keeps well.

Gentian-violet.—A saturated alcoholic solution; should be kept in stock.

Ehrlich's Anilin Gentian-violet Solution:

Saturated alcoholic solution of gentian-violet,	16 c.c.
Anilin water,	84 c.c.

Mix and let stand for 24 hours. Does not keep longer than 1 week or 10 days.

Safranin.—Any of the three following solutions may be used:

1. A saturated aqueous solution of safranin O, soluble in water (to be made with aid of heat).
2. A mixture of equal parts of a saturated aqueous solution of safranin O, soluble in water, and a saturated alcoholic solution of safranin, soluble in alcohol.
3. Two percent anilin water, 100
   Safranin O, soluble in water, in excess.

Saturate the solution with heat (60° to 80° C.), and filter.

Methyl-violet.—Aqueous solutions of several strengths, as 0.5 to 2 percent. Stains nuclei of cells, bacteria, etc.

Eosin.—Stains rapidly and gives a beautiful, diffuse, rosy hue. It is one of the best contrast stains with hematoxylin. Make a 5 percent aqueous solution, and dilute as required. It is also a specific stain for red blood-corpuscles (to which it gives a copper color), for certain leukocytes, and for the giant-cells of leprosy and tubercle.

Eosin-hematoxylin stain and the "polychrome" *methylene-blue, eosin solution (Romanowsky stain)*

are excellent for routine work. The former combined with Wright's stain is in conjunction especially valuable in the study of nuclear structures. The Romanowsky stain is particularly serviceable in examining the malarial organism and other parasites.

Ehrlich-Biondi-Heidenhain Triple Stain.—To 100 c.c. of a saturated aqueous solution of orange add, with continual agitation, 20 c.c. of a saturated aqueous solution of acid fuchsin and 50 c.c. of a like solution of methyl-green; dilute with from 60 to 100 volumes of water. A drop on blotting paper should form a spot bluish-green in the center, orange at the periphery; a red zone outside the orange indicates that the mixture contains too much fuchsin. From 6 to 24 hours are required to stain. Wash out in alcohol and clear in xylol. Chromatic elements are colored blue; cytoplasm, violet or orange-red; karyoplasm the same, but in lighter tones, and all the denser protoplasmic elements the same, but darker (Gilson). This is the best stain for photomicrography, except for connective tissue (Lindsay Johnson). A slightly acid reaction of the alcohol used for washing out will produce a relatively strong coloration by the methyl-green; while that by the fuchsin will be relatively pale; the opposite result will be obtained if the alcohol contains a trace of alkali. The addition of very dilute acetic acid, until the red tint is markedly intensified, will restore the energy of the fuchsin, which is likely to decline after a time (Heidenhain).

Wright's Stain.—A modification of Jenner's stain, an alkaline eosinate of methylene-blue. To a 1/2 percent aqueous solution of sodium bicarbonate in an Erlenmeyer flask is added 1 percent of Grübler's medicinal methylene-blue. The mixture is placed in steam sterilizer for an hour. When cooled to it is added with constant stirring a 1 to 1000 aqueous solution of Grübler's water-soluble yellow eosin till the original color changes from blue to purple and forms a yellowish scum on the surface. The resulting precipitate upon filtration is dried and added to methyl alcohol (3/10 gram will require 100 c.c. for solution). The solution is filtered and to the filtrate is added 25 percent of methyl alcohol.

Giemsa Stain.—The formula is as follows: Azure II, 3 grams; eosin B. A., 0.8 gram; glycerin (C. P.), 250 c.c.; methyl alcohol (C. P.), 250 c.c. The films are fixed in methyl alcohol and then stained 5 minutes in a mixture of 14 drops of the stain to 10 c.c. of distilled water. A trace of sodium carbonate added to the water accentuates the basic stains. Then wash, dry and mount.

Pianese Double Stain.—Prepare a saturated solution of nigrosin in a saturated alcoholic solution of picric acid; mix 2 volumes of this with 1 volume of anilin water, and evaporate in open air. The crystals deposited are dissolved in absolute alcohol, and from this solution green crystals are obtained, soluble in alcohol, ether, and water. For tissues, make a 2 percent solution in alcohol; for microorganisms, in water. Stain sections first in lithium carmin, treat with acid alcohol, wash, and immerse in an alcoholic solution of picronigrosin until they assume a brown hue. Decolorize in oxalic acid. Nuclei are stained red; plasma dark yellow; cartilage yellow; connective tissue pale green; elastic fibers violet.

Silver Nitrate.—Particularly adapted to the study of epithelial and connective tissues. Make a 1 percent solution in distilled water, and dilute from 2 to 4 times for use. Very thin sections of fresh tissue are washed in distilled water to remove the chlorids, immersed for 1/2 hour in the solution in the dark, washed in distilled water, and then placed in water and exposed to sunlight until brown. Fix in a solution of sodium hyposulphite in the dark, and mount in glycerin jelly.

Gold Chlorid.—Recommended for tracing nerve-endings in fresh tissues, and for staining connective tissue and cartilage cells. Place small pieces of tissue, 1/4 inch square, in from a 0.5 to a 1 percent solution of commercial gold chlorid in distilled water. Keep in the dark, and when the tissue has become yellow, wash in distilled water. Then expose to the light in 50 c.c. of water containing 2 drops of acetic acid for 48 hours, or until the tissue acquires a purple tint.

Osmic Acid.—Tissues fixed in osmic acid and subsequently treated with weak pyrogallic acid are stained greenish-black (Lee). It is a fixing reagent as well as a stain for fat or myelin. A 1 or 2 percent solution is used. A developing mixture of water, alcohol, tannin, and pyrogallic acid, or a 5 percent solution of tannin is used by Kolosson. Treatment with oxalic acid 1 part, in water 15 parts, gives a Burgundy-red stain to osmium objects, which should be washed in water before they are put into the acid.

Clearing Reagents.—These reagents are used for the purpose of rendering certain tissue elements more distinct. For this purpose acetic acid may be recommended in the strength of 2 to 5 parts of acid to 100 parts of water.

This reagent causes swelling of the ground substance, and facilitates the study of the nuclei, elastic fibers, fat, myelin, and microorganisms.

Other reagents are also used for the purpose of clearing tissues, but care must be exercised to select one which will not dissolve the anilin dye in the section already stained, and one which will clear it when celloidin is used. When either the celloidin or paraffin method is used, one of the following clearing reagents is recommended: oil of bergamot, or a mixture of oil of cloves 1 part, and oil of thyme 4 parts. When anilin dyes have been used, the best clearing reagent is xylol. It is to be preferred also in unembedded sections, and for paraffin sections that have been dehydrated in absolute alcohol. Other reagents are oil of lavender, oil of cedar, and anilin oil.

Mounting Reagents.—The best mounting reagent is Canada balsam, although dammar and colophonium are sometimes used.

Staining Methods.—Tissues are stained for the purpose of differentiating the tissue elements; to show bacteria; to present evidences of pathologic change in the arrangement of the tissues, and to show the affinity of tissue for special anilin dyes. The three principal tissue elements are (1) the

cell, (2) intercellular substance, and (3) pathologic products.

The cell contains the nucleus, protoplasm, and cuticle. Within the *nucleus* may be seen the nucleolus, resting nucleus, and frequently bacteria. The *protoplasm* may show the centrosome and polar bodies, the different varieties of granules, dendritic processes of ganglion cells, axis-cylinder and terminal processes, contractile elements of striated muscle-fiber, red blood-globules, cilia of bacteria. Within the *cuticle* there may be seen certain dots in ependymal cells, cilia in certain renal cells, and bile capillaries.

In the intercellular substance may be studied the cement substance of endothelial cells; the ground substance of connective tissue; connective-tissue fibrillæ; myxomatous tissue; mucin; elastic fibers; intercellular substances of cartilage; ground substance of bone; myelin; neuroglia fibers; clubs of actinomyces, and capsules of bacteria.

Pathologic products may be shown after the staining process: as, for instance, the hyalin substance may be changed into substances such as fibrin, mucin, amyloid glycogen, hyalin colloid, keratohyalin, and eleidin. There may also be present fat, hemosiderin, hematoidin, or hemoglobin.

The tissue elements may be stained differentially in a number of ways, frequently one stain answering the purpose, while in others a series of stains may be required, depending upon the affinity of certain chemic constituents of the cell for certain dyes.

Nuclear Stains.—Probably the most serviceable stain for nuclei in general work is alum-hematoxylon, using eosin as a contrast stain. Such carmin stains as lithium carmin, followed by picric acid, have also been used.

Safranin is also highly recommended as a nuclear stain. Other nuclear stains are eosin, followed by methylene-blue, and Unna's alkaline solution of methylene-blue (methylene-blue, 1 part; potassium carbonate, 1 part; water, 100 parts).

Method.—(1) Stain for from 2 to 30 minutes; (2) wash in several changes of water; then leave the sections, if possible, for several hours or overnight in a large dish of water; (3) contrast stain usually an aqueous solution of eosin, 1/10 to 1/2 of 1 percent, for 1 to 5 minutes; (4) alcohol, 95 percent, 2 or 3 changes to dehydrate and remove excess of contrast stain; (5) clear in oleum origani cretici, or in the mixture of oil of cloves and thyme; (6) mount in Canada balsam.

To Study Changes of Karyomitosis.—In studying these changes it is essential that the tissue be selected and fixed in one of the reagents at the earliest possible moment after its removal. For this reason the figures produced by mitosis cannot be so well studied when removed postmortem. A fixing reagent should be selected which penetrates quickly, such as safranin.

To Stain Karyokinetic Figures.—Fix the section in Zenker's or Orth's fluid, embed in paraffin, and stain with Babe's anilin safranin solution, prepared as follows: Two percent anilin water, 100; safranin O, soluble in water in excess. Saturate the solution by heating in a flask placed in hot water at a temperature of 60° to 80° C., and filter.

Method.—(1) Stain the paraffin section from a few minutes to an hour; (2) wash in water; (3) wash in 95 percent alcohol, to which are added a few drops of acid alcohol (hydrochloric acid, 1 c.c.; 70 percent alcohol, 99 c.c.); (4) wash in pure 95 percent alcohol, followed by absolute alcohol; (5) clear with xylol; (6) mount in xylol balsam (Canada balsam, 4 grams; xylol, a sufficient quantity to make a fluid having a syrupy consistency).

If the specimen is embedded in celloidin, clear the section in oil of bergamot or oleum origani cretici after the 95 percent alcohol, wash in xylol, and mount in xylol balsam.

Carbol-fuchsin and anilin gentian-violet may also be used in the place of safranin.

Staining of Bacteria in Tissues.—After embedding the section in the usual manner—by the paraffin method preferably—it is cut in a very thin section and attached to a slide by means of Mayer's glycerin-albumin mixture (equal parts of white of egg and glycerin). The best staining fluids are dilute aqueous or alcoholic solution of the anilin dyes, such as methylene-blue, gentian-violet, and fuchsin.

The sections should be heated moderately while being stained, either in a thermostat or over an alcohol lamp.

The decolorizing agent will vary with the stain employed. Those generally used are dilute acetic acid, 1 : 100 up to 1 : 1000, alcohol, iodin in potassium iodid solution, dilute mineral acids, chlorid of anilin, anilin, and ethereal oils.

Many pathogenic microorganisms require special staining fluids for their detection in the tissues, for further discussion of which see under their special heads, as GONOCOCCUS, PNEUMONIA, TYPHOID FEVER, etc.

Gram's Method.—Heat 2 to 5 minutes, or stain cold 20 to 30 minutes (tubercle bacilli, 12 to 24 hours), in saturated solution of gentian-violet anilin-water; rinse quickly in absolute alcohol; transfer to Gram's solution (1 to 1 1/2 minutes), in which the specimen turns black; wash in alcohol until the black color vanishes and a pale gray color appears; dry and mount in Canada balsam. The decolorization may be hastened by adding 3 percent nitric acid to the alcohol and then washing in pure alcohol. All the tissue cells are decolorized by this method, while the bacteria are stained a deep blue. The cells may subsequently be stained with a watery or alcoholic solution of Bismarck brown 2 to 5 minutes, then washed in absolute alcohol until the section is yellowish-brown. This method is of diagnostic value, as certain bacteria are stained, others decolorized, by it.

Bacteria that are Stained by Gram's Method.—Staphylococcus pyogenes aureus; streptococcus pyogenes; micrococcus lanceolatus (of pneumonia); micrococcus tetragenus; bacillus of diphtheria; bacillus of tuberculosis; bacillus of leprosy; bacillus of anthrax; bacillus of tetanus; bacillus aërogenes capsulatus; ray fungus of actinomycosis.

Of these the tubercle bacillus and the bacillus

of leprosy require a much longer exposure to the stain than other bacteria in the list.

Bacteria that are not Stained by Gram's Method.—Gonococcus; diplococcus intracellularis meningitidis; micrococcus melitensis; bacillus of chancroids (Ducrey); bacillus of dysentery (Shiga); bacillus of typhoid fever; bacillus coli communis; bacillus pyocyaneus; bacillus of influenza; bacillus of bubonic plague; bacillus of glanders (bacillus mallei); bacillus of Friedländer; bacillus proteus; spirillum of Asiatic cholera; spirillum of relapsing fever.

Staining of Nervous Tissue.—The tissue element to be studied in this structure are: (1) The ganglion cells, including the dendritic and axis-cylinder processes; (2) the myelin sheaths, and (3) the neuroglia fibers. Each requires special fixing reagents to be studied in detail. Formaldehyd (4 percent) has, however, been recommended as a fixing reagent for the preservation of all of these elements of nerve tissue.

Special stains are also required for each element: thus for the *ganglion cells*, Nissl's and Lenhossek's methods have been used.

For staining the *dendritic* and axis-cylinder processes, Golgi's slow or quick method is recommended.

For staining the *myelin sheath*, use Weigert's quick method or Pal's modification of Weigert's process.

For staining *neuroglia fibers*, use Weigert's or Mallory's method.

All of these processes are quite complicated and require very accurate manipulation in order to get the best results.

Transmission of Materials Containing Bacteria, in the Mails.—The ruling of the Post-Office Department of the U. S. is as follows:

"That the order of the Postmaster General of December 27, 1897 (Order No. 677), amending Order No. 88 of February 5, 1896, prescribing the conditions under which specimens of diseased tissues may be admitted to the mails is hereby further modified in the following manner:

"Specimens of diseased tissues may be admitted to the mail for transmission to the United States, State or municipal laboratories, only when enclosed in mailing packages constructed in accordance with the specifications hereinafter enumerated: Liquid cultures, or cultures of microorganisms in media that are fluid at the ordinary temperature (below 45° C. or 113° F.) are unmailable. Such specimens may be sent in media that remain solid at ordinary temperatures.

"Upon the outside of every package shall be written or printed the words 'Specimen for Bacteriological Examination. This package to be treated as letter mail.' No package containing diseased tissue shall be delivered to any representative of any of said laboratories until a permit shall have first been issued by the Postmaster General certifying that said institution has been found to be entitled, in accordance with the requirements of this regulation, to receive such specimens."

The regulation includes not only cultures, but "specimens of diseased tissues." The specifications prescribing the manner of packing, which are minute and complicated, may be obtained from local postmasters.

PEDICULOSIS (Lousiness; Phthiriasis).—A contagious animal parasitic disease, characterized by the presence of pediculi, hemorrhagic points, and scratch-marks.

Varieties.—There are three varieties: (1) Pediculosis capitis; (2) pediculosis corporis; (3) pediculosis pubis.

Pediculosis Capitis.—Pediculosis capitis is due to the invasion of the scalp by the pediculus capitis, or head-louse. It is characterized by severe itching, which excites scratching and leads to the formation of excoriations with serous, purulent, or sanguineous exudation. This dries in the form of crusts and mats the hair together. A foul odor is usually present. Owing to the irritation, the postcervical glands may become enlarged, and in some cases suppurate. The occipital region is the most frequent seat of this particular dermatitis. Scattered papules, pustules, and excoriations are frequently seen about the face and neck. Pediculi are present in varying numbers, and ova or "nits" in abundance. Ova are grayish, translucent, pyriform bodies, attached to the hair by a membranous sheath, they hatch out in from 3 to 8 days. Pediculosis capitis is far more common in children than in adults.

Diagnosis.—Owing to the presence of the pediculi and the "nits," the diagnosis, is as a rule, easy. Every pustular eczema in the occipital region should be regarded with suspicion, and warrants a search for pediculi and ova.

Treatment.—The object of treatment is to kill the pediculi, devitalize the ova, and subdue the accompanying inflammation. Among the most popular and efficacious remedies are petroleum, either pure or with equal parts of olive oil, and balsam of Peru. They should be thoroughly applied to the scalp for 1 or 2 nights, followed in the morning by a shampoo of the scalp with soap and water or tincture of green soap. Other remedies, such as cocculus indicus, staphisagria (2 fluidrams to 4 fluidounces dilute acetic acid), or corrosive sublimate (1 to 4 grains to 1 fluidounce), may be employed.

When there are much pustulation and crusting, the following ointment may be applied:

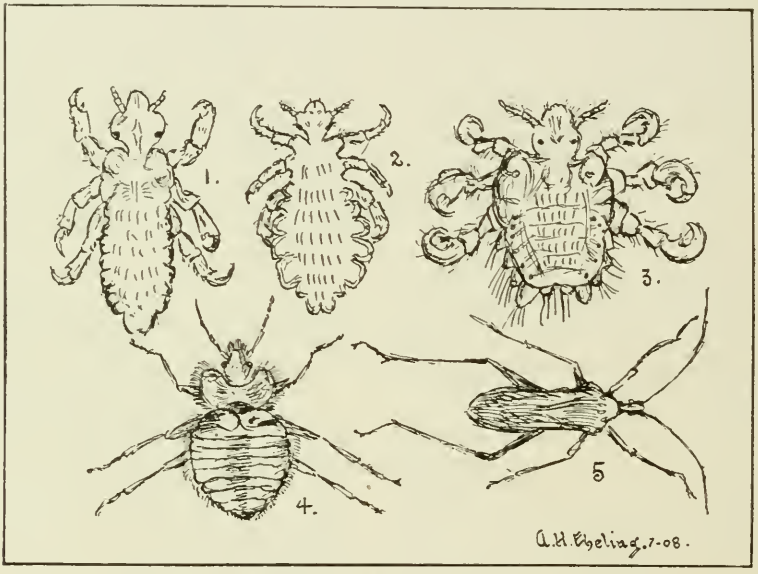
℞.	Ammoniated mercury,	gr. xxx
	Petrolatum,	℥ j.

For the removal of "nits," alkaline solutions (such as carbonate of sodium, borax, etc.) or acid solutions (dilute acetic acid) should be applied frequently. There is rarely need of sacrificing the hair in women, although this may be done in children.

Pediculosis Corporis.—This is produced by the pediculus corporis or vestimenti, a parasite larger than the scalp louse. It resides in the seams of the underclothing, where the ova are deposited. They hatch out in about 6 days. The louse is

merely present upon the skin when foraging. The perambulation of the parasite produces intense itching, which gives rise to violent scratching. As a result linear scratch-marks, blood crusts, and, in chronic cases, pigmentation and thickening may be seen. The parts affected are those coming in contact with the seams of the undergarments—namely, the scapular region, the chest, waist, and thighs. Hemorrhagic points mark the sites from which pediculi have extracted blood. The disease is common among the poorer classes in adults of middle or advanced age. It is rare in children.

Diagnosis.—The characteristic features are the presence of excoriations, nail-marks, blood crusts, and hemorrhagic points upon the scapular region and around the waist. Careful search in the seams of the undergarments will usually reveal the existence of pediculi.



1. Head Louse. 2. Body Louse. 3. Crab Louse. 4. Bed Bug. 5. Mexican Bed Bug.—(*Stitt.*)

Treatment.—The most important part of the treatment is the sterilization of the clothes and bed-linen. These should be thoroughly boiled or baked. A lotion of carbolic acid or thymol will relieve the itching quite effectually. When sterilization of the clothing cannot be carried out, it is best to prescribe an ointment of sulphur (1 dram to 1 ounce) or staphisagria (2 drams to 1 ounce).

Pediculosis Pubis.—The pediculus pubis, or crab louse, is responsible for this form. It is the smallest of the pediculi, and is found clinging tenaciously to the hair with the head buried in the follicular orifice. The "nits" are seen attached to the hair-shaft. Itching about the genitalia, variable in degree, is the most prominent symptom. Hemorrhagic points, papules, and excoriations may also be present. The pubis and perineum are the usual regions involved. Occasionally the axillæ and sternal regions are attacked, and in rare cases the beard, eyebrows, or eyelashes. The disease is almost exclusively observed in adults, and is usually contracted during sexual intercourse.

Diagnosis.—The diagnostic features are itching about the genitalia and the presence of pediculi and ova.

Treatment.—The parts should be washed with soap and water twice daily. Lotions, being more cleanly than ointments, are preferable. Corrosive sublimate, the tincture of cocculus indicus, or the fluidextract of staphisagria are all excellent applications.

℞. Fluidextract of staphisagria, ʒ ij
Dilute acetic acid, ʒ iij
Distilled water, ʒ iij.

White precipitate ointment (1 dram to 1 ounce), or mercurial ointment, is effective. Vinegar, dilute acetic acid, and soda and borax solutions are of value in effecting the removal of the nits.

PELIOSIS.—See Purpura.

PELLAGRA. Synonyms.—*Malatie della miseria, Mal del sole, Pellarella,* Asturian leprosy, Alpine scurvy, *Mal rosso, Mal del padrone.*

Definition.—Pellagra is a chronic specific disease, probably infectious, characterized locally by erythema involving usually the exposed portions of the body surface and recurring from year to year during the summer months; characterized constitutionally by symptoms involving the gastro-intestinal tract and the mental and nervous systems.

History and Distribution.—The first authentic description of the disease as a distinct entity was written by Gaspar Casal, a Spanish physician, his monograph on the subject appearing in 1762, after his death. The disease was observed by him as early as 1735 and was described as "*Mal de la rosa.*"

His description of the disease was based on clinical observations among the peasants of the Asturias (Oviedo, Spain). In Italy, the first recorded reports appeared in 1700 (Ramazini) and 1740 (Pujati), but it was not until 1771 that serious attention was directed to the disease through the efforts of Frapolli. Though these are the first recorded reports of the disease, Sambon adduces abundant evidence in support of the supposition that the disease existed in Italy for several centuries prior to this time.

In Italy, the disease has always been most prevalent in the North—Piedmonte, Lombardia, Veneto—sweeping from the Julian Alps to the Piedmont Alps and from Lago Maggiore downward to the Arno. Within recent years, however, with betterment in general conditions, with the tremendous growth in industrial concerns, and with the extensive temporary emigration during the summer months, the disease has practically disappeared in Piedmont, and is rapidly decreasing in Lombardy and certain sections of the region of Venice.

The disease is extending to the south of Italy, and is to be found in Umbria, Tuscany, the Marche and the Abruzzi. In 1881, the number of pellagrins reported from Lombardy was 36,630. In the 1905 census this number had decreased to 15,746. In Umbria, Tuscany and the Marche, the official figures show an increase:

	1881	1905
Tuscany,	924	1137
Marche,	406	1436
Umbria,	872	4250

The disease is quite common in Spain, Portugal, the Tyrol, Austria-Hungary, Roumania, Servia, Bulgaria, and Asia-Minor; it has also been observed in India. Sandwith has reported its extensive prevalence in Egypt, and its occurrence in Southern Africa. On the Western Hemisphere it is to be found in North, Central and South America, Barbados, Jamaica and Porto Rico.

Though isolated cases were reported in the United States by Gray and Tyler in 1864, Sherwell 1883, Harris 1902 and Sherwell 1902, no widespread interest was manifested in the disease until 1907, at which time Searcy, of Alabama, and Babcock, of South Carolina, reported independently extensive outbreaks in institutions for the insane in Alabama and South Carolina. Since 1907 a rapidly increasing interest in the subject has been evinced and to-day—1911—the disease is reported from more than twenty states. Unfortunately, in many of the states in which the disease is most prevalent, there are no facilities for the determination of accurate statistics as to incidence and no accurate estimate can be made as to the prevalence of the disease. Could accurate statistics be obtained, there can be no doubt that the figures would show not less than 10,000 cases n the United States in 1910. The disease is most prevalent in the Southern United States—North and South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi, Louisiana. Siler saw in the State of Illinois approximately 200 cases in 1909 and 150 cases in 1910, and the disease is reported from other middle western states and California.

Etiology.—The specific agent producing pellagra is unknown. During the past century many theories have been advanced, among them the following: Insufficient nutriment (including vitamin deficiency), insolation, syphilis, poverty, insanitary surroundings, leprosy, alcohol, molds, bacteria, metazoa, maize, protozoa, etc.

All theories concerning etiology except the bacterial, maize, metazoal, protozoal and vitamin deficiency may be dismissed as unworthy of comment.

Bacterial Theory.—Tizzoni has recently announced the isolation of a specific bacterium as the causative agent—namely, the *streptobacillus pellagræ*. Nichols and Siler failed to confirm this observation, notwithstanding the fact that they repeatedly attempted to cultivate microorganisms from the blood, spinal fluid and body organs, on various kinds of culture media. Many other observers in different sections of the United States have reported like results.

It has been suggested that the specific bacterium is present in the intestinal canal. This theory should be regarded with skepticism, as it is extremely difficult to harmonize with it the clinical picture of the disease, some peculiarities in its topographic distribution and more particularly some striking facts as to transmissibility. Should the specific agent prove to be an intestinal bacterium, the method of transmission is probably by water or by contact. During the summers of 1909 and 1910, Siler studied pellagra in an institution averaging more than 2000 patients, 350 of whom were pellagrins. Notwithstanding the facts that all patients and the large force of employees used the same water and that the nurses were thrown in intimate contact with the patients, not one case of pellagra developed in any of the attendants.

This has been the experience of Italian investigators and, with one exception, also of investigators in the United States.

Maize Theory.—This theory which has been advanced so positively by continental authorities, particularly Italian and Roumanian, assigns to Indian corn, of one sort or another, the rôle of principal etiologic factor. Adherents of this theory disagree as to just how and why corn products produce the disease.

1. *Sound Corn.*—It is asserted by one group of investigators that sound corn produces the disease, but opinions differ as to the actual exciting factor. Briefly, the following views are held: (a) Deficient nourishment with particular reference to nitrogen starvation in those subsisting, mainly, on a corn diet. (b) Toxic substances of various kinds, for example, toxins normally present in corn, toxins generated by the action of intestinal bacteria after the ingestion of corn.

2. *Damaged Corn.*—Another group asserts that damaged corn is the factor of principal import. Here, again, opinions differ, the following views being held: (a) Specific toxins are generated during the decomposition of corn. (b) Poisons are generated during the period of germination. (c) A specific poison is produced through the action

of *Penicillium glaucum* on corn. (d) Toxins are generated by the action on corn of certain fungi—namely, *aspergillus fumigatus* and *aspergillus flavescens*.

Italian investigators hold corn products responsible in great part on the following hypotheses: Pellagra followed the introduction of maize into Italy, and the extension of the disease was coincident with increase in area of corn cultivation. The disease occurs exclusively among people who subsist mainly on corn products and in districts in which corn is either cultivated or into which it is imported.

The Italians claim to have greatly reduced incidence and mortality rates in the endemic areas, by inspection of corn with condemnation and exchange of damaged lots; by the installation of drying apparatus; by the provision of proper baking ovens; by the compulsory notification of pellagrins to the health authorities; by supplying to all pellagrins corn-free meals twice each year for periods of not less than 40 days; by the issue of free salt to pellagrins and by the establishment of special hospitals—"Pellagrosarii"—for the treatment of this disease.

In 1905, Sambon suggested that corn was not the agent producing the disease; and in 1910 he further elaborated his hypothesis after an investigation of conditions in Italy. His investigations tend to refute all theories alleging a relationship between corn *per se* and pellagra.

In this connection it should be stated that Italians seem to have lost sight of pellagra in their investigations and have confined their researches almost exclusively to corn.

Sambon has presented quite conclusive evidence, that though pellagra was first described in Italy about the middle of the eighteenth century, it must have existed centuries prior to that time and has no coincident relationship with the introduction of corn from America; nor is there any definite proof to substantiate the supposition that corn was introduced into Europe from America.

The topographic distribution of pellagra does not coincide with that of corn cultivation and corn consumption. In Italy the disease is confined largely to endemic foci, and though corn is cultivated throughout certain provinces and the diet of the peasants throughout such districts consists almost exclusively of corn—"polenta"—it by no means follows that pellagra will be observed throughout such districts; on the contrary, the disease is frequently sharply limited to restricted areas.

The disease in Italy is almost, without exception, confined to the field laborer and is never found in cities, notwithstanding the fact that the peasant in cities subsists, in large measure, on "polenta." The disease has practically disappeared in certain provinces and shows marked decrease in others.

The claims put forward by Italian authorities in explanation of the decrease in the disease are subject to criticism. The laws providing for inspection, condemnation, and exchange of corn are in numerous instances a "dead letter." The use of a drying apparatus for extracting moisture is an unpopular measure, and is but seldom applied to home grown corn. The lists of cases notified to the health authorities as pellagrins are inaccurate and contain the names of many patients who are not pellagrins, while many actual cases of pellagra are not included. It is difficult and beyond reason to attribute any permanent or even temporary prophylactic benefit to the soup kitchen. These kitchens are open only for a fortnight in the spring and autumn, supply only a midday meal, are frequented largely by non-pellagrins, and many actual cases of pellagra (for various reasons), do not attend. The special hospitals for the treatment of pellagrins are few in number and admissions are confined largely to children.

It would seem more reasonable to attribute the decrease in the disease in Italy to other factors. The disease is intimately associated with field labor. In many sections there has been a marked increase in industrial pursuits and as the peasant changes his occupation from that of a field laborer to that of an operative in silk factories, cotton factories or other industrial concerns, the exposure to the probable transmitting agent necessarily becomes more remote.

It is also a fact that in many communes numbers of the inhabitants emigrate temporarily during the summer months to Switzerland, France, Austria, and other countries, for the purpose of engaging in tunnel and railway construction.

There can be no doubt that corn is not the etiologic factor in the production of pellagra, and this opinion is substantiated by experience with the disease in this country. Any one familiar with the extensive use of corn products in the Southern States, can well understand that the maize theory, pending thorough investigation, would be accepted as explaining the etiology of pellagra. Corn-meal, however, comparatively speaking, plays but an insignificant part as an article of diet throughout the remainder of the United States. During the summer of 1909 Nichols and Siler followed an outbreak of pellagra in an Illinois institution. The disease was apparently endemic, affecting about 200 of 2000 patients. It was possible to collect reliable statistics, covering a period of 4 years, as to the amount of corn products consumed. It was found that the average amount consumed per patient was less than 2 ounces daily and the corn products used were always fresh and of excellent quality.

To more thoroughly test the relationship of corn products to the disease a feeding experiment was instituted at the suggestion of Nichols to be continued for a period of 1 year. Two cottages, each with a capacity of 60 patients, were filled with selected nonpellagrins. In one cottage the diet included approximately 16 *ounces* of *corn-foodstuffs per day*, while in the control cottage a *corn-free* diet was instituted. The patients were carefully observed for a period of 1 year. The results reported by Watkins are as follows:

	Patients	Cases of pellagra	Suspects
Corn diet,	59	4	1
Corn-free diet,	58	5	3

The proportion of new cases developing in these cottages agrees practically with the percentage of new cases developing throughout the institution (2000 patients). Corn products were eliminated from the general diet of the institution in the summer of 1909.

Nichols has carried out extensive experimental inoculations on animals—rabbits and guinea-pigs —using extracts of cultures of various molds and bacteria grown on corn. His results were negative.

An attempt has been made to transmit the disease to animals—monkeys. No definite results have been obtained.

Metazoal Theory.—Quite recently—May, 1910 —Prof. Alessandrini, of Italy, has recorded the finding of a nematode (Filaria?) as yet unclassified, in the skin of pellagrins and in the drinking water of endemic areas, to which he assigns etiologic significance. But other observers have failed to confirm this observation.

Long has recently (1910) suggested, as a working "hypothesis," that the entamebæ together with the inflammatory changes brought about by their action are the etiologic factors of importance. Nichols and Siler in 1909 directed attention to the strikingly large percentage of pellagrins presenting evidence of entamebic infection and were impressed with the fact that this infection was not an etiologic, but an important complicating and possibly predisposing factor.

Protozoal Theory.—In 1905 Sambon suggested that the disease is parasitic (protozoal) and in 1910 reiterated this opinion and further elaborated it by assuming that the disease is not only parasitic, but insect-borne and conveyed by some species of *simulium* (sand-fly). He bases his theory on the following facts: (1) The disease is parasitic for the reasons that: (a) the cutaneous and other symptoms usually recur periodically each spring for many years even though the patients remove from an endemic area and subsist on a corn-free diet; (b) its peculiarities in distribution, symptoms, chronicity and pathology correspond to those of other protozoal diseases (trypanosomiasis, kala-azar, syphilis). (2) The disease is insect-borne because: (a) it is not directly contagious; (b) infection through food or water does not explain its epidemiology; (c) it is limited to rural districts, being practically restricted to the field laborer. (3) The disease is conveyed by *simulium*, because: (a) the topographic distribution of the *simulium* and pellagra appear to be coincident; (b) the adult stage of the *simulium* apparently presents a seasonal incidence similar to pellagra; (c) the insect is found in rural districts only, but seldom entering houses or towns; (d) the only class of people constantly exposed to the bite of the *simulium* are field laborers; (e) the disease is practically confined to the field laborer, and (f) other similarly small blood-sucking flies are strongly suspected of being conveyors of disease—*phlebotomus, papatassi, dilophus febrilis.*

It seems quite likely that eventually the disease will be placed among those of parasitic origin, probably protozoal.

Vitamin Deficiency.—Many now believe that pellagra, along with beriberi and scurvy, belongs to the group of "food deficiency" diseases. Just as beriberi is caused by the absence of a neuritis-preventing substance or vitamin in the dietary, so is the symptom-complex of pellagra brought about by the absence from the dietary of some vitamin or vitamins essential to proper metabolism. There are various ideas as to the factor which eliminates the pellagra-preventing vitamins. Some think that in the process of milling maize the vitamin containing outer portion (bran) has been taken off just as with beriberi producing white rice, from which the pericarp with its neuritis-preventing vitamin has been more or less completely removed. From analyses of milled maize and millings Funk has recently suggested that pellagra in different countries is in relation to the degree of milling. Just as with rice so does excessive milling of wheat get rid of vitamins, therefore, bread made from highly milled flour is dietetically deficient.

Again, as brought out by Voegtlin, alkalis tend to destroy any remaining vitamins in such bread. The practice of using sodium bicarbonate in preparation of bread is a further factor in the food deficiency problem. With the use of baking powder or buttermilk the alkaline carbonate of soda is neutralized so that there is no destructive effect on vitamin content.

The vitamin deficiency of highly milled flour and highly milled cornmeal runs parallel with the phosphorus pentoxid content of such products. Whole wheat shows about 1.1 percent P_2O_5, while highly milled flour contains only about 0.1 percent. Whole corn has about 0.76 percent P_2O_5, while highly milled cornmeal has only about 0.3 percent.

Others think that as the result of bacterial or mold diseases of the corn grain these important vitamins are destroyed. Then too, as with rice and beriberi, the prevailing idea is that while there is a striking association between a maize dietary deficient in the pellagra preventing vitamin and the occurrence of pellagra, yet this deficiency may be supplied by other foods. Then too this vitamin is thought to be present normally in other cereals than corn so that grain foods deficient in this vitamin, other than corn, may be factors in producing pellagra, just as a preponderating diet of a single cereal, other than polished rice, which has a vitamin deficiency as the result of milling or disease, may produce beriberi.

Goldberger and his colleagues, after a careful investigation of pellagra epidemiology, decided that such facts as the complete absence of the disease among the nurses and attendants of the pellagrous insane, or among the prison guards of institutions where pellagra prevailed extensively, as well as among those caring for pellagrous orphans, indicated that a dietary factor rather than an infectious one was operative in the disease. Even where it was stated that attendants and inmates of institutions had the same dietary investigation indicated that as a matter of fact the insane and the prisoners were not as well fed as the other group. Then too the insane frequently fail to avail themselves of the food provided.

A study of the records of the Army and Navy of the United States failed to show that a single case of pellagra had ever developed among the personnel, although large numbers of the men came from pellagrous districts of the South. This exemption they thought due to the generous service ration.

Goldberger's Experiment.—In February, 1915, Goldberger started a "pellagra squad," consisting of 11 prisoners on a diet of wheat flour (patent), cornmeal, corn grits, corn starch, polished rice, granulated sugar, cane syrup, sweet potatoes, fat fried out of salt pork, cabbage, collards, turnip greens and coffee. Baking powder was used for making biscuits and corn bread. The food value of each man's diet averaged 2952 calories. A control was carried out with prisoners on a normal diet. The experiment was continued until Oct. 31, 1915. Of the 11 volunteers on the excessive carbohydrate diet 6 developed symptoms. Loss of weight and strength and mild neurasthenia were early symptoms. Definite cutaneous manifestations appeared only after 5 months. The skin lesions were first noted on the scrotum, later appearing on backs of hands in two cases and back of neck in one case.

There are those who believe that the methods of preserving foods, cereal or protein, by sterilizing at high temperatures, destroy these vitamins so essential to proper metabolism so that people who subsist extensively on canned vegetables and preserved meats, instead of fresh meats and vegetables, may develop pellagra. Evidence of this sort is obtainable in the mill-villages of the Southern States of the United States where pellagra is so very prevalent.

We are now beginning to recognize that slight and vague digestive trouble may be pellagrous in nature although never going on to the development of the cutaneous, neurological and alimentary tract diagnostic triad of symptoms.

Again there would appear to be efficient resistance to pellagra in those who are in good physical condition, but when reduced by illness, or the effects of poor diet and defective hygienic surroundings, they may develop it. There are those who think that hookworm disease is an important factor in predisposing to pellagra.

Not only does alcoholism, when coexistent with pellagra, make for a bad prognosis but there are many who think that any abuse of alcohol predisposes to pellagra. Against this, however, is the fact that pellagra in the United States is about 5 times as common among women as among men. It is generally recognized that pregnancy and lactation predispose to pellagra (Stitt).

Clinical Description.—In attempting to outline the clinical picture of this disease, one is confronted by a multitudinous variety of symptoms enumerated by various authorities as making up the symptom-complex. Many of these symptoms, when analyzed, can definitely be ascribed to complicating factors and are of no diagnostic value in pellagra *per se*. The disease, under ordinary circumstances, is chronic, extending over a period of many years—about 4 to 25 or more. The incubation period is unknown. The disease is not hereditary.

An *acute typhoidal* type of the disease, of sudden onset and rapid course, usually ending in death, is referred to by many authorities. As such cases, however, are of rare occurrence and likely to be confounded with an exacerbation of a chronic condition, they do not merit classification as a distinct type.

The symptoms are cutaneous—involving more particularly the extensor surfaces; and constitutional—involving the gastrointestinal tract and nervous system. Prodromal symptoms—general malaise, vertigo, digestive disturbance, obscure epigastric pain and various other symptoms—are referred to by many authorities, but these symptoms are so indefinite in character and so inconstant in occurrence as to preclude reliable deductions for diagnostic purposes.

Cutaneous Symptoms.—The skin symptoms are by far the most striking, most constant, most characteristic and most important from a diagnostic standpoint. In their absence, a diagnosis of pellagra is unwarranted.

The eruption usually appears suddenly as an erythema, irregular in outline, involving most frequently the dorsal aspect of the hands. Its most characteristic feature is the symmetry of

Showing Edema of Hands. Bleb Formation Occurred, and Illustration Shows Condition after Blebs have Ruptured.—(*Reproduced by courtesy of Dr. George A. Zeller.*)

the lesions on both hands. The erythema may be confined to the dorsum of the hands, or extend downward to the finger-nails or upward on the forearm. Quite frequently it encircles the wrist as a more or less broad cuff and the exact similarity of the bands on both wrists constitutes a striking picture. The erythema, while most commonly observed on the dorsum of the hands, is by no means confined to this area. It is of frequent occurrence on the face, usually as symmetrical patches on the cheeks or forehead. Occasionally the entire face is involved—"pellagra mask"; this has been observed in Italy but not (by Nichols and Siler) in the United States. The neck is frequently involved, the erythema appearing in symmetrical patches or occasionally encircling the neck as a broad or narrow band—"Casal's collar." Triangular tongues of erythema, base above, are occasionally observed extending from the neck downward, in front or behind, depending greatly on the type of clothing worn. It not infrequently

appears on the dorsum of the feet and as bands encircling the legs, particularly so if no shoes are worn. Occasionally reddish-brown patches, resembling hemorrhagic areas, appear on the upper and lower lids. The erythema in the early stages may easily be mistaken for a sunburn of moderate severity in mild cases. It may be differentiated by the fact that the sunburn clears up within 3 or 4 days, while the pellagrous erythema pursues a different course.

Showing Erythematous Cuff around Both Wrists and Slight Extension to Palm over Thenar Eminence. —(*Reproduced by courtesy of Dr. George A. Zeller.*)

The color, at onset, depends largely on the type of patient affected. In blondes the color is first a bright pink, in brunettes usually a dull red. As the erythema progresses, the affected areas gradually take on a darker shade and within a few days show a characteristic purplish, dusky red color. In brunettes, the lesions are occasionally of a dark, greenish-bronze cast. At the onset of the erythema the color disappears on pressure, but later the contrary is the case. The line of demarcation between healthy skin and affected areas is usually distinct and clear cut. Ordinarily, the color begins to fade after about 10 days, and desquamation occurs. The exfoliation of epidermis may occur in fine scales or in large bran-like flakes. After desquamation is practically complete the skin is soft, smooth and pinkish in color, a distinct line of partially desquamated epithelium being noteworthy around the edges, showing distinctly the extent of the lesion. The entire course of the erythema and subsequent desquamation may occur within a period of a few days, but it usually lasts for a period of 3 or 4 weeks, or even longer. In some cases, edema of the affected area may be observed and occasionally vesicles appear. These vesicles frequently become confluent and may become infected. Nichols and Siler found the bleb formation to be a symptom of serious omen, and to bear an important relationship to prognosis.

Eventually the skin becomes pigmented and thickened, and as the erythema recurs from year to year this pigmentation is accentuated. After repeated recurrence of the erythema, atrophy of the skin occurs. The elbows and knees occasionally show evidence of erythema—pigmented, roughened, thickened skin. The genitalia are occasionally involved. Palmar involvement has been recorded by many observers. In observations covering several hundred cases in the United States and Italy, Siler saw this in only one case in which a complicating factor could not be excluded.

Pain is but seldom complained of in the sites of erythema, though a burning sensation may be present.

The erythema appears during the spring, summer, or autumn, more commonly spring and autumn. The exact time of its appearance depends largely on climatic conditions; being hastened by warmth, sunlight and settled weather conditions; and retarded by cold, rainy unsettled weather. Though the erythema may occur without exposure to sunlight, it is an undoubted fact that direct exposure to the sun's rays markedly accentuates the condition. During the winter it disappears.

Pellagrous Erythema, Involving the Face and Neck. Desquamation Taking Place.—(*Reproduced by courtesy of Dr. George A. Zeller.*)

Constitutional Symptoms.—Gastrointestinal symptoms may or may not be present. Some writers go so far as to attribute important diagnostic significance to the appearance of the tongue and to a special odor noted in the diarrheic stools. Siler concludes that in some instances there are no gastrointestinal symptoms; while in many others these disturbances may be attributed to complicating factors, most frequently amebic dysentery. This complication has been

referred to also by many observers in the southern sections of the United States, notably Allen and Long.

Among other complicating factors may be mentioned bacillary dysentery and various protozoal and zoo-parasitic intestinal parasites (flagellates and ciliates, uncinaria, ascaris, trichuris, schistosomidæ, etc.). In the absence of clear and definite cutaneous symptoms, it is inadvisable to attribute any great diagnostic importance to gastrointestinal disturbances.

Bearing in mind the fact that the digestive disorders may be due in large part to a complicating factor, they may be briefly summarized in the following manner: The patient may suffer from dyspeptic symptoms, as evidenced by coated tongue, poor appetite and flatulency. Frequently there is redness of the tongue with exfoliation of epithelium, giving rise to so-called "bald" tongue. The digestive disturbances may be accompanied by a mild transient diarrhea, by diarrhea of a more stubborn type or by severe dysenteric symptoms—frequent small stools containing blood and mucus and of a highly offensive odor. None of these symptoms is distinctive of pellagra and may be accounted for by complicating factors (amebic and bacillary dysentery, etc.).

In the more severe manifestations of the disease the picture is characteristic, and it is evident that some specific agent is at work in addition to a complicating dysentery or other factor. The tongue is edematous and red; the buccal mucosa is intensely inflamed and dotted with ulcerating patches, and the gums are soft and spongy. There is swelling of the salivary glands accompanied by excessive salivation. The mouth symptoms may be so severe in character as to cause very intense pain, prevent protrusion of the tongue and interfere greatly with eating and drinking. The dysenteric symptoms in such cases are most pronounced and intractable. The gastrointestinal symptoms may precede, accompany or follow the cutaneous manifestations. Vomiting is seldom noted and vertigo is uncommon.

Nervous and Mental Symptoms.—Symptoms referable to the nervous system may or may not exist, depending partly on the stage of the disease. Ordinarily during the first 3 or 4 years, nervous symptoms are indefinite in character and frequently absent. During the periodical recurrences there may be in the early stages mental depression, insomnia, irritability, headache, vertigo, tremors, languor and exaggeration of reflexes.

Complications in pellagra—(uncinariasis, amebic and bacillary dysenteries, tuberculosis, syphilis, bilharziosis)—are so frequent and the mental symptoms observed differ so markedly in character as to make it impossible to define with any degree of accuracy the nervous symptoms referable to pellagra.

As the disease progresses a small percentage of cases manifest involvement of the nervous system and some develop the so-called "pellagrous insanity." It is said that 10 percent of pellagrins in Italy develop this type of mental derangement.

Note Symmetrical Erythematous Involvement of Hands, Forearms and Neck.—*(Reproduced by courtesy of Dr. George A. Zeller.)*

In the later stages the mental depression frequently develops into profound melancholia with eventual terminal dementia. There may be periods of excitability alternating with stupidity, hallucinations, delusions of persecution and suicidal tendencies. Suicide by drowning is reported as common; but of the thousands of cases of pellagra in the United States, Siler was able to find only one instance in which this tendency was exhibited. The reflexes are said to be diminished or absent in the later stages; but in a series of 100 cases Siler found the contrary to be true, both the patellar and plantar reflexes being increased in a majority of cases. The Babinski reflex is sometimes present.

The facies in pellagra—a fixed, despondent appearance—is said to be typical, but in many cases this has not been confirmed. The final picture resembles closely that of general paralysis of the insane. Sandwith attributes diagnostic value to tenderness on pressure along the sides of the dorsal vertebræ (4th to 9th).

Differential Diagnosis.—In the presence of cutaneous lesions, it is quite unlikely that pellagra will be mistaken for other diseases. *Sprue* gives rise to somewhat similar mouth conditions, but the characteristic copious, whitish diarrheic stools, with no history of cutaneous lesions, will serve to differentiate. It has been compared to *leprosy*, but it is inconceivable that the two diseases can be confounded. *Weeping eczema* on the dorsum of the hands differs from pellagra in many respects—irregular outline of affected areas, peculiar color, itching, persistent serous oozing on stimulation. Both in the United States and Italy, *vitiligo* is mistaken for a pellagrous eruption; but scaling is not present in vitiligo.

Pathology.—The disease presents no uniform definite pathologic findings. Abnormal conditions observed can, in many cases, be attributed to complicating factors.

The blood, in uncomplicated cases, shows slight decrease in red cells and hemoglobin, and a relative increase in the mononuclear elements with slight leukocytosis. The anemia in uncomplicated cases is of low grade. Blood platelets are found in excessive numbers. Though prolonged and careful search has been made of both unstained and stained blood preparations, with one or two exceptions all observers have failed to demonstrate any bacterial or protozoal organisms. The Wassermann and Noguchi modification complement fixation reactions are negative in uncomplicated cases. A specific complement fixation reaction has been obtained by the use of liver from pellagrins as antigen.

The cutano-reaction with extracts of all grades of corn has been worked out by Hirshfelder with negative results. Stained preparations from the spinal fluid, liver and spleen show no organisms. There is decrease or absence of hydrochloric acid secretion in the stomach.

Necropsies frequently show serious concurrent diseases. Atrophy of the muscles, heart, liver and small intestines is found. The spleen is frequently small in size and shows atrophic changes. The large intestine frequently shows numerous undermined ulcers of the amebic type or well marked folliculitis. Various intestinal parasites may be present. The nervous system may show no pathologic change.

In chronic cases there may be diffuse leptomeningitis with scattered thickened areas, degeneration of the nerve elements with round celled perivascular infiltration, and an excess of fluid in the ventricles. The spinal cord frequently shows sclerosis of the posteromedian and posterolateral columns.

Harris has observed in chronic cases atrophy of the pancreas, softening of the cord, and degenerative changes in the myelin sheaths of nerves and of nerve cells of the gray matter and ganglia.

Prognosis.—In determining mortality rates in this disease, complicating diseases must be considered. Experience shows that, on necropsy, sufficient cause for death is revealed in many cases, exclusive of pellagra.

The death rate shows wide variation from year to year. It may occasionally rise to 25 percent, but usually is from 5 to 10 percent.

The disease occasionally results in death during the first attack. Ordinarily its course is extremely chronic—persisting for from 5, 10, 20, 30 or even 40 years, frequently without apparent detriment to the patient.

Entire recovery is not infrequent, but at least 2 or 3 years should elapse, without symptoms, before cure is pronounced.

Prophylaxis.—"There does not seem to be any satisfactory evidence as to the contagiousness of pellagra, so that any method involving isolation is not indicated. It is possibly advisable that the stools be disposed of as would be indicated in typhoid fever, there being some evidence that where proper disposal of feces is operative there is an absence of pellagra.

"Even if not productive of pellagra it is certainly advisable to prevent the use of spoiled corn by state regulation.

"American authorities attach rather more importance to *Stomoxys* than to *Simulium* as a possible transmitting agent. *Stomoxys* breeds best in the hay mixed horse manure about stables and measures should be taken along this line.

"If the feces are of importance we should guard against the contaminating influences of the house fly.

"As a proper, well-balanced dietary is an important curative measure it is therefore prophylactic" (Stitt).

Treatment.—"In a disease which characteristically shows a marked amelioration in the winter or a disappearance of symptoms for one or more years we should be very conservative in attributing improvement to any drug. At the New York Post Graduate hospital, 17 cases were apparently cured on rest in bed and full nutritious diet. Hospital treatment, thereby removing the patients from the environment in which the disease developed, is generally conceded of the greatest benefit. It is always recommended by the advocates of some special drug treatment that the patient be kept on a nutritious diet. Roussel in 1866 stated: 'With-

out dietetic measures all remedies fail.' Many authorities speak highly of arsenic in various forms as Fowler's solution, atoxyl, salvarsan, etc. Others are equally pessimistic as to the value of arsenic in any form. Niles is a strong advocate of hydrotherapeutic measures. He recommends the drinking of two to six glasses of tepid water daily as well as colon irrigations, cold abdominal compresses, hot packs and saline baths. Deeks prefers to eliminate sugar and starchy food from the dietary of pellagrins for a few days at a time and to give fresh fruit juices, with broths and milk. He highly recommends dilute nitric acid, well diluted, before meals. As there is almost constantly anacidity and pepsin deficiency in the gastric juice it would seem that this condition should be treated. It is advisable to keep the patient out of the sun and require him to take his exercise after sunset. Dyer recommends 1/2 to 1 ounce gelatin daily together with the juice of two or more oranges or lemons. He prefers a diet of eggs, milk and well-cooked vegetables. He also gives quinin hydrobromate in 3 grain doses 3 times daily. Lavinder says that many people have pellagra because they have some other condition and when this is cured the pellagra is also cured. In truth, pellagra is very rarely a primary condition. We must then give careful attention to the predisposing causes which may not only be ankylostomiasis, alcoholism, or malaria, but, as well, various gynecological or alimentary tract disorders. Goldberger has cited the following as showing the influence of diet: In an orphan asylum with 211 orphans, 68, or 32 percent, had pellagra. These children were divided into 3 groups and given different rations, those under 6 years of age receiving milk and eggs, while those over 12 years were given meat, as they assisted in the work of the institution. The children between 6 and 12 lived practically on a vegetarian diet in which corn products and syrup preponderated with deficiency of legumes. Of 25 young children only 2 showed pellagra, and there was but 1 case in the 66 children over 12 years of age while the 120 between 6 and 12 gave 65 cases or 52 percent. As the result of increasing the milk supply, so that every child under 12 years got a pint daily, also at least one egg daily, together with an increase in the use of beans and peas, as well as fresh meat, the disease was entirely eradicated. The corn elements of the diet were reduced but not excluded. There was increase in proteins and a decrease of carbohydrates. Babcock recognizing the importance of the treatment of the pellagrous neurasthenia, recommends the Weir-Mitchell plan of prolonged rest in bed, nutrition, hydrotherapy and hygienic measures. 'Fat and blood' should be our aims and he notes the value of cacodylate of soda in increasing fat. He also refers to the susceptibility to suggestion of pellagrins and is an advocate of psychotherapy" (Stitt).

PELLETIERIN TANNATE.—A mixture of the tannates of 4 alkaloids obtained from pomegranate; it is an effective teniafuge. Dose, 3 to 8 grains, in powder, taken fasting, and followed after 20 minutes by a full dose of castor oil. Pelletierin is actively poisonous, causing weakness of the legs. It is best administered in the form of Tanret's pelletierin, each bottle of which contains an adult dose. But the practitioner had better not prescribe this for poor people, as each dose costs *three dollars!* See ANTHELMINTICS.

PELLITORY.—See PYRETHRUM.

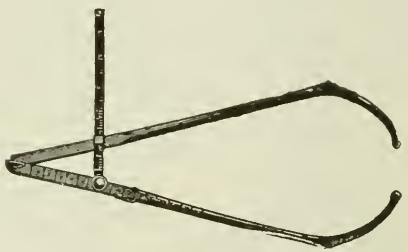
PELVIC INFLAMMATION.—See PUERPERAL FEVER.

PELVIMETRY.—The process of determining the size of the pelvis.

It is by no means desirable to subject every pregnant woman to the annoyance of a careful pelvic measurement. In private practice those patients should be measured who give a history of difficulty in former labors, or who are subjects of evident deformity, such as rachitis or kyphosis.

An accurate determination of the size of the pelvis necessitates both internal and external measurements. These measurements are made between certain well-defined bony prominences.

Pelvic Diameters.—The most important are the following: **Anteroposterior** (of pelvic inlet), that which joins the sacrovertebral angle and the pubic symphysis. **Anteroposterior** (of pelvic outlet), see



SCHULTZE'S PELVIMETER.

COCCYPUBIC. **Coccypubic,** that which joins the tip of the coccyx with the subpubic ligament; the anteroposterior diameter of the pelvic outlet. **Conjugate,** the anteroposterior diameter of the pelvic inlet. **Conjugate, diagonal,** that connecting the sacrovertebral angle and subpubic ligament. **Conjugate, external,** that connecting the spine of the first sacral vertebra and the middle of the upper border of the symphysis pubis. **Conjugate, true,** that connecting the sacrovertebral angle and the most prominent portion of the posterior aspect of the symphysis pubis. **Oblique** (of pelvic inlet), left and right, that connecting one sacroiliac symphysis with the opposite iliopectineal eminence. **Oblique** (of pelvic outlet), that extending from the middle of the under surface of the sciatic ligament upon one side to the junction of the ischiopubic rami on the opposite side. **Sacropubic,** see ANTEROPOSTERIOR. **Sacrosubpubic,** see CONJUGATE, DIAGONAL. **Sacrosuprapubic,** that connecting the sacrovertebral angle and the upper portion of the symphysis pubis. **Transverse** (of pelvic inlet), that connecting the two most widely separated points of the pelvic inlet. **Transverse** (of pelvic outlet), that connecting the ischial tuberosities.

Size of the Pelvic Inlet.—Its transverse diameters are obtained by measuring between the anterior

superior spinous processes of the ilia (26 cm.); between the widest divergence of the crests of the ilia (29 cm.), and between the two femoral trochanters (31 cm.).

The anteroposterior or conjugate diameter is obtained by measuring between the depression under the last lumbar vertebra and the upper edge of the symphysis (20 1/4 cm.). This is called the external conjugate diameter. A more reliable measurement is the internal conjugate diagonal. This is the measurement between the promontory of the sacrum and the middle of the subpubic ligament. It is obtained by passing the index and middle fingers of the left hand into the vagina in such a manner that the tip of the middle finger rests upon the top of the promontory of the sacrum. A mark is made on the upper surface of the hand, just where it presses against the under surface of the symphysis. The distance between this mark and the tip of the middle finger is the internal conjugate diagonal (12 3/4 cm.). The true conjugate is obtained from this diameter by simply subtracting 1 3/4 cm.

Size of the Pelvic Cavity.—This is determined approximately by a vaginal examination. Thus, a tumor obstructing the pelvic canal could easily be discovered in this way.

Size of the Pelvic Outlet.—This is rarely decreased except in kyphosis, when it is the transverse diameter that suffers. This diameter is measured between the two tuberosities of the ischia (11 cm.).

TABLE OF MEASUREMENT OF THE FEMALE PELVIS COVERED WITH THE SOFT PARTS

Between iliac spines,	26 cm.
Between iliac crests,	29 cm.
External conjugate diameter,	20¼ cm.
Internal conjugate diagonal,	12¾ cm.
True conjugate, estimated,	11 cm.
Right diagonal,	22 cm.
Left diagonal,	22 cm.
Between trochanters,	31 cm.
Circumference of pelvis,	90 cm.

PELVIS, DEFORMITIES.—The pelvis is divided into two parts by the iliopectineal line. The shallow, expanded portion situated above this line is known as the **false pelvis.** It has very little influence on the course of labor.

The narrow, more contracted portion situated below the iliopectineal line is called the **true pelvis.** Contraction or deformity of this part of the pelvis may cause serious difficulty during childbirth. The shape of the pelvic inlet or superior strait is usually cordiform, the pelvic cavity is irregularly circular, and the outlet or inferior strait is cordiform. The pelvic cavity is lined with muscles, the most important of which is the iliopsoas. These muscles serve as cushions or protectors to the bony wall during labor, and also guide the presenting part in the most favorable direction for its expulsion. The pelvic floor, which almost completely closes the pelvic outlet, is formed chiefly by the levator ani muscle. This muscle, by the direction of its resistance, directs the presenting part upward and outward under the symphysis pubis.

For the measurements of the normal pelvis, see PELVIMETRY.

The frequency of pelvic deformity is about 14 percent. It is probable, however, that in not more than 5 percent is the deformity severe enough to seriously complicate labor.

The following is the most satisfactory classification of deformities of the female pelvis:

CLASSIFICATION OF DEFORMITIES OF THE FEMALE PELVIS, ACCORDING TO SCHAUTA

A. ANOMALIES OF THE PELVIS THE RESULT OF FAULTY DEVELOPMENT.
1. Simple flat.
2. Generally equally contracted (*justominor*).
3. Generally contracted flat (*nonrachitic*).
4. Narrow funnel-shaped (*fetal* or *undeveloped*).
5. Imperfect development of one lateral mass of the sacrum (*obliquely contracted* or *Naegele's pelvis*).
6. Imperfect development of both lateral masses (*transversely contracted* or *Roberts' pelvis*).
7. Generally equally enlarged (*justomajor* or *giant pelvis*).
8. Split pelvis.

B. ANOMALIES DUE TO DISEASE OF THE PELVIC BONES.
1. Rachitis.
2. Osteomalacia.
3. New growths.
4. Fractures.
5. Atrophy, caries, and necrosis.

C. ANOMALIES IN THE CONJUNCTION OF THE PELVIC BONES.
1. *Too firm union* (*synostosis*).
   (1) Of symphysis.
   (2) Of one or both sacroiliac synchondroses.
   (3) Of sacrum with coccyx.
2. *Too loose a union or separation of the joints.*
   (1) Relaxation and rupture.
   (2) Luxation of the coccyx.

D. ANOMALIES DUE TO DISEASE OF THE SUPERIMPOSED SKELETON.
1. Spondylolisthesis.
2. Kyphosis.
3. Scoliosis.
4. Kyphoscoliosis.

E. ANOMALIES DUE TO DISEASE OF THE SUBJACENT SKELETON.
1. Coxalgia.
2. Luxation of one femur.
3. Luxation of both femurs.
4. Unilateral or bilateral club-foot.
5. Absence or bowing of one or both lower extremities.

Contracted Pelvis.—Only the commoner varieties of contracted pelves will be considered. These, as found in this country, are:
1. The generally equally contracted pelvis.
2. The simple flat pelvis.
3. The rachitic flat pelvis.
4. The kyphotic pelvis.
5. The obliquely contracted pelvis.

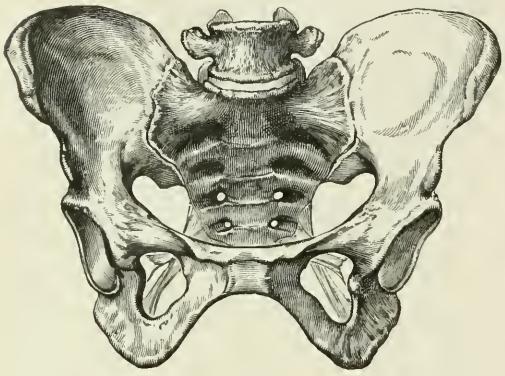
The generally equally contracted pelvis is, as its name implies, a pelvis in which there is proportionate contraction of all its diameters. This contraction very rarely exceeds 2 or 3 cm. This pelvis is the result of arrested development at an early period of life. It has been thought to be due to a mild degree of rickets which has passed away rapidly, leaving no characteristic deformity.

The diagnosis of this variety of contracted pelvis is easily made by noticing the proportionate degree of contraction of the different pelvic measurements.

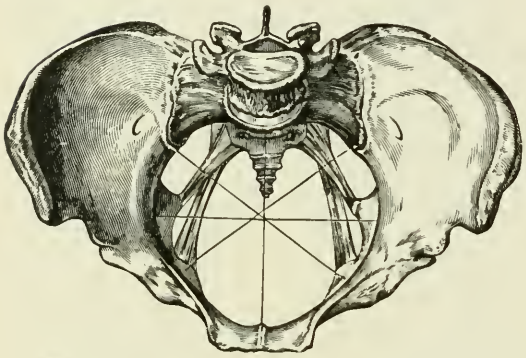
The mechanism of labor in the generally equally contracted pelvis differs but slightly from the

normal. Vertical flexion at the inlet is somewhat exaggerated, while there is little or no lateral flexion.

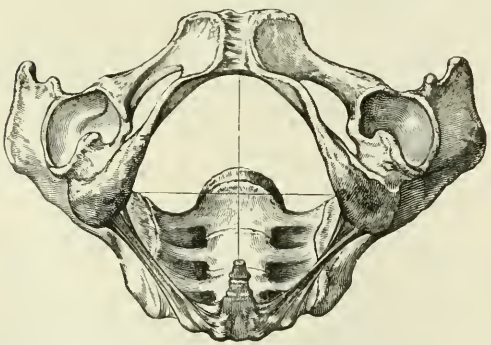
The treatment of labor obstructed by this variety of pelvis will depend upon the degree of con-



Female Pelvis, Seen from the Front.



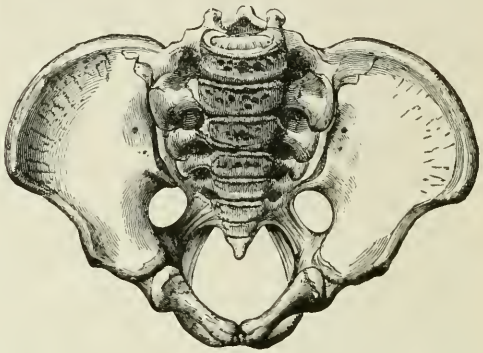
Female Pelvis, Viewed in the Axis of the Brim, Showing the Diameters of the Superior Strait.



Outlet of Pelvis. Anteroposterior and Transverse Diameters of Outlet seen from Below.

traction. If the true conjugate diameter measures 9 1/2 cm. or over, delivery at term with forceps should be comparatively easy. With a contraction between 8 and 9 1/2 cm., the induction of premature labor is advisable. This, supplemented by the use of forceps, if necessary, will be found almost uniformly successful. When the contraction is below 8 cm., choice will have to be made between symphysiotomy, cesarean section, and craniotomy.

The simple flat pelvis is one in which there is shortening of the anteroposterior diameter, the other diameters being normal. The amount of



Infantile Pelvis, Viewed in the Axis of the Brim.

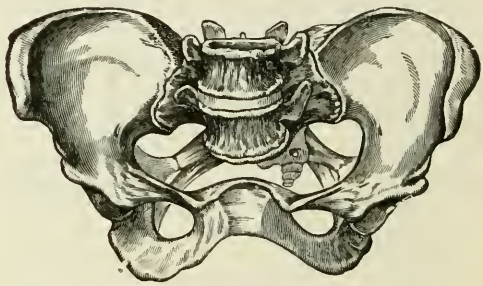
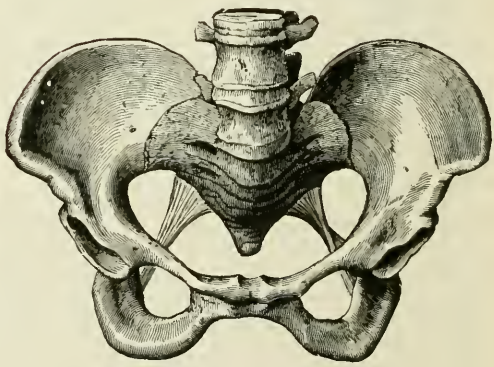


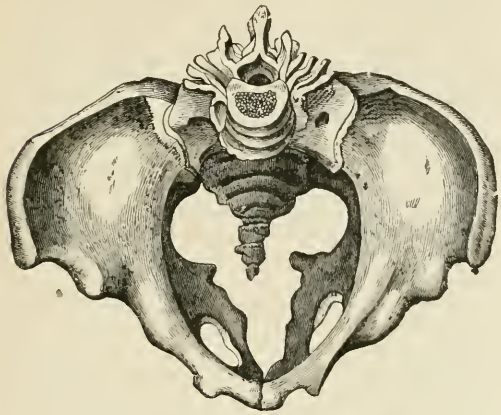
Figure-of-eight Rachitic Pelvis.



Reniform Rachitic Pelvis.

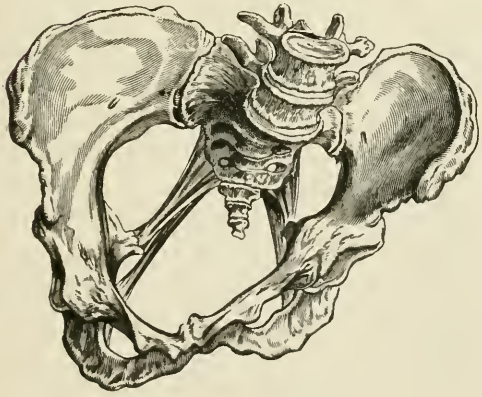
contraction very rarely exceeds 3 cm. It may be congenital in origin, or it may be caused by carrying heavy weights during early childhood. In this variety of pelvis the external conjugate diameter will be less than 20 1/4 cm., probably 18, or even 17; the true conjugate will be less than 11 cm., probably as low as 8. The other pelvic measurements will practically be normal.

The rachitic flat pelvis is one of the results of infantile rickets. In this disease there is a diminution of the mineral constituents of the bones, which



Kyphotic Pelvis.

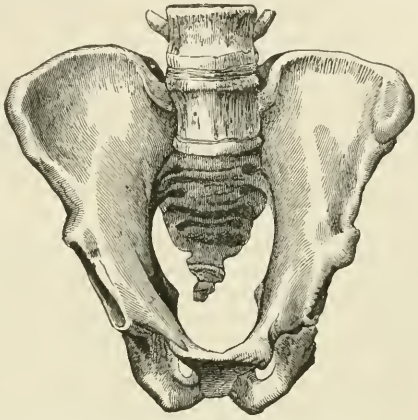
Oblique Pelvis, from Ankylosis of the Hip-joint and Disuse of the Right Leg.



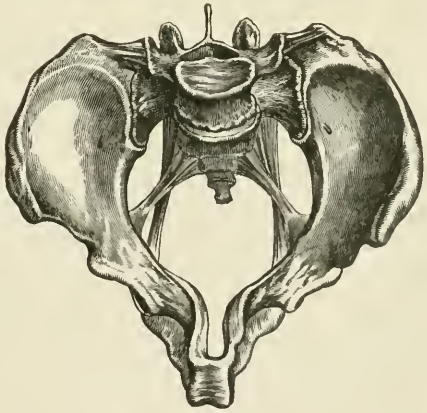
Oblique Pelvis of Naegele.

results in a preternatural pliability. There is a tendency, therefore, to an exaggeration of the changes which occur in the development of an adult from an infantile pelvis—*i. e.*, there is excessive rotation of the sacrum on its transverse axis. This results in an abnormal projection of the promontory, which causes a decrease in the conjugate diameter, an increase in the curve of the sacrum, a decrease in the depth of the pelvis, and a widening of the iliac spines and crests. The true conjugate diameter may be as low as 4 cm.

Diagnosis.—This pelvis is recognized by the marked decrease in both internal and external conjugate diameters; by the disturbance of the relation between the iliac spines and crests, the



Transversely Contracted Pelvis of Robert.



Rostrated Malacosteon Pelvis in Early Stage of Deformity.

distance between the crests being almost or fully as great as between the spines; by the marked sinking of the depression under the last lumbar vertebra, it being now almost on a level with the posterior superior iliac spines; and by the accompanying constitutional signs of rickets.

The mechanism of labor in the simple flat and in the rachitic flat pelvis is the same. The long diameter of the head engages in the longest diameter of the pelvis, which is now the transverse; there is exaggerated lateral flexion of the head, so that it may adapt itself to the increased sacral curve; and there is imperfect vertical flexion, so

that the bitemporal diameter (8 cm.) may first be brought in relation with the contracted conjugate instead of the biparietal (9 1/4 cm.).

The treatment of labor complicated by a flat pelvis depends upon the degree of contraction. Four grades are usually recognized:

1. When the true conjugate measures 9.5 to 11 cm. Here it is advisable to allow the patient to proceed to term. A rather prolonged and difficult labor should be expected, with perhaps malposition of the child or prolapse of the cord. If, after waiting a reasonable length of time, the head will not engage, version should be performed; if the head engages, but further delivery ceases, forceps should be employed.

2. When the true conjugate measures 8 to 9.5 cm. If the patient is seen in time, labor should be induced at the thirty-sixth or thirty-eighth week of gestation. If, now, there is difficulty in delivery, or if the patient is not seen until term, version or forceps, as previously described, will usually prove successful.

3. When the true conjugate measures 6.5 to 8 cm. Here one of the graver obstetric operations is indicated. Choice must usually be made between symphyseotomy, cesarean section, and craniotomy. It should be remembered, however, that spontaneous birth may occur even with a contraction as low as this, and also that version or forceps may prove successful. The size and compressibility of the child's head and the strength of the uterine contractions are factors which must not be overlooked in the treatment of a contracted pelvis.

4. When the true conjugate measures less than 6.5 cm. This is an absolute indication for cesarean section, since it would be dangerous to pull even a mutilated child through such a degree of contraction.

The kyphotic pelvis is that variety of pelvic deformity resulting from Pott's disease of the lower spinal column. In this deformity the promontory of the sacrum is pushed backward and the conjugate diameter at the pelvic inlet is slightly increased. The deformity is most marked at the pelvic outlet; the transverse diameter is markedly decreased by approximation of the ischial spines, and the conjugate diameter is somewhat lessened by forward displacement of the coccyx.

The diagnosis is easily made by the marked decrease in the transverse diameter at the outlet and by the associated kyphosis with its characteristic signs.

The mechanism of labor in this variety of pelvic deformity may differ but little from the ordinary. Posterior rotation is frequent; also, the first stage of labor may be precipitate, while the second stage is abnormally slow.

Treatment.—Here, again, the treatment depends upon the degree of contraction. If the contraction of the transverse diameter is slight—not below 8 cm.—spontaneous delivery may be expected. With a greater degree of contraction than this, choice will be made between the induction of premature labor, forceps, symphysiotomy, cesarean section, and craniotomy.

The obliquely contracted pelvis is due to a variety of causes, such as scoliosis, coxalgia, club-foot, the absence of one extremity, and dislocation or fracture of one limb. The pelvis becomes obliquely contracted from the overuse of one limb, or, in the case of the scoliotic pelvis, from unequal pressure from above. The diagnosis is easily made by the presence of the marked asymmetry of the pelvis, associated with one of its various causes. Unless the deformity is marked, no treatment is necessary. Marked degrees of contraction will require forceps, version, the induction of premature labor, symphysiotomy, cesarean section, or craniotomy.

PELVIS, INJURIES.—**Fracture of the pelvis** is usually the result of direct violence—a heavy fall, a cart-wheel passing over the pelvis, a squeeze between the buffers of two railway cars, and similar accidents. It may, of course, result from gunshot wounds or from indirect violence, as when a person falls from a height and alights on his feet.

The symptoms are inability to walk, though the patient may be able to move his limbs in bed; mobility and crepitus, obtained by pressing on both crests of the ilium; pain on moving or coughing; displacement, which may be recognized by external examination, by the rectum, or by the vagina. Inability to empty the bladder or voiding of bloody urine denotes some injury of this organ.

Fracture of the acetabulum is indicated by the crepitus elicited on rotating the femur with one hand placed over the trochanter.

Separation of the symphyses, or of the **sacro-iliac articulation,** is recognized by the free mobility of the part, and at the same time an interval may be felt in the situation of the separation. The pelvic viscera are frequently injured in this fracture; rupture of the bladder or urethra, giving rise to extravasation of urine, laceration of the rectum or of the larger blood-vessels, may occur.

Usually the rami of the pubes and ischium are the seats of fracture. The line of fracture may pass above the acetabulum in various directions, or it may involve the acetabulum, fissuring its floor or fracturing its margin. The acetabulum may be comminuted, and the head of the femur driven into the pelvic cavity. Any portion of these bones may be broken, including the crest of the ilium or the tuberosity of the ischium, and not infrequently both innominate bones.

Treatment.—Absolute rest of from 6 weeks to 2 months is essential. The pelvis must be bound around with a broad roller-bandage, and the patient laid to rest on a flat bed or mattress. The thighs must be flexed upon the abdomen and supplied with pillows under the knees.

Fracture of the acetabulum must be treated by means of a long splint, or hip splint of gutta-percha, molded to the side of the pelvis and thigh so as to fix the joint. A catheter should be introduced to ascertain the state of the bladder. If bloody urine or other symptom of injury to this organ or to the urethra is present, the catheter must be kept in the bladder to prevent extravasation. See BLADDER (Injuries).

PEMPHIGUS.—Pemphigus is an acute or chronic inflammatory disease of the skin, char-

acterized by the formation of successive crops of variously sized, rounded or oval bullæ, affecting seriously the general health and often terminating fatally.

Symptoms.—There are two principal types—pemphigus vulgaris and pemphigus foliaceus.

Pemphigus Vulgaris.—With or without febrile disturbance, there appear upon the limbs, face, or trunk, pea-sized to egg-sized, rounded or oval, tense blebs. These rise abruptly from the normal skin, and, while having at times a slightly reddened base, have no areola. The contained fluid is at first serous, later becoming turbid and purulent. The eruption occurs in crops, a half of a dozen or more blebs appearing at a time. These persist for a few days (the fluid disappearing by absorption or rupture), and are then followed by another crop. The parts most frequently affected are, in their order of frequency, the limbs, the face, and the trunk. The mouth, vagina, conjunctiva, and other mucous membranes may become involved. The disease in some cases runs a more or less acute course, getting well in a few months. Far more frequently, however, it persists for years, greatly impairing the general health.

Pemphigus Foliaceus.—In this form the blebs, which are flaccid and purulent, rupture before distention and dry to crusts, which are thrown off with the surrounding epidermis, exposing to view the reddened corium. A new crop of blebs succeeds the old, often developing upon the same site, and giving to the skin the appearance of a severe scald. The entire cutaneous surface may thus become involved, and the general health seriously compromised. The process lasts for months or years, and almost always leads to a fatal termination.

Neumann has described a rare form of pemphigus, characterized by the development of wart-like or papillary vegetations upon the sites of ruptured bullæ. This form he has called **Pemphigus Vegetans.** The mouth, vagina, or other mucous membranes are often first affected. The favorite situations upon the skin are the genital and anal regions, the neck, axillæ, and flexures of the extremities. The affection lasts months or years, and tends to a fatal termination. The subjective phenomena in pemphigus are itching and burning (usually moderate in degree), and often tenderness, pain, and a feeling of tension. The disease is distinctly rare, particularly in this country.

Etiology is obscure. The disease has been observed in many cases in which marked changes in the central and peripheral nervous systems were noted. In addition, mental strain, nervous exhaustion, and a lowered or vitiated state of the general health are considered to be causative.

Pathology.—The blebs are usually situated between the horny layer and the rete mucosum, but may occur at any depth in the epidermis. The contents of the bullæ consist of a slightly alkaline serum containing a few leukocytes. There is dilatation of the papillary vessels, and a leukocytic infiltration of the papillæ, corium, and subcutaneous tissue. The affection is looked upon as a trophoneurosis.

Diagnosis.—It should be remembered that all bullous eruptions are not pemphigus. Care should be exercised to differentiate the bullous forms of erythema multiforme, dermatitis herpetiformis, impetigo contagiosa, and syphilis (pemphigus syphiliticus of the older writers). The blebs of pemphigus are large, tense, abruptly elevated, noninflammatory, and come out in crops. These characteristics, with the history and course of the disease, should enable one to make the diagnosis.

Prognosis.—The course of the disease is uncertain. Mild cases may recover after a duration of months. Severe cases (particularly pemphigus foliaceus) are likely to end fatally. The occurrence of flaccid or hemorrhagic blebs, extensive cutaneous involvement, frequent outbreaks, or constitutional depression are all unfavorable signs.

Treatment.—Both internal and local treatment are to be employed, the former alone, however, being curative. Arsenic is by far the most valuable remedy. It is to be perseveringly tried, beginning with small doses and increasing until the physiologic limit is reached. Quinin in full doses is also of value, as are, at times, iron, strychnin, and cod-liver oil. Nutritious food, good hygiene, and bodily and mental rest are important therapeutic factors.

Local treatment is designed to heal the abraded surfaces and relieve the subjective symptoms. The blebs should be evacuated, and simple dusting-powders, ointments, or lotions applied. The calamin lotion is a most grateful application. Bran and starch baths are useful in extensive cases. In pemphigus foliaceus the continuous bath is perhaps the best treatment, the patient living day and night, for weeks and months, immersed in water.

PENIS, DISEASES.—**Inflammation** is usually the result of injury or associated with venereal disease. Cuts, twists, "breaking" a chordee, ligation of the penis, or forcing rings over it, passage of instruments, and impactions from calculi are the ordinary injuries. Injuries to the perineum may result in inflammation of the penis from extension. Excessive sexual intercourse or persistent masturbation are causative agents in inflammation. It may be a sequel to the exanthems and diphtheria. It is also found in gouty and diabetic subjects.

The treatment follows the general treatment of inflammation, with especial regard to the cause or condition in connection with which the inflammation has arisen.

Herpes of the penis is a vesicular eruption, occurring on the cutaneous or mucous surface of the prepuce, and running its course in about a week, but being liable to recur at stated intervals. Its recognition is important, because its appearance after doubtful intercourse may lead to improper treatment. A sedative lotion and the avoidance or prevention of all irritation are all that are needed in treatment. See CHANCROID.

Priapism.—The condition of temporary and functional fulness and firmness of the penis, clitoris, etc., due to sexual excitement, friction, spinal irritation, etc. The mechanism consists in an overfilling of the blood-vessels with an inhibition of the return circulation.

Treatment.—Hyoscin hydrobromid, 1/120 to 1/60 grain at bedtime, will prevent erections and check emissions. Belladonna in gradually increasing doses brings good results. Camphor often succeeds, while potassium and sodium bromids are especialy sedative in irritable states of the genitourinary organs in which erections occur. Chloral, given at bedtime, may be repeated every night. A few drops of a 4 percent solution of cocain upon the glans penis often promptly controls an erection. Cold applications are of value. The anaphrodisiacs lower the sexual appetite and depress the genital centers in the brain and cord. See ANAPHRODISIACS, CHORDEE, GONORRHEA.

Deformities.—The roof may be defective (epispadias); or the floor (hypospadias); or the invagination that forms the fossa navicularis may fail to meet the part behind. If the urethra is imperforate, the kidneys become cystic, and the child dies at or before birth. Usually, however, there is hypospadias, and occasionally the two channels run one above the other for a considerable distance.

Hypospadias.—The orifice is usually at the base of the glans, or a little further back; the frenum is absent; the prepuce forms a great fold on the dorsum like a caul, and the corpus spongiosum possesses scarcely any erectile tissue. In other cases it lies at the end of the membranous urethra, the bulb and the scrotum failing to unite in the middle line, and forming labia, as in the female. When the defect is slight, the fossa navicularis may run back and end blindly; in other cases the penis is small, and the corpus spongiosum, if it is developed, incapable of erection.

Epispadias.—The complete form is always associated with ectopia vesicæ; occasionally the urethra opens behind the corona, the rest of the penis being well developed.

The treatment is not very promising. If the defect is slight, and micturition not impeded, it is better not to interfere. The orifice should be dilated to prevent any strain upon the structures behind; and if the urethra fails in front, so that it is impossible to direct the stream, an attempt should be made to carry it forward by means of a plastic operation. The flap must be double, so that a cutaneous surface may face the new channel; the deeper layer is taken from the side of the penis near, and twisted round upon itself; the superficial one borrowed from the redundant prepuce the center of the caul being dissected up, and the glans thrust through the opening, so that the dorsal surface becomes inferior, or *vice versa*, as the case may be.

Phimosis may be congenital or acquired, following balanitis, soft sores, chancre, or injury. In the former case the glans is often adherent, and the orifice may be reduced to the size of a pinhole, so that the prepuce swells out with each act of micturition. Circumcision should always be performed, unless the corona can be thoroughly and easily exposed; the secretion collects inside; there is a constant risk of balanitis and paraphimosis; preputial calculi may form; and the liability to syphilis and phagedena is much greater. If gonorrhea occurs, it is more severe, and the constant irritation undoubtedly favors carcinoma.

Circumcision.—In the operation of circumcision the prepuce is drawn well forward, and clipped with a pair of polypus forceps in front of the glans; the projecting end cut off; the cutaneous sheath allowed to retract, and the mucous membrane slit up along the dorsum as far as its attachment. Each half is then cut away, following the line of the corona, and leaving the frenum and just enough to hold a few sutures. If catgut is used, and the wound dried and covered with iodoform, the dressing may remain on until the skin has united.

Paraphimosis is the condition produced by forcing the glans through the orifice of the prepuce when it is too narrow to admit it. The immediate result is congestion and inflammation, ending, if left, in ulceration and sloughing. The glans becomes swollen; the prepuce overhangs it like an edematous collar, and concealed behind this is a tight, unyielding ring formed by the orifice. In early cases reduction can usually be effected by oiling the parts well, and drawing the foreskin forward with the index- and middle fingers of the two hands, while the thumbs compress the glans; or the penis may be wrapped round with lint soaked in equal parts of adrenalin solution 1:1000 and cocain solution 1:100; this is left on for 15 minutes, when the edema disappears, and reduction is often easy. In cases that have already lasted some days, it is often necessary to slip the end of a director under the constricting band on the dorsum, and divide it with a bistoury.

Epithelioma.—Squamous epithelioma is not uncommon after middle life, commencing on the glans or the inner surface of the prepuce, especially in cases of phimosis. It usually begins as a warty nodule, which soon breaks down into an ulcer, with intensely hard base and edges. If allowed to remain, the growth spreads rapidly, owing to the constant irritation of the urine; the corpora cavernosa and the glans are quickly infiltrated; the lymphatics in the groin become involved, and secondary deposits follow. The diagnosis from syphilis rests chiefly on the character of the base, which is covered with decaying epithelium, and the intense induration beneath and around.

Treatment.—Amputation is the only treatment. Until recently this was accomplished either with a single sweep of the knife, or more deliberately, forming a flap of skin to cover the surface of the wound, leaving the corpus spongiosum and the urethra longer than the rest, and stitching the edge of the mucous membrane to that of the skin. Recurrence, however, is exceedingly common after this operation; cicatricial stricture at the orifice invariable; and all power of directing the stream of urine lost. To avoid this, Thiersch recommends an oval incision round the root of the penis, prolonged a little backward in the median raphe of the scrotum, and then dissecting off the whole of the corpora cavernosa from the rami of the pubes and the triangular ligament. The corpus spongiosum and the urethra are dealt with separately, through an incision in the median line of the perineum behind, as

much being removed as appears desirable, and the rest sutured to the skin in front of the anus. Micturition must, of course, be effected in the sitting posture, but there is not the same tendency to the formation of stricture, and there is much further freedom from return of the growth.

Benign Tumors.—Of these there are cystic, vascular, fibrous, horny, fatty, sebaceous, and other new growths. The most common are the papillomata or warty growths, which are associated chiefly with venereal disease. They may arise from uncleanliness, especially if the prepuce is long. They constitute a "cauliflower" mass, and sometimes completely cover the mucous surface of the glans and prepuce. Removal by scissors, or by torsion with forceps, is a most speedily effectual treatment. Repeated applications of zinc, calomel, tannic acid, burnt alum, or the pressure of dry lint between the foreskin and glans may suffice. Cleanliness is essential.

PENNYROYAL.—See HEDEOMA.

PEPO.—Pumpkin seed. The ripe seed of *Cucurbita pepo*, with properties due to a resin contained in the inner covering of the embryo. Dose of the resin, 15 grains; of the seeds 1/2 to 1 1/2 ounces, made into a suitable emulsion.

It is efficient and harmless used as a vermifuge against the tape-worm. The husks should be removed and the remainder rubbed into an emulsion with water, or into an electuary with sugar, should be taken on an empty stomach, and followed in 1 or 2 hours by an active purge. See ANTHELMINTICS, WORMS (Tape-).

PEPPER.—See PIPER.

PEPPERMINT.—See MENTHA PIPERITA.

PEPSIN.—A name for the hypothetic digestive principle in the gastric juice, unknown as a definite body. All preparations vary much. Pepsin forms either a fine, white or yellowish-white, amorphous powder, or thin, translucent scales or grains, free from any offensive odor, soluble in about 100 parts of water, more soluble in water acidulated with hydrochloric acid, but insoluble in alcohol, ether, or chloroform. It should never be alkaline. Commercial pepsin is obtained from the rennet bags of sheep or the stomachs of pigs. It is precipitated by sodium chlorid, lead acetate, or by drying the peptones on glass plates. Alcohol also precipitates it. **Saccharated pepsin** consists of 1 part pepsin, triturated with 9 parts of sugar of milk. One part should digest at least 300 parts of egg-albumen. The dose is 5 grains to 1 dram, given shortly after meals. **Liquid pepsin** contains 40 parts of saccharated pepsin, 12 of hydrochloric acid, 400 of glycerin, and enough water to make 1000 parts. The dose is 2 to 4 drams, after meals.

Every manufacturer of pepsin has his own preparation, with his peculiar name, but all preparations have in some degree the power of digesting albumin or fibrin.

Pepsin is a ferment, not a solvent; it converts casein, albumin, fibrin, and other albuminoids into peptones for assimilation, being aided by lactic and hydrochloric acids. It should be given within 2 or 3 hours after taking food. Its activity is destroyed by alcohol, and alkalies and many mineral acids precipitate it. It is chiefly employed in dyspepsia, and in apepsia of infants, gastralgia, anemia, chlorosis, gastric ulcer and cancer, infantile diarrhea, and in the vomiting of pregnancy.

It is added to rectal enemata of nutritive character, and when injected into fatty tumors or morbid growths homologous to the tissues, may arrest their growth and promote absorption. Among the laity it is a much overrated remedy for indigestion. Pancreatin is usually of more service.

In indigestion with atony:

℞.	Strychnin,	gr. 1/24
	Powdered pepsin,	gr. x
	Powdered starch,	gr. vij.

Give at 1 dose.

PEPTONIZED FOOD.—This is indicated when the natural digestive powers are enfeebled or suspended. In gastric catarrh, with pain and intolerance of food, in gastric ulcer, in anorexia and dyspepsia associated with valvular heart-disease, and in pyloric and intestinal obstruction, in defective nutrition and intestinal irritation, it is serviceable. Peptonized food does not keep well, especially in warm weather. It should be prepared twice daily, and never be given when more than 12 hours old, or after having been reboiled. Peptonized food may be prepared by the gastric method, using pepsin and hydrochloric acid, or by the intestinal method, making use of the extract of pancreas. The latter is the preferable method. Probably the best solvent for an extract of pancreas is dilute spirit. The pancreas of the pig yields the best or most active preparation, but that of the ox or sheep may be employed. Calf pancreas yields an active extract, not, however, affecting starchy materials.

To make an extract of pancreas, first free the pancreas from fat, and cut into small pieces. Mix with 4 times its weight of dilute spirit, cork in a wide-mouthed bottle, and set aside for a week, agitating once daily, at the end of which time it is strained through muslin and then filtered through paper until clear.

Peptonized Milk.—Heat a pint of milk mixed with half a pint of water to about 140° F., or heat one-half of the milk and water to the boiling-point, and add to the other (cold) half 2 teaspoonfuls of the extract of pancreas and 10 grains of sodium bicarbonate. Pour into a covered jug and place in a warm situation. In an hour or hour and a half it is to be boiled for 2 or 3 minutes and may then be used like ordinary milk.

Peptonized Gruel.—It may be prepared from wheaten flour, oatmeal, arrow-root, sago, pearl-barley, pea or lentil flour. The gruel should be well boiled, thick, and strong, and poured into a jug and allowed to become lukewarm. Pancreatic extract, a dessertspoonful to a pint of gruel, may then be added, and the jug kept warm for 2 hours or so, and then the gruel brought to a boil and strained. This gruel is not generally an acceptable food for invalids, but it serves as a basis for peptonized soups, jellies, and blanc-manges.

Peptonized Milk-gruel.—This may be regarded as a predigested bread and milk, and is especially useful for weak digestions. Thick gruel from farinaceous articles, while boiling hot is added to an equal quantity of cold milk. To each pint of this mixture 2 or 3 teaspoonfuls of extract of pancreas and 10 grains of sodium bicarbonate are added. It is then treated as peptonized milk or gruel. If too bitter, less pancreatic extract may be used.

Peptonized Soups, Jellies, and Blanc-manges.—One way of making soups is to add to peptonized milk or gruel what is known as "stock." A better way is to use thin and watery peptonized gruel instead of simple water for extracting the soluble matters of shins of beef and other materials used in preparing soups. Jellies may be made by simply adding the due quantity of gelatin or isinglass to hot peptonized gruel and flavoring to suit. Blanc-manges are made in the same way, using peptonized milk instead of gruel, and adding cream. If the final boiling in the preparation of the peptonized gruel or milk is not complete, the extract will act on the gelatin, and the power of setting on cooling will be lost.

Peptonized Beef-tea.—To a pint of water are added a pound of finely minced lean beef and 10 grains of sodium bicarbonate. Allow this combination to simmer for an hour and a half in a covered sauce-pan. Decant the ensuing beef-tea into a covered jug. Beat up with a spoon the undissolved beef residue into a paste, and add to the tea in the jug. When it is cool enough to be tolerated in the mouth, a tablespoonful of the extract of pancreas is to be added, and the whole stirred together and kept warm for 2 hours, being occasionally agitated, at the end of which time the contents of the jug are boiled for 2 or 3 minutes, and finally strained. Beef-tea prepared in this way contains about 4 percent organic residue, of which more than three-fourths consists of peptone. When seasoned with salt, its taste resembles ordinary beef-tea.

Peptonized Enema.—To the enema prepared in the usual way—with a mixture of milk and gruel, or of milk alone, or of gruel and beef-tea—is added, just before administration, a dessertspoonful of liquor pancreaticus, or extract of pancreas. The ferment, in the warm temperature of the bowel, acts favorably, and no acid secretion interferes with the completion of the digestive process. It is a valuable resource when the stomach is intolerant of food, or obstruction exists in higher portions of the digestive tract.

PEPTONURIA.—The presence of peptone in the urine. The proteid body found in the urine in peptonuria is really not a peptone but an albumose, and a better term would be albumosuria. Albumose is characterized by yielding the biuret reaction; it is not precipitated by heat, but is precipitated by ammonium sulphate. Peptonuria—*i. e.*, albumosuria—occurs in all conditions attended by the destruction of tissue, especially in suppurative processes, purulent pleurisy, purulent peritonitis, abscesses, cerebrospinal meningitis, pyelonephritis, bronchoblennorrhea, in some cases of pulmonary tuberculosis with cavity formation, and during the puerperal state. The blood in leukemia may also contain albumose. Propeptonuria is probably only an albumosuria of high degree. See URINE.

PERCENTAGE SOLUTIONS, TABLE OF

Based on 456 Grains as the Weight of One Fluid Ounce of Water

Dissolve the quantity of ingredient (in grains) in less water than the required volume of solution, and then add sufficient water to bring the solution up to the required volume.

SOLUTION.	℥j.	℥ij.	℥iv.	℥vj.	PINT.	QT.	GALLON.
1/100 p.c., 1:10,000	1/25	1/10	1/5	3/10	3/4	1½	6
1/50 p.c., 1:5,000	1/10	1/5	2/5	3/5	1½	3	12
1/30 p.c., 1:3,000	1/7	3/10	6/10	9/10	2	5	19½
1/20 p.c., 1:2,000	1/5	1/2	9/10	1½	3½	7½	29
1/10 p.c., 1:1,000		1/10	2	3	7½	14½	58
¼ p.c., 1:800	10	1	2½	3½	9	18	73
½ p.c., 1:500	9/10	2	3½	5½	14½	29	117
¼ p.c., 1:400	1	2½	4½	7½	18	36	146
⅓ p.c., 1:300	1½	3	6	9	24	49	195
½ p.c., 1:200	2½	4½	9	14	36	73	292
¾ p.c., 1:150	3	6	12	18	47	95	379
1/100 p.c., 1:111	4	8	16	25	65	131	525
1 p.c., 1:100	4½	9	18	27	73	146	584
2 p.c., 1:50	9	18	36	55	146	292	1167
3 p.c., 1:33⅓	14	27	55	82	219	438	1751
4 p.c., 1:25	18	36	73	110	292	584	2335
5 p.c., 1:20	23	46	91	137	365	730	2918
7 p.c., 1:14.28	32	64	128	192	511	1021	4086
10 p.c., 1:10	46	91	182	274	730	1459	5837
12 p.c., 1:8⅓	55	109	219	328	876	1751	7004
15 p.c., 1:6⅔	68	137	274	410	1094	2189	8755
20 p.c., 1:5	91	182	365	547	1459	2918	11673
30 p.c., 1:3⅓	137	274	547	821	2189	4378	17510
40 p.c., 1:2½	182	365	730	1094	2918	5837	23345
50 p.c., 1:2	228	456	912	1368	3648	7296	29184

(POTTER.)

PERCUSSION.—A method of physical examination applied by striking upon any part of the body, with a view of ascertaining the conditions of the underlying organs by the character of the sounds elicited. In percussing attention is paid to the resonance, the pitch, and the duration of the sound, and to the resistance of the parts. Percussion is sometimes performed by striking with the entire hand. The method, in the case of the chest, serves to distinguish marked degrees of dulness from resonance.

Auscultatory percussion is percussion combined with auscultation. The method by which fine shades of difference in the quality of sounds may be detected. It is employed for outlining organs, both those containing and those not containing air. It is best applied by placing a double stethoscope at a fixed point and percussing gently all around. The stethoscope may be held with one hand, while with a finger of the other immediate percussion is made; or an assistant may percuss. See CHEST (Examination).

PERICARDITIS.—See HEART-DISEASE (Organic.)

PERICARDIUM, INJURIES.—See HEART (Injuries).

PERIHEPATITIS.—See LIVER.

PERIMETER.—See FIELD OF VISION.

PERINEUM, INJURIES.—Injuries to the perineum are almost invariably the result of childbirth. They are classified, according to the extent and position of the injury, into: (1) Slight median tear not involving the anal sphincter; (2) median tear in which the sphincter is divided; (3) laceration in one or both vaginal sulci; and (4) subcutaneous laceration of the muscles and fascia.

These injuries should be repaired by **perineorrhaphy.** Primary perineorrhaphy, or repair of the injury within the first few hours after labor, is preferable. When this cannot be done, or when it has been neglected, secondary perineorrhaphy should be performed. This may be done any time after cicatrization has occurred.

Slight Median Tear not Involving the Sphincter.—This tear passes through the fourchet, and may extend down the median line of the perineum as far as the sphincter. It usually extends for 1/2 of an inch or more up the posterior vaginal wall. In this injury there is no involvement of the supporting structures of the pelvic floor, and, therefore, there is no tendency toward prolapse of the vaginal walls and pelvic organs. This tear should be closed immediately after labor by the introduction of sutures, as shown in the accompanying illustration. The first stitch should be introduced at the apex of the tear in the posterior vaginal wall. It should be carried well out, so as to include sufficient tissue, and should emerge at the bottom of the tear; it should be reintroduced here, to be brought out on the opposite side of the tear at a point corresponding with its first point of introduction. Sufficient stitches should be introduced, about 1/4 inch apart, to completely close the wound. The external tear should be closed in a similar manner. The sutures may be tied or shotted. If this tear is neglected at the time of its occurrence, the secondary operation of perineorrhaphy is not indicated.

Median Tear in Which the Anal Sphincter is Divided.—This tear, although an extensive one, does not injure the supporting structures of the pelvic floor. There is, therefore, no tendency toward prolapse of the pelvic organs or the vaginal walls. The laceration takes place in the median line of the perineum, extends through the sphincter muscle, and may involve the rectovaginal septum to a greater or less extent. Permanent incontinence of feces is the result of this injury.

It is of the utmost importance that an injury of this character be repaired immediately after labor. The stitches are introduced as follows: The tear in the rectovaginal septum should first be closed by interrupted sutures, placed about 1/4 inch apart. They should be introduced from the vaginal aspect, beginning at the apex of the tear, and should extend to, but not through, the rectal mucous membrane. These sutures should now be shotted. The sutures which bring together the divided ends of the sphincter ani muscle are next introduced. This is obviously the most important step of the operation, since failure to bring together the ends of this muscle will result in continued incontinence of feces. The ends of the divided muscle are usually clearly marked by a dimple well back of and to each side of the anal opening. The first suture is introduced from the skin surface, back of and to the inner side of this dimple, close to the rectal mucous membrane. It is passed upward and outward through the dimple, and finally inward, to emerge at the apex of the tear in the rectovaginal septum, or if the septum has been extensively torn and repaired, just below the last stitch in the septum. It is reintroduced here, and is passed outward, downward, and inward through the septum, to emerge on the skin of the perineum just below the dimple of the opposite side. For greater security, a second similar stitch is introduced a little to the outer side of the first one. The subsequent steps of the operation consist in closure of the external perineal tear by a row of interrupted stitches. These stitches are now shotted, the two sutures holding the sphincter ani being secured first. If this injury is neglected at the time of its occurrence secondary perineorrhaphy must be performed. The technic of this operation is similar to that just described, except that the torn surface will have to be denuded. This is done with sharp scissors, particular care being taken to expose the ends of the divided sphincter muscle.

Laceration in One or Both Vaginal Sulci.—This tear extends in the direction of the ischiorectal fossa, and divides the vaginal sphincter, the transverse perineal muscle, and the inner fibers of the levator ani. The anal sphincter usually escapes, since it is out of the line of injury, which is usually bilateral, the left sulcus being, as a rule, the more extensively torn.

The result of this injury is prolapse of the vaginal walls and pelvic organs, since the supporting structures of the pelvic floor are lacerated. Repair should be immediately undertaken by first closing the torn sulci, and finally the tear of the external perineum in the manner that is described under the secondary operation.

The best secondary operation for the repair of a tear involving the sulci is *Emmet's*, which is performed as follows: The crest of the rectocele is seized with a tenaculum; the labia majora are seized with tenacula at about the height of the orifice of the ducts of the vulvovaginal glands. If the rectocele is drawn to one side, a triangular area is exposed which represents the site of the old laceration. This area is next denuded. The rectocele is now drawn to the opposite side, when a similar area is exposed and denuded. The base of the rectocele and a small portion of the skin of the perineum are next denuded. In denuding these areas care should be taken to remove every particle of scar tissue and mucous membrane.

The stitches are next introduced, the sulci being closed first. The first stitch passes directly across the apex of the tear in the left sulcus. The second stitch is introduced about 1/4 inch lower down, and about 1/8 inch from the edge of the mucous membrane on the left vaginal wall; it passes outward, downward, and inward, emerging at the bottom of the sulcus. It is reintroduced here, and emerges on the edge of the mucous membrane of the rectocele at a point corresponding to its point

of insertion. A third, and sometimes a fourth, suture is introduced in a like manner. Similar stitches are introduced in the right sulcus.

The skin of the perineum is now closed by a suture which is known as the crown stitch. It is introduced on the skin, passes outside of the denuded area, and emerges at the edge of the mucous membrane of the left lateral vaginal wall just below the last suture in the sulcus. It is then passed through the rectocele below the mucous membrane, and finally through the lateral denudation of the opposite side. A second suture, somewhat like the crown stitch, is usually necessary. The sutures in the sulci are first shotted, and finally those which close the skin of the perineum.

Subcutaneous Laceration of the Muscles and Fascia.—In this tear the muscles and fascia are injured, while the mucous membrane and skin remain intact. This is due to the great elasticity of the latter, which enables them to stretch, while the deeper structures, which are less elastic, tear. This injury invariably occurs in the sulci, and its results and treatment are the same as the preceding tear. It is sometimes called relaxation of the perineum. The best suture material for the foregoing operation is silkworm-gut. After the operation is completed, a douche of sterile water is given and a light vaginal tampon of iodoform gauze is introduced. This tampon is removed at the end of 24 hours. The bowels are moved on the third day. The stitches are removed at the end of 2 weeks, after which the patient may get out of bed. She should avoid heavy lifting, long standing, or any other form of active or tiresome exercise for at least 2 months after the operation.

PERIOSTITIS.—See Bone (Diseases).

PERISPLENITIS.—See Spleen (Diseases).

PERITOMY.—See Pannus, Trachoma.

PERITONITIS.—Inflammation of the peritoneum. According to cause it may be primary or secondary; according to extent, local or general; according to time, acute or chronic; and according to the exudate, serofibrinous, fibrinous, or purulent.

Etiology.—(1) Traumatic; (2) secondary to a suppurative process elsewhere, as abscess, pyosalpinx, endometritis, appendicitis; (3) secondary to obstruction of the bowels with infection; (4) secondary to certain diseases, as typhoid fever, hepatic abscess, empyema of the gall-bladder, tuberculosis, nephritis, or rheumatism. (See Colon Bacillus Infection.) Idiopathic peritonitis is no longer recognized. Traumatic peritonitis, following chemical irritation as well as injury, gives rise to distinctly localized trouble and is very different from true acute peritonitis, which is always caused by bacterial infection. In the former condition the elevation of temperature is probably caused by the absorption of fibrin ferment or other chemical substance generated in the injured tissues.

Acute Peritonitis

Pathology.—The membrane is red, swollen, and covered with an exudate—serofibrinous, fibrinous, or purulent. Frequently the coils of intestines are glued together through the medium of the inflammatory creamy exudation, which in many cases undergoes organization with the formation of fibrous bands. The endothelium undergoes desquamation or is infiltrated with liquid, and if infection takes place, fatty degeneration ensues, with the formation of pus. The usual infective microorganisms are the bacillus coli communis and the streptococcus.

Symptoms and Clinical Course.—Diffuse pain over the entire abdominal region and abdominal distention are the two most characteristic symptoms. On pressure over this area the patient complains of excessive tenderness, and, as in appendicitis, the dorsal decubitus is assumed to relieve as much as possible the tension of the abdominal muscles. Vomiting is an early symptom: first the contents of the stomach are ejected, and later the vomitus has a greenish tint, showing the presence of bile. The bowels are obstinately constipated; the temperature is considerably elevated (103° to 104° F.); the pulse is rapid (120 to 140), small, hard, and of a wiry character; the respirations are increased in number (30 to 40), and deep breathing is painful on account of distention of abdomen; the skin is moist and cold, devoid of color; the eyes are sunken; the cheek bones are prominent; the nose is pinched, giving rise to the Hippocratic facies. When the case terminates favorably, the fluid may be collected in sacs formed by the adhesion of the peritoneum to that of the intestine, and small areas of dulness may be found. The duration of an acute attack of peritonitis is from 6 to 9 days.

Diagnosis.—See table under Intestinal Obstruction.

Prognosis is always grave, but modern methods of treatment have lowered the mortality rate. The pulse is the best index of the gravity of the infection.

Treatment.—Medical treatment offers little hope in this affection. The cases which terminate favorably under its employment would probably do equally as well if no drugs were used. The key-note of success is early determination and removal by surgical means of the causative lesion. Opium should never be given until a diagnosis has been made, as it obscures the symptoms and also confers a false sense of security upon the patient, who naturally thinks that the relief of pain which follows its administration is a sign that his condition is improving. In cases in which operation is refused and in those in which the surgeon is called when it is too late to operate, then of course its use is permissible. Saline cathartics, at one time highly esteemed by some practitioners in the early stage of the disease, are not only devoid of curative effect but undoubtedly are harmful in that they may cause dissemination of an infection which nature is endeavoring to localize. A movement of the bowels may be obtained by a simple or medicated enema. Neither food nor drink should be given by the mouth, but enough fluid given by rectum to relieve thirst. As diagnosis is usually not difficult in the early cases an exploration can be made with no little degree of

assurance that the causative lesion will be found and removed. The later cases constitute one of the most difficult problems of surgery. As a general rule it may be stated that the decision to operate or not to operate will depend upon the degree of collapse from which the patient is suffering. Each case of this kind must be decided upon its own merits as there is no invariable rule which will apply to all. In operations in these cases all delaying minutiæ of technic should be disregarded. The abdomen is opened, the cause of the peritonitis removed, if possible, and drainage made through the original wound and also through a suprapubic incision. The postoperative treatment is very important. John B. Murphy has taught the profession the value of introducing large quantities of water or salt solution into the rectum by means of a constant though gentle flow. The patient is placed in the high-head (Fowler's) position and a nozzle, perforated in three or four places and attached to a container by a rubber tubing, is inserted into the anus. The container is placed but a few inches above the level of the rectum, so that the fluid shall flow in very slowly, no faster than it is absorbed. The flow may be regulated by compressing the tube, so that no fluid shall accumulate in the bowel. From a pint to a quart will ordinarily be absorbed in an hour. (See Proctoclysis.) In addition to the institution of this measure, food by the mouth is withheld, in order to prevent peristalsis. Concentrated liquids may be given by rectum either separately or mixed with the fluid used for proctoclysis. Strychnin and morphin given hypodermatically may be used according to the indications of the individual case.

Chronic Peritonitis

A form of peritonitis of slow development, and generally secondary to some constitutional disease. It occurs in two forms, circumscribed adhesive or diffuse proliferative.

Etiology.—(1) Most frequently tuberculosis; (2) cancer; (3) nephritis; (4) chronic alcoholism, are the most common etiologic factors.

Pathology.—The coils of intestines are often firmly matted together, and bands of adhesions connect the intestine to the peritoneum, often forming pouches in which fluid may be present. Its color in tuberculosis and in malignant diseases is usually reddened from the presence of blood.

Symptoms and Clinical Course.—The symptoms at first are very indefinite, though a sense of tenderness may be complained of on pressure over the affected area. The abdomen becomes retracted and hardened, a stiff, rigid abdomen being quite characteristic of tubercular peritonitis. Later tympany is present especially in the upper part of the abdomen. Ascites may be present. Localized swellings may occur, giving rise to pain and edema on pressure. The temperature is usually normal, or only slightly elevated. Constipation and albuminuria are common.

Prognosis is unfavorable.

Treatment is palliative by opium and other appropriate remedies. Treatment for tuberculosis (*q. v.*) should be instituted in the tubercular form. When ascites is present, or there is a purulent condition, the surgeon should perform a celiotomy. An incision is made in the median line evacuating the serum or pus, and, by a lifting motion of the abdominal wall, causes a free access of air within the peritoneal cavity. Abscesses found may be iodoformized after evacuation and drying. The abdomen should be closed without drainage. Secondary infection and fecal fistula are apt to result from the use of a drain. Results have been most encouraging, although surgeons do not agree as to the way in which the cure is produced. Dense adhesion of the intestines to the abdominal wall takes place in the course of a cure.

PERITYPHLITIS.—Inflammation of the peritoneum surrounding the cecum. This is a disease most frequently encountered in the young and in males. It is usually due to some inflammatory disease of the vermiform appendix, and is marked by pain in the right iliac fossa, and a tumor—elongated, sausage-shaped, dull on percussion, and very tender—in the same region. The disease may give rise to general peritonitis from escape of pus into the general peritoneal cavity. The abscess may burst through the abdominal wall into the bowels, bladder, or pleural cavity. See Appendicitis.

PERMANGANATE, POTASSIUM.—See Manganese.

PERNICIOUS ANEMIA.—See Anemia (Pernicious).

PERNIO.—See Frost-bite.

PERSPIRATION.—See Diaphoretics, Sweat-glands.

PERTUSSIS.—See Whooping-cough.

PESSARY.—See Uterus (Retrodisplacements).

PETECHIA.—A small, round, oval, or irregular spot of ecchymosis beneath the epidermis, varying in size from a flea-bite to an area having a diameter of 1/2 inch or more. It is not raised above the level of the skin, but is of a reddish or purple shade, and does not alter by pressure of the finger. Flea-bites have in them a puncture which is always perceptible, and which contrasts strongly with the lighter color of the rest of the disc. The tint varies according to age and the amount of effused blood. They occur on mucous membranes as well as on the skin, in purpura, scorbutus, malignant fevers, and in constitutional diseases. The term *petechial* is applied to certain varieties of diseases, such as typhus, when petechiæ occur in their course, or the eruption becomes hemorrhagic.

PETROLATUM.—A mixture of hydrocarbons, chiefly of the methane series, obtained from petroleum. It is colorless or yellowish, and in the latter case is more or less fluorescent; amorphous, odorless and tasteless, of neutral reaction, insoluble in water, slightly soluble in absolute alcohol, readily soluble in ether, chloroform, petroleum benzin, benzene, carbon disulphid, oil of turpentine, and fixed or volatile oils. The soft variety is known commercially as *terralin*, *cosmolin*, *vaselin*, *petroleum ointment*, etc. Besides petrolatum itself it is official in the following-named forms—P. **Album,** a white, unctuops

mass, without odor or taste, of about the consistence of an ointment. **P. Liquidum,** a colorless, oily, transparent liquid, without odor or taste, but giving off, when heated, a faint odor of petroleum. **Paraffinum,** a mixture of solid hydrocarbons, a colorless, translucent mass, odorless and tasteless, and slightly greasy to the touch.

Petrolatum is a valuable protective dressing, and an excellent basis for ointments, having no acridity and no liability to become rancid. It is readily miscible with many active agents, as the alkaloids and phenol compounds, but it does not penetrate the skin so readily as animal fats and fixed oils. Uncombined, it forms an excellent bland application in all irritated conditions and injuries of the skin, and it has been used with benefit alone, or mixed with castor or olive oil, in chronic eczema accompanied by desquamation. Paraffin is employed by subcutaneous injection for cosmetic effects on saddle-shaped noses and other superficial deformities.

Liquid Petrolatum is used as a laxative in doses of a teaspoonful to 1 ounce at bedtime or 3 times a day. Lane advises the heavy Russian mineral oil, but Bastedo's investigations indicate that there is no important difference between the actions of heavy Russian and the heavy and light American oils. (Lightest specimen, sp. gr. 0.0857 at 22° C.) It is readily taken as it is almost tasteless, is unabsorbed and acts by softening and increasing the bulk of the feces. It is warmly recommended by Lane for chronic constipation and the autointoxication which manifests itself in so many forms as a result of intestinal stasis.

Ambrine, Mulene, and Parresine are names applied to proprietary paraffin mixtures of secret composition which have recently come into prominence in the treatment of burns. The greatest notoriety surrounds the sensational reports concerning Ambrine which is the French preparation; the other two are of American origin. The principle of the paraffin film method is supposed to be mainly mechanical, the film forming a protective covering to the exposed tissues and perhaps forming a sort of scaffold for the feeble granulations. It is easily removable.

PHAGEDENA.—See Ulcer.

PHARYNGITIS (Simple Angina).—An inflammation of the mucous membrane of the pharynx, and also very frequently involving the soft palate, uvula, tonsils, and larynx.

Varieties.—(1) Acute pharyngitis; (2) chronic pharyngitis.

Acute Pharyngitis

Definition.—An acute catarrhal inflammation of the mucous membrane of the pharynx.

Etiology.—(1) Exposure to the cold and wet; (2) overheated sitting or sleeping room, with a sudden chilling; (3) sedentary habit, with indigestion and constipation; (4) certain diseases, such as tuberculosis, gout, rheumatism, and lithemia; (5) inhalation of steam, dust, or noxious vapors.

Symptoms.—There is pain on swallowing, accompanied by a sensation of dryness or of a foreign body, and a desire to clear the throat.

Tenderness may exist in muscles in region of neck and pain may arise from pressure over the region of the tonsils; for this reason in many cases the mouth cannot well be opened. Should the catarrhal process extend upward, the orifices of the eustachian tubes may become occluded, giving rise to temporary deafness or ringing in the ears; and if it extends downward into the larynx, hoarseness will be added to the other symptoms. Often the senses of taste and smell are temporarily impaired.

Physical Signs.—On inspecting the pharynx it will be seen to be greatly reddened in color and the blood-vessels in a condition of hyperemia, especially on the posterior wall, and the uvula and fauces may be edematous. See Pharynx (Examination).

Prognosis is favorable.

Treatment.—Rest in bed is essential; free purgation at the onset is desirable. Calomel (1/6 grain) should be given every hour until 6 or 8 doses have been taken, followed by a saline purge. A hot mustard foot-bath at bedtime is recommended. A commendable prescription is:

℞. Tincture of aconite, ♏ xlv
Solution of potassium citrate, ℥ ij
Aromatic elixir, ℥ iv
Camphor water, add enough to make, ℥ iv.

One tablespoonful every 3 hours.

If there is much edema:

℞. Tincture of opium, ℥ j
Tincture of belladonna, ♏ xv
Camphor water, add enough to make ℥ iv.

One tablespoonful every 3 or 4 hours.

Also apply locally boroglycerid (50 percent) or glycerol of tannin to the affected parts if they are edematous. Quinin (4 grains) every 3 or 4 hours may be administered. If the disease is due to a rheumatic tendency, sodium salicylate (7 grains) or aspirin is indicated.

Local Treatment.—Give small pieces of ice on the tongue every hour or two; apply at onset of symptoms a few drops of a solution of cocain (4 percent), and also:

℞. Menthol, gr. vj
Almond oil, ℥ ij.

Apply every 3 hours.

In some cases it is advisable to apply a strong solution of silver nitrate (20 grains to 1 ounce) during the initial symptoms. If the fever is high, phenacetin (5 grains) may be given every 3 or 4 hours and the aconite discontinued. A nutritious fluid diet should be given.

Chronic Pharyngitis

Synonyms.—Clergyman's sore throat; chronic follicular tonsillitis.

Varieties.—(1) Hypertrophic; (2) atrophic; (3) ulcerative; (4) suppurative (hospital sore throat).

Etiology.—(1) Sequel of acute pharyngitis; (2) excessive straining of the voice or continuous clearing of the throat; (3) constant inhalation of dust or tobacco.

Symptoms and Clinical Course.—The voice is hoarse, often quickly fatigued, and may be entirely lost; cough is frequent and hacking in character; slight pain is complained of on deglutition. There is often a sensation of a foreign body lodged in throat, with a constant desire to expel it by forced effort, and, in some cases, the viscid, tenacious mucus may be tinged with blood.

Hypertrophic Pharyngitis.—The mucous membrane is swollen, hypertrophic, and covered with small reddish or pink granulations composed of glandular tissue. The capillaries are highly injected, and the surface of the mucous membrane seems rough and often mottled. The mucous secretion is thick, viscid, and very tenacious. Digestion is bad, and dyspepsia is a frequent accompaniment.

Atrophic Pharyngitis.—The mucous membrane is lighter in color and atrophied.

Ulcerative pharyngitis is characterized by the formation of ulcers, generally of a specific nature, such as from syphilis, tuberculosis, or cancer.

Syphilitic ulcers of the pharynx and tubercular ulcers of the pharynx are differentiated by Bosworth as follows:

Syphilitic Ulcers.	Tuberculous Ulcers.
Deeply excavated.	No apparent excavation.
Few granulations, and those highly inflammatory.	Much indolent granulation.
Deep-red areola.	Faint areola.
Sharply-cut edges.	Irregular and ill-defined edges.
Distinct demarcation.	Demarcation indistinct.
Yellow purulent secretion.	Grayish, ropy mucous secretion.
Discharge profuse.	Discharge scanty.
Penetrating to deeper tissues.	Superficial, with lateral in place of deep extension.
No fever as a rule.	Hectic fever as a rule.

Suppurative Pharyngitis.—There is a suppurative inflammatory process, first confined to the pharynx, but later extending downward to the larynx and trachea, or upward into the nasal chamber. The predominant feature is its tendency to involve the deeper structures, leading to suppuration and sloughing.

Prognosis depends upon the cause. In the atrophic form the disease may be very obstinate. In the suppurative variety grave complications may ensue.

Treatment. Hypertrophic Pharyngitis.—Correct any constipation by the use of Rochelle or Epsom salts (2 to 3 drams), taken before breakfast, or fluidextract of cascara (1/2 dram) at bedtime. A pill composed of aloin, strychnin, and belladonna may be taken 3 times daily. For the indigestion, avoid overloading the stomach, especially with rich desserts. Alcohol should not be used. Tobacco, tea, and coffee should be restricted. Give elixir of lactopeptin and gentian (2 drams) after each meal. As a general tonic, the elixir of the phosphates of iron, quinin, and strychnin, after meals, is valuable. In bathing it is necessary to guard against taking cold, and the time should be so arranged as to exercise the precaution. Frequent bathing is essential. To render the throat less susceptible, cold water may be sponged over parts once or twice daily. The habit of constantly clearing the throat should be absolutely repressed.

Local Treatment.—Alkaline sprays should be used every 2 or 3 days to keep the parts clean. For this purpose, an alkaline antiseptic tablet (Seiler), dissolved in 3 ounces of water, acts admirably.

Subsequent to the spraying of the throat by the alkaline solution, the following local application may be made by means of a spray:

℞.	Menthol,	gr. ij
	Eucalyptol,	gr. j
	Liquid vaselin,	ʒ j.

The anterior and posterior nares may also be cleansed in the same manner, and the local application made.

Spray for anterior nares to be used cautiously:

℞.	Menthol,	gr. j
	Compound tincture of benzoin	ʒ j.

Apply the smallest amount possible to parts by means of an atomizer, once a week.

Should the granulations not begin to disappear within the first 2 or 3 weeks of treatment, they may be touched with the galvanocautery and the other local applications be discontinued for a few days. Before applying the cautery to parts, the latter should first be cleansed with the alkaline spray and subsequently swabbed with a solution of cocain (4 percent), being careful that none of the solution is swallowed, as alarming symptoms have sometimes occurred from this accident. In case the galvanocautery is not used, an application of silver nitrate (20 grains to 1 ounce) may be made once a week, or boroglycerid (50 percent) or glycerol of tannin used every 3 days. Carbolic acid should be used cautiously about the nares, as it has been known to produce anosmia.

Atrophic pharyngitis may result from the hypertrophic form, and should be treated in much the same way. The crusts should be cleansed and an oily solution used to keep the nares moist.

Ulcerative pharyngitis should be treated specifically. Locally, iodoform in powder may be blown over the parts, equal parts of iodoform and boric acid may also be used. At certain intervals the granulations may be cauterized with molded silver nitrate or the same salt in strong solution.

Suppurative pharyngitis calls for surgical interference if abscesses develop. When this complication does not ensue, prescribe, as a gargle, the alkaline solution recommended for the hypertrophic form. Apply cold cloths to throat ex-

ternally, and give large doses of the tincture of ferric chlorid containing quinin.

PHARYNX, EXAMINATION. **Anatomy.**—The pharynx is that portion of the alimentary canal posterior to the nose, mouth, and larynx. It is a membranous sac about 4 1/2 inches in length, of cone shape, with the apex directed downward. The pharynx has 7 openings: Two posterior nares, 2 eustachian tubes, mouth, larynx, and esophagus. On each side of the pharynx and between the anterior and posterior palatine folds may be seen the tonsils.

Normal Appearance.—In color it is somewhat redder than the mucous membrane of the mouth. On the posterior surface may be seen minute elevations or follicles. The minute arterial and venous blood-vessels are very tortuous and distinct, but are occasionally obscured by an excess of saliva and mucus.

Examination of the pharynx may be made with either direct or reflected light. In the former instance the patient should sit facing the strongest light possible, and the examination conducted either by holding the tongue down with a tongue-depressor, or else have the organ grasped between the folds of a napkin and drawn forward. If the light is insufficient, the room may be darkened, and the light from a lamp reflected by means of the head-mirror. The posterior nares may also be examined at the same time by the use of the laryngoscopic mirror. In those cases in which there is a hypersensitiveness of the pharynx, and in which it is necessary to examine the posterior nares, a very small amount of a 4 percent solution of cocain may be swabbed over the vault of the pharynx. The laryngoscopic mirror should be gently heated before being introduced, otherwise the moisture from breathing will obscure the image.

PHARYNX, INJURIES.—See NECK (Injuries).

PHENACETIN.—A phenol derivative (acet-paraphenetidin), the product of the acetylization of paraamidophenetol. It occurs in white, glistening, crystalline scales, or fine, crystalline powder, odorless and tasteless, soluble in 70 parts of boiling water, in 12 of alcohol, nearly insoluble in water. Dose, 5 to 10 grains in powder, tablets or cachets, hourly or every two hours, but larger doses have been administered.

The action of phenacetin is similar to that of acetanilid. It is one of the safest of the new synthetic antipyretics, yet in sufficiently large doses it is as poisonous as any of its analogues. In one case 22 1/2 grains, taken by a woman within six hours, produced collapse with marked lividity, great dyspnea and restlessness, cold perspiration, and slightly dilated pupils; in another case 120 grains were taken in twelve hours without the production of any symptoms (Wood). A toxic dose causes vomiting, cyanosis, chocolate-colored urine, yellow discoloration of the body, leukocytosis, and death by respiratory paralysis. In medicinal doses it depresses the heart slightly, and does not affect the blood or the respiration. It acts more gradually than other antipyretics, its maximum effect being reached in three or four hours. It reduces fever by lessening heat production and causes perspiration without producing collapse. It is also analgesic and hypnotic, relieving pain and inducing sleep. It has been administered with benefit, in 2-grain doses with 1/2 grain of citrated caffeine at short intervals, for migraine; also in epidemic influenza, both as a prophylactic and as a remedy. As an antipyretic it is extensively employed in phthisis, peritonitis, polyarthritis, endocarditis, typhus and typhoid fevers; and as an analgesic in vasomotor neuroses, for the lancinating pains of locomotor ataxia, also in neuralgia and hemicrania. It is highly praised in whooping-cough, rheumatic and other fevers, and though slower in action than antipyrin or acetanilid, it is deemed fully as efficient in reducing pyrexia, while usually free from the depressant after-effects of the latter agents. It is strongly commended as a local antiseptic dressing.

For neuralgia:

℞.	Phenacetin,	gr. x
	Citrated caffein	gr. v
	Sugar of milk,	gr. xx.

Divide into 10 powders. Give 1 powder every 2 hours while the pain exists.

Incompatibles are: Acids (strong), alkalies (strong), chloral hydrate, oxidizers, piperazin, phenol, pyrocatechin, salicylic acid.

PHENOCOLL.—Produced by the interactions of phenetidin and glycocoll. **P. Hydrochlorid** is a soluble phenacetin, chemically and medicinally, and is distinguished by its comparatively free solubility. It is a white, fine powder, incompatible with alkalies, and is given in doses of 5 to 20 grains 4 times a day. It is best administered in capsule. It has decided antipyretic, antirheumatic, and analgesic powers, is promptly absorbed and readily excreted, and reduces fever without the marked sweating or other unpleasant after-effects of other coal-tar antipyretics. In hectic, malarial, typhoid, and other fevers, in acute rheumatism, neuralgia, epidemic influenza and its neuralgic pains, in gouty and rheumatic affections when accompanied by fever and pain, and in combination with piperazin (15 grains), it has been employed with success. **P. Salicylate,** the salicylate of the synthetic base phenocoll, combines the actions and uses of its constituents. Dose, 15 to 30 grains.

PHENOL. C_6H_5OH.—Formerly called carbolic acid—is procured from coal-tar by fractional distillation and subsequent purification, or made synthetically. It has a very peculiar and characteristic odor, a burning taste, is poisonous and has preservative properties. It crystallizes in colorless rhombic needles; and at ordinary temperatures it dissolves in water with difficulty (1:15), but is soluble in alcohol, ether, glacial acetic acid, and glycerin in all proportions. Upon exposure to light and air it deliquesces, and acquires a pinkish color. It is used in the manufacture of many of the artificial coloring-matters: *e. g.*, picric acid, used as a yellow dye. Large quantities of various qualities of carbolic acid are consumed for antiseptic purposes. Dose, 1/4 to 1 grain, well diluted.

Therapeutics.—Phenol is employed as an antiseptic, caustic, and local anesthetic. For antiseptic dressings and for purifying sponges, and for instruments, it is most useful. In diphtheria, infectious stomatitis, or ulcerative sore throat, combined with glycerin, it is a valuable application. Internally it is used in acute diarrhea and flatulent dyspepsia (1/4 to 1 grain), and as a deodorant inhalant in bronchiectasis, pulmonary gangrene, and phthisis. Injections of 3 to 5 minims of a 2 percent solution will often abort carbuncles and boils. It is in common use in dentistry as an antiseptic and local anesthetic. It will allay the itching in eczema, pruritus, and piles, and will check obstinate vomiting from gastric irritability. Mixed with vaselin, 5 drops to the ounce, it makes a soothing application for burns. As a caustic it may be used against condylomata and chancroids.

A wash in acne or impetigo:

℞.	Phenol,	gr. x
	Glycerin, Rose-water, each,	ʒ j.

In tympanites:

℞.	Phenol,	gr. j
	Extract of opium,	gr. j
	Bismuth subnitrate,	gr. xviij.

Make into 6 powders. One powder 3 times a day.

For mosquito-bites:

℞.	Phenol,	gr. xxx
	Glycerin,	ʒ iij
	Rose-water, enough for	ʒ viij.

Make into a lotion.

Poisoning.—A toxic dose of carbolic acid, taken internally, is one of the most rapidly acting poisons known, sometimes equaling prussic acid in this respect. The symptoms develop almost immediately, and death may occur in a very few minutes; but usually the patient lives from 1 to 10 hours; rarely over 2 days. In some cases a great amendment has occurred, with restoration of consciousness, but after some hours sudden and fatal collapse has supervened. The minimum fatal dose is not determined, but 1/2 of an ounce has frequently caused death; and doses as small as 6 minims have given rise to dangerous symptoms. Cases of suicidal and accidental poisoning by this drug are very frequent, by reason of the facility with which it may be obtained for use as a disinfectant.

If the patient is seen shortly after ingestion, apomorphin may be administered hypodermically, as a rapidly acting emetic; but in any case the stomach should be washed out freely with alcohol and water, equal parts of each, and 8 or 10 ounces of the same should be left in the stomach for a short time, and this is to be followed by a washing out with warm water. Next in value is any soluble sulphate to form the harmless phenolsulphonates: as, magnesium sulphate 1 ounce or sodium sulphate 1/2 of an ounce, dissolved in 1/2 of a pint of water. Even if several hours have elapsed since the ingestion of the poison, the sulphates should be used, as their antidotal action proceeds in the blood. In one case where 1/2 of an ounce of the 95 percent acid had been taken, nearly 3 ounces of magnesium sulphate (Epsom salts) were used, resulting in complete recovery from an apparently hopeless condition. Stimulants, as ether or brandy hypodermically, should be used freely; also hot-water bottles and hot blankets if signs of collapse appear. Vegetable demulcents may be given (but no oils or glycerin), to protect the mucous surfaces. Liquor calcis saccharatus or syrupus calcis is also antidotal to the poison in the stomach, but is much less efficient than the sulphates. Atropin hypodermically is a very complete physiologic antagonist to the systemic symptoms, maintaining the heart and respiration until elimination occurs (Post). Oils should not be used, as they increase the absorption of the poison (Potter).

Incompatibles are: acetanilid, acetphenetidin (phenacetin), antipyrin, albumin, antisepsin, borneol, bromal hydrate, bromin water, butylchloral hydrate, camphor, chloralformamid, chloral hydrate, collodion, diuretin, ethyl carbamate (urethan), euphorin, exalgin, ferric salts, gelatin in dilute solution, hydrogen dioxid, lead acetate, menthol, methacetin, naphthol, nitric acid, phenyl salicylate (salol), piperazin, potassium permanganate, pyrocatechin, pyrogallol, resorcinol, sodium phosphate, thymol, terpin hydrate.

Preparations.—**P. Liquefactum,** a liquid composed of not less than 86.4 percent by weight of absolute phenol, and about 13.6 percent of water. Dose, 1/2 to 2 minims. **Glyceritum P.,** has of liquefied phenol 20, glycerin 80. Dose, 3 to 10 minims. **Unguentum P.,** has of phenol 3, white petrolatum 97. For external use. **Sodii Phenolsulphonas** (*Sodium sulphocarbolate*), occurs in transparent, rhombic prisms, soluble in 5 of water. Dose, 2 to 10 grains. **Zinci Phenolsulphonas** occurs in transparent, rhombic prisms, soluble in 2 of water. Dose, 1 to 5 grains.

PHENOLSULPHONATE.—A salt of phenolsulphonic acid.

Zinc phenolsulphonate is antiseptic and disinfectant. It is used as an intestinal antiseptic and sometimes in small doses for fetor of the breath.

The phenolsulphonates of sodium and potassium are employed internally with advantage in septic diseases, the exanthems, diphtheria, puerperal fever, etc., with the object of obtaining the antiseptic action of phenol without the dangers attending its use in efficient doses. They may be used locally with good results in aphthæ, tonsillitis, otorrhea, gonorrhea, and for inflamed mucous membranes generally.

PHENOLSULPHONEPHTHALEIN TEST.—Rowntree and Geraghty have introduced a test of renal functional activity which has maintained its place for several years and represents the highest degree of accuracy so far obtained by simple and practical methods.

It should be thoroughly understood that normal excretion does not prove that the kidneys are free from disease. It does show that, at the time, the renal function is not seriously affected. We do not know what degree of change is required to produce recognizable impermeability.

Drug.—The drug is a non-toxic, bright red powder moderately soluble in alcohol and water and readily soluble in the presence of alkalies.

Normal Excretion.—It is excreted with almost incredible rapidity, appearing in the urine a few moments (five to eleven) after hypodermic injection, and being eliminated in normal cases almost wholly within 2 hours. From 50 to 60 percent of the drug should be excreted during the first hour, and from 70–90 percent by the end of the second.

Test Solution.—0.6 gram of the phenolsulphonephthalein and 0.84 c.c. of a 2/N NaOH solution (8 percent) are added to normal salt solution sufficient to make 100 c.c. The addition of a few drops more of the 2/N NaOH solution to the injection fluid at the time it is used changes the color of the test fluid to a wine red and renders it non-irritating to the tissues.

Technic.—(*a*) The patient is given 300 to 400 c.c. of water to insure free secretion. (*b*) A catheter is passed into and retained in the bladder after this viscus is completely emptied. (*c*) At a carefully noted time, 20 to 30 minutes after the ingestion of the water, 1 c.c. of the test solution (6 mg. of the drug) to which 2 or 3 additional drops of the 2/N NaOH solution have been added to prevent irritation, is injected into the upper arm. (*d*) From this time all of the urine is led into a test-tube containing a drop of 25 percent sodium hydrate solution and the first appearance of a pink color carefully noted.

This represents the initial excretion period which normally varies between 5 and 11 minutes.

Obstructive vs. Unobstructive Cases.—If no obstruction to micturition exists the catheter now may be removed, the patient voiding at the end of both the first and second hours.

In obstructive cases the catheter is clamped and maintained *in situ* until 2 hours have elapsed, the bladder being drained at the end of each hourly period.

Colorimeter.—The amount excreted is measured by a colorimeter. Each hour's voiding, being measured and its specific gravity determined, is placed in a 1-liter volumetric flask and treated with sufficient 25 percent NaOH solution to alkalinize it and thus develop the maximum color, a brilliant purple red.

Sufficient distilled water to bring the solution to the 1-liter mark is then added, the mixture thoroughly shaken up and a filtered portion taken for comparison with a standard solution consisting of 1 c.c. of the test solution in 1 liter of water, plus 1 or 2 drops of a 25 percent NaOH solution.

The standard solution is accurately adjusted to the 10-mm. mark of the scale and compared with the unknown solution, the percentage of drug excreted being calculated by the differences in scale required to secure uniformity of color in the two solutions.

Clinical Application.—In renal disease, both parenchymatous and interstitial, but especially the latter, the excretion is retarded and greatly diminished if the kidneys are insufficient.

Advantages Claimed for the Test.—Its originators claim for it the following advantages:

(*a*) It represents a non-toxic agent promptly secreted by normal kidneys, or by diseased kidneys, while functionally efficient, but retained for suggestively longer periods in actual renal insufficiency.

(*b*) The brilliant red of the solution lends itself readily to colorimetric determinations.

(*c*) In cardiorenal cases the drug may show clearly the extent of actual renal insufficiency inasmuch as simple chronic congestion, save in the most extreme degrees of incompensation, affects excretion but slightly as compared with actual nephritis.

(*d*) It permits better prognosis, forecasts or determines the presence of uremia and is of great importance with relation to proposed surgical procedure, and in warning the obstetrician of impending eclampsia.

(*e*) Within reasonable limits and in conjunction with ureteral catheterization it permits an estimate of the relative functionating values of the two kidneys.

Uremic Seizures.—During an actual uremic attack the elimination during 2 hours is almost nil.

Impending Attacks of Uremia.—In any nephritic patient a showing of 10 percent or less indicates an impending uremic seizure (Greene's *Medical Diagnosis*).

PHENOSALYL.—A clear, syrupy liquid, prepared by fusing together phenol 9 parts, salicylic acid 1, lactic acid 2, and menthol 0.1. It has a pleasant odor, is very soluble in water, and is used in a 1 percent solution as an antiseptic application, and in 10 to 30 percent solutions as a curative lotion for varicose ulcers and ulcerated gummata. It is said to be superior as a germicide to any one of its ingredients, and to prove much less toxic than the agents usually so employed.

PHIMOSIS. See Penis (Diseases).

PHLEBITIS.—See Veins (Inflammation).

PHLEBOTOMY.—See Venesection.

PHLEGMASIA ALBA DOLENS (Milk Leg).—An acute swelling of the leg due to venous obstruction from thromboses, and occurring most frequently in women after labor.

Etiology.—It is usually due to some form of septic infection of the genital region. Perineal or cervical tears may be the point of entrance of the poison. Infection of the blood-vessels at the placental site is probably the most frequent cause. Occasionally it may be due to simple pressure; these cases arise usually during the latter part of pregnancy.

Symptoms.—The symptoms usually develop from 1 to 3 weeks after labor. The leg becomes swollen, firm, and tender on pressure. The skin is strongly stretched and white in color; movement of the leg is extremely painful. There may be tenderness and redness over the course of the femoral vein. One or both legs may be affected. Fever, rapid pulse, and prostration, more or less

marked, are common accompaniments. In the severer cases suppuration and abscess of the cellular tissue of the leg may develop.

Prognosis.—The prognosis depends very largely upon the cause of the condition. If it is an accompaniment of a general septic process, it is very grave. It is always doubtful, on account of the liability to embolism.

Treatment.—This consists in elevation of the leg with absolute rest. It should be well protected with cotton, and, if the pain is very severe, hot applications or ichthyol ointment may be tried. Should abscess occur, free incision and drainage are required. The constitutional treatment should consist in plenty of good, nutritious food and free stimulation.

PHLYCTENULAR CONJUNCTIVITIS.—See Conjunctivitis.

PHONENDOSCOPE.—An instrument designed to be used in place of the stethoscope in auscultation. It consists of a shallow metal cup covered by a disc of ebonite, with a perforation in the cup to which are attached rubber tubes for the ears. From the center of the disc of ebonite arises a little rod with a button at the end. The tubes are placed in the ears, and the button is placed over the organ to be examined, while the finger is drawn over the skin, beginning at the point where the button is applied and running outward. The rasping bruit heard before the application of the phonendoscope ceases as soon as the finger passes beyond the organ. The instrument is useful to differentiate murmurs and distinguish between endocardial and pericardial sounds. It is a distinct improvement over the binaural stethoscope. See Chest (Examination).

PHOSPHORIC ACID. H_3PO_4.—Orthophosphoric acid. It is said to be of value in strumous affections, but is of little real benefit except as a feeble digestive stimulant. **Dilute phosphoric acid** contains 10 percent of the absolute acid. Dose, 5 to 45 minims.

PHOSPHORUS.—A nonmetallic element, having a quantivalence of III or V, and an atomic weight of 31. Symbol, P. Phosphorus does not occur in the free state, but is widely distributed in rocks, in fertile soils, in animal and vegetable tissues, in urine, and in guano. The human body contains a large quantity of calcium phosphate in the form of complex organic compounds. Phosphorus is an important constituent of nervous tissue. In commerce it is prepared from bone-ash, or from sombrerite, an impure calcium phosphate found in West Indian guano. Phosphorus may be obtained in several allotropic forms. **Ordinary phosphorus** is a yellowish-white, waxy solid, of a specific gravity of 1.837. It melts at 44.2° C., and boils at 290° C. It is insoluble in water, soluble to a slight extent in olive oil and in ether, freely in carbon disulphid. **Red or amorphous phosphorus** is formed when ordinary phosphorus is heated to 240° C., in an atmosphere free from oxygen; also by the addition of a trace of iodin at 200° C. It is a dark red powder, having a specific gravity of 2.11, insoluble in carbon disulphid, noninflammable, nonluminous, and nonpoisonous. **Metallic rhombohedral phosphorus** is an allotropic form produced by heating phosphorus in a sealed tube with melted lead. Its specific gravity is 2.34. Other modifications have been described. Phosphorus combines with other elements to form phosphids; with hydrogen and oxygen to form a series of acids, known chiefly through their salts.

Therapeutics.—Medicinally, phosphorus is used as an alterative in osteomalacia, rickets, and ununited fractures. It is also employed in sexual impotence, in threatened cerebral degeneration, in neuralgia, and in convalescence from exhausting diseases. Dose, 1/150 to 1/50 grain.

Poisoning.—Ordinary phosphorus is exceedingly poisonous; it causes a widespread fatty degeneration, most marked in the liver. Vomiting is one of the earliest symptoms, the material ejected being generally luminous in the dark. Jaundice appears usually within 36 hours; sometimes, however, much later. The liver is at first enlarged, but subsequently diminishes in size. Cerebral symptoms of an intense type occur—wild delirium, convulsions, coma. Death is generally due to failure of respiration and circulation. The urine in phosphorus-poisoning is albuminous, contains bile acids and pigments, and leucin and tyrosin. Chronic phosphorus-poisoning is common among workers in match factories. A prominent symptom is necrosis of the jaws. See Jaws (Diseases).

The treatment of phosphorus-poisoning consists in the administration of emetics and purgatives and of the antidote—copper sulphate or old French oil of turpentine.

Preparations.—**Acidum Hypophosphorosum,** a liquid composed of 30 percent by weight of absolute hypophosphorous acid, H_3PO_2, and 70 percent of water. **Acidum Hypophosphorosum Dilutum,** a liquid composed of 10 percent of the absolute acid and 90 percent of water. Used in the preparation Syrupus hypophosphitum. Dose, 5 to 10 minims. **P. Pilulæ,** each contain phosphorus 1/100 grain dissolved in chloroform, mixed with althæa and acacia in glycerin and water, and coated by shaking with a solution of balsam of tolu in ether. Dose, 1 to 2. **Calcii Hypophosphis,** colorless prisms, or thin, pearly scales, of nauseous taste, soluble in 6.8 of water, insoluble in alcohol. Is an ingredient of the syrupus hypophosphitum. Dose, 5 to 15 grains. **Ferri Hypophosphis,** a white or grayish-white powder, odorless and tasteless, slightly soluble in water. A ferruginous tonic. Dose, 1 to 5 grains. **Mangani Hypophosphis,** a pink, crystalline powder, soluble in water, almost insoluble in alcohol. Dose, 1 to 5 grains. **Potassii Hypophosphis,** white masses, or a white granular powder, deliquescent, odorless, of saline taste and neutral reaction. Soluble in 0.6 of water and in 7.3 of alcohol at 59° F. Dose, 5 to 10 grains. **Sodii Hypophosphis,** small plates, or a white, granular powder, deliquescent, odorless, of sweetish, saline taste, and neutral reaction. Soluble in 1 of water and in 30 of alcohol at 59° F. Dose, 5 to 30 grains. **Syrupus Hypophosphitum** has of calcium hypophosphite 4 1/2, of potassium and sodium hypophosphites 1 1/2 each, percent. Dose, 1 to 4 drams. **Calcii Phosphas Præcipitatus,** a

light, white amorphous powder, insoluble in water or in alcohol. Dose, 2 to 30 grains. **Syrupus Calcii Lactophosphatis** has of calcium carbonate 2 1/2, lactic acid 6, phosphoric acid 3.6, percent. Dose, 1 to 4 drams. **Sodii Phosphas,** large, colorless, monoclinic prisms, efflorescent, of saline taste and alkaline reaction; soluble in 6 of water, in 1 1/2 of boiling water; insoluble in alcohol. Its solubility in water is much increased by the addition of citric acid. Dose, 20 grains to 2 drams. **Sodii Phosphas Exsiccatus** is the crystallized phosphate allowed to effloresce, and then gradually heated to 212° F. until the salt ceases to lose weight. Dose, 10 to 20 grains. **Sodii Phosphas Effervescens** has of the exsiccated salt 20, sodium bicarbonate 47 3/4, tartaric acid 25 1/4, citric acid 16 1/4. Dose, 1 to 3 drams. **Liquor Sodii Phosphatis Compositus** has of the phosphate 100, sodium nitrate 4, citric acid 13, water to 100. Dose, 1 to 3 drams. **Sodii Pyrophosphas,** colorless, monoclinic prisms, of saline taste and alkaline reaction; soluble in 12 of water, insoluble in alcohol. Dose, 10 to 45 grains. **Elixir Ferri, Quininæ et Strychninæ Phosphatum** has 1/64 grain of strychnin in each dose of 1 dram. Dose, 1/2 to 2 drams. **Glyceritum Ferri, Quininæ et Strychninæ Phosphatum** has in each dose of 15 minims 1/80 grain strychnin. Dose, 10 to 20 minims. **Syrupus Ferri, Quininæ et Strychninæ Phosphatum** has in each dose of 1 dram 1/80 grain strychnin, and is prepared by mixing the glycerite 25 with syrup to 100. Dose, 1/2 to 2 drams. **Ferri Phosphas Solubilis,** and **Ferri Pyrophosphas Solubilis** are described under Iron. For glycerophosphates, see Glycerophosphoric Acid.

PHOTOMICROGRAPHY.—A photograph of a small or microscopic object, usually made with the aid of a microscope, and of sufficient size for observation with the naked eye. A microphotograph is a microscopic (in size) photograph.

Apparatus.—Different varieties have been devised; possibly the simplest consists of a camera with extra long bellows length and stable base or support upon which the microscope can be clamped. Of the different varieties, the horizontal, the reversible, and the reversible in a vertical position have been described. While sunlight is preferred, light derived from a paraffin lamp, incandescent gas, magnesium oxyhydrogen, acetylene or electric light will do. An apparatus which may be used in either the vertical or horizontal position is offered by the leading microscope makers in America and abroad. A compound microscope with larger diameter body tube is preferable.

The camera is so made that bellows is adjustable at both ends along its supporting bed bar attached to the heavy base which supports also the microscope in relation to the bellows so that the sensitive plate may at all times be kept parallel to the specimens under the microscope whether bellows stands vertically, inclined or in a horizontal position. The double plate carrier is the usual 4 by 5 inches size with kits for 3 1/4 by 4 1/4 plates. Any of the hand camera shutters may be used on the front board; a light-tight connection is provided between shutter and microscope tube. Where artificial light is used simply the lamp with bull's-eye lens separately or in combination will do. A more elaborate illuminating system of lamp and condensers as supplied on projection lanterns is used quite often. A dark room is necessary only for loading plate holders and developing plates after exposure. Depending upon the size of the objective and character of specimen, also light intensity, exposures from 1/25 second to 10 minutes are made.

Practical Manipulation (Crookshank).—For working with the paraffin lamp, the mode of procedure is, as regards the illumination, briefly as follows: The substage condenser, as well as the mirror, is dispensed with when a low power is employed, and the lamp is so placed that the image of the flat of the flame appears accurately in the center of the field of the microscope. A bull's-eye condenser is then interposed, so that the image of the flame disappears and the whole field is equally illuminated. With high powers the substage achromatic condenser is necessary, and a more intense illumination is obtained by using the flame edgewise. In using a low power with the oxyhydrogen light, the lantern is withdrawn some little distance from the microscope. By opening and closing the shutter of the camera, the plate is exposed usually about 3 seconds.

Determination of amplification varies with the object employed, and also with the distance of the focusing screen from the object. To determine the amplification afforded by a certain objective at a certain distance, a photograph should be taken, under the same conditions, of the lines of the micrometer slide. From this calculate the amplification obtained by the photomicrograph.

PHOTOPHOBIA.—A dread or intolerance of light, usually due to some inflammation of the eye. It is particularly common in strumous children with phlyctenular disease of the cornea. It may be present in any inflammatory condition of the eye, whether of the conjunctiva, cornea, iris, ciliary body, choroid, or retina. In many cases it is directly due to uncorrected ametropia. In such instances the constant use of tinted glasses is most pernicious. Photophobia is often associated with diseases of the nervous system, cerebral irritation, meningitis, etc. It is also seen in many pyrexial conditions. See Eye.

PHOTOTHERAPY (Light Therapy).—The treatment of disease by light rays. The beneficent effects of light upon the debilitated body have long been recognized. Besides the ordinary **sun-bath,** various means of using artificial light have been proposed. To the chemic properties of the ultraviolet rays are attributed the good effects of the **electric-light bath.** The functions of the organism are stimulated without elevation of temperature and consequent disturbance of circulation.

At the present time, the term phototherapy is more strictly used to designate the treatment of skin-diseases and other affections in the manner devised by Finsen, of Copenhagen. This investigator treated the exanthems of small-pox and other

eruptive diseases by means of red light. As the "chemic" (blue, violet, and ultraviolet) rays of light are capable of causing an inflammation (erythema solare) of the healthy skin, it may be assumed that they are equally capable of aggravating preexisting inflammations. In other words, if the diseased skin was protected against the injurious action of the chemic rays of light, it would be possible to diminish the intensity of the inflammation, and thus prevent suppuration. The object was therefore to exclude the chemic rays of light which are injurious to the skin. In a new treatment of lupus and other bacterial skin-diseases devised by Finsen, these rays are now used as curative agents. The method consists in treating local superficial bacterial skin-diseases by the concentrated chemic rays of light. Bie, an assistant of Finsen, published a description of the method and technic, and it is from his paper that the material for the present article has been obtained.

The experimentally proved data on which the method is founded are the following.

1. The bactericidal property of the chemic rays of light.
2. The power of the chemic rays of light to produce an inflammation of the skin (erythema solare).
3. The power of the chemic rays of light to penetrate the skin.

The Bactericidal Property of the Chemic Rays of Light

The bactericidal property of light, originally demonstrated by Downes and Blunt, has more recently been studied in detail by a great many investigators. The particular question which is of the greatest interest in this connection is the following: Whether the bactericidal property is essentially attached to a single part of the spectrum, or whether it resides only in the whole uncolored light. The most trustworthy examinations have given the result that it is especially due to the blue and violet rays. If it is desired to employ the bactericidal property of the light therapeutically, the greatest possible number of violet and ultraviolet rays must be procured. On the other hand, the red, yellow, and green are useless.

Another condition for the advantageous use of the bactericidal property of the light therapeutically is that the bacteria are quickly killed. Finsen has found that on days of bright sunshine at noon in July and August in Copenhagen, the sunlight killed the bacillus prodigiosus in plate-cultures within 1 1/2 hours of insolation. An electric arc-lamp of 25 amperes killed a plate-culture of the bacillus prodigiosus at a distance of 75 cm. from the carbon points after 8 or 9 hours' exposure.

Even the strongest sunlight in summer—which takes more than 1 hour to kill the bacteria in plate-cultures, and probably still longer when they are growing in the skin—has then too slight a bactericidial property ever to be of any use for therapeutic purposes, otherwise all bacterial skin-diseases would be cured spontaneously in the summer. In order to obtain a more energetic effect, Finsen concentrates the light by means of apparatus, which is described later. It is only when the light is concentrated in such a way that it contains as many blue, violet, and ultraviolet rays as possible that its bactericidal property becomes so powerful that it can be used therapeutically with advantage. Concentrated electric light, which Finsen now uses for the treatment of patients, kills the bacteria until now examined in a few seconds when they are spread in a stratum of agar about 1/5 mm. thick.

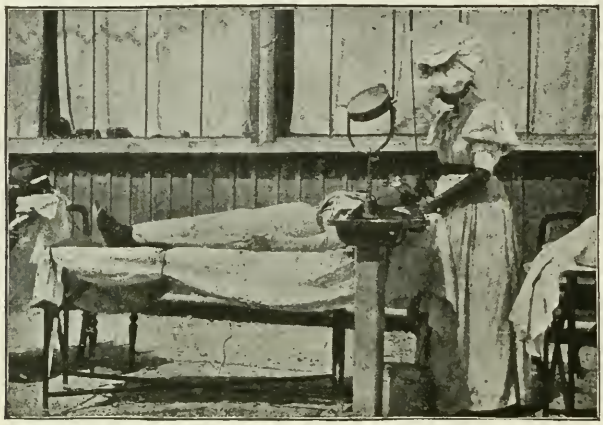
The Power of the Chemic Rays of Light to Produce an Inflammation of the Skin

The old name of erythema solare (erythema calorícum) proves that this disease was supposed to be due to a too intense heating of the skin consequent on the heat that always is inseparable from the light. Widmark (Stockholm) first experimentally showed the error of this view. He concentrated the electric light into parallel rays by means of a lens of quartz, and applied them to the skin, after they had passed either through a layer of distilled water, which absorbs the ultrared rays (dark rays of heat) or through a glass plate, which absorbs a large part of the ultraviolet rays. It turned out to be immaterial whether the light contained the ultrared rays or not; on the other hand, the absorption of the ultraviolet rays by the glass plate prevented completely the appearance of the inflammation. The experiments of Widmark prove, then, that the ultraviolet rays are of predominant importance in regard to producing light erythema. Later researches made by Finsen have confirmed this, and further he has proved that the blue and violet rays have also the power to produce the specific photochemic inflammation, but in a slighter degree than the ultraviolet rays. It is still impossible to decide finally of what importance this photochemic erythema is in regard to treating bacterial skin-diseases with concentrated chemic rays of light; but that, at any rate, it is not quite insignificant for the treatment of lupus vulgaris may well be considered probable, in view of the trials made of other methods of treatment which tend to cause an inflammation of the skin.

The Power of the Chemic Rays of Light to Penetrate the Skin

This point has been investigated by Godneff and Finsen. With a trocar Godneff placed small sealed glass tubes with silver chlorid under the skin of dogs and cats. Then he allowed some of these animals to remain in the dark, while he exposed the rest of them to the direct sunlight. After an hour he took out the tubes; and it was invariably found that the silver chlorid was blackened in those animals exposed to the sun, but not in those kept in the dark. The chemic rays of light can then penetrate the skin. Finsen thus proved that they penetrate far more easily in bloodless tissues than those filled with blood. He placed a piece of sensitized paper on one side of a man's ear, letting

the blue and violet rays of one of his apparatus for concentration of sunlight fall on the other side of the ear. After 5 minutes this paper was not affected; on the other hand, the paper was distinctly blackened in 20 seconds, if all the blood was pressed out of the ear between 2 glass plates. In agreement with this is the fact that by looking into a spectroscope through an ear filled with blood the observer will only discover a red stripe; if the ear is made anemic, the spectrum will consist of all the colors. Accordingly, the area of the skin that is going to be treated is made as anemic as possible.



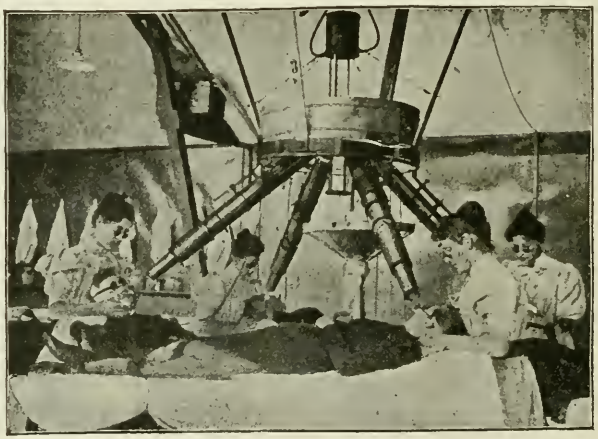
Treatment by Sunlight.

Description of the Apparatus

Based as it is on these three experimentally proved facts, this method of treatment is so rational that objections can scarcely be raised against it from a theoretic point of view. In the treatment of patients sunlight is used in the summer, when the sky is bright, otherwise the light of electric arc-lamps of 50 to 80 amperes. As already explained, it is only by concentration that the light becomes so powerful that its bactericidal property can be used in treatment. In order to avoid burning the skin it is also necessary to cool the light. This double object—to make the light stronger and cooler—is attained, in regard to the sunlight, by an apparatus consisting of a lens of about 20 to 40 cm. in diameter. The lens is composed of a plane glass and a curved one, which are framed in a brass ring, and between them there is a bright blue, weak, ammoniacal solution of copper sulphate. As one surface of the liquid is a plane, the other one being curved, its optic function is that of an ordinary planoconvex glass lens. By making the lens of a blue liquid instead of solid glass, a considerable cooling of the light will be obtained, because water absorbs the ultrared rays, and because the blue color excludes a considerable amount of the red and yellow rays. These three kinds of rays have particularly strong heating effect, while their bactericidal power is insignificant. On the other hand, the blue, violet, and ultraviolet rays, which it is important to procure in as great a number as possible, are but very slightly impaired by passing through the blue liquid. The lens hangs on a foot, made in such a way that the lens can be raised and lowered as well as turned on a vertical and horizontal axis; therefore it is easy to place the lens perpendicularly on the sun-rays, and at such a distance as to make the light strike the area of skin which it is intended to treat.

The apparatus for concentrating the electric arc-light consists of lenses of quartz framed in two brass tubes, which can be moved, the one into the other, like the two pieces of a telescope. Lenses of quartz are used because this material, in a far higher degree than glass, allows the ultraviolet rays to pass through. The apparatus for concentrating the sunlight may, on the other hand, be made of glass, because all the ultraviolet rays of the sunlight have so long a wave-length that they can pass through glass; those of a shorter wave-length are already absorbed by the atmosphere.

In the part of the apparatus which faces the lamp, two lenses are placed that have together a focal distance of 12 cm.; when the apparatus is placed in such a way that the first lens is exactly at this distance from the points of the carbons of the lamp, they consequently will concentrate the divergent rays coming from the lamp and make them parallel; these rays pass through the brass tubes, at the distal end of which they meet again with two lenses of quartz, which concentrate the



Treatment by Electric Light.

parallel rays, making them convergent. Between these two quartz lenses there is distilled water, which cools the light by absorbing the intensely heating ultrared rays, but does not impair the blue, violet, and ultraviolet ones. It is not possible, as in the apparatus for the sun, to make the water blue in order to cool the light further, because the extreme ultraviolet rays, which abound in the electric light, may well pass the quartz, but get absorbed by the blue coloring matters; the advantages of using the lenses of quartz would consequently be lost if the light got cold through a blue solution. Of course, the distilled water between the quartz lenses is heated by the absorption of the ultra-red rays. In order to avoid too much heating (boiling), cold ordinary water may be run through the mantle surrounding this end of the apparatus.

Four such apparatus for concentrating are fixed to an iron ring around each lamp, this ring again being fixed to the ceiling by 4 iron supporters. The lamp is movable up and down by the mechanism, and can be put exactly into the center of the ring by the aid of four strings, which are connected with screws in the iron support. The apparatus for concentrating hangs on iron arms, fastened to the ring, and depends from this at an angle of about 45 degrees, because the lamp sends out the strongest light in this direction; the apparatus for concentrating can be put nearer to or further from the lamp by sliding on the iron arm. By this disposition the lamp and the apparatus for concentrating can be fixed so that the points of the carbons are exactly in the focus of the front lenses of all the four apparatus. The apparatus for concentrating can be revolved on a perpendicular axis and a horizontal one by 3 screws; by this they can be so placed that the axis of the apparatus gets fused with the axis of the parallel rays, so that no light is striking the brass cylinders. The distant focus can be placed at the height which suits the patient by pushing the lowest cylinder into the uppermost one of the concentration apparatus.

Through the two forms of apparatus for concentrating described, the concentrating and cooling of the light are thus affected. But the light is still too warm to be applied to the skin without hurting it; the skin must therefore be cooled in order to avoid burning. This is effected by a little apparatus consisting of a plate of quartz and a plain convex lens of quartz, both framed in a conic brass ring which carries 2 small tubes and 4 arms; to each arm is fastened an elastic band, by means of which the apparatus is pressed against the skin. By making cold water run into one of the tubes and out of the other one, the skin would be cooled to such a degree that it can stand even the strongest light. By the pressure which the planoconvex quartz lens excites on the skin this is made anemic, so that the chemic rays penetrate it much better. In this manner an area of skin 1 1/2 cm. in diameter is treated for 1 hour each day. The treated skin reddens and swells, a bulla may appear, but necrosis has never been observed. The illustrations on the previous page show the arrangement of the apparatus for treatment.

Results of Treatment

Finsen has tried to treat different skin-diseases, known or supposed to be of microbic origin, but it is only of lupus vulgaris, lupus erythematosus, and alopecia areata that he has treated a number of cases sufficiently great to estimate the value of the method

Lupus Vulgaris.—Up to the time of publication of the first edition of this work about 350 cases of this disease altogether had been treated. The first patients were treated entirely by light; the same thing is done with all the slighter cases; on the other hand, in the more serious cases the treatment by light is assisted by treatment with pyrogallic acid ointment in order to make the skin smooth and as easily penetrable by the light as possible. While one part is being treated by light, the pyrogallic acid ointment is put on another part; when the cauterization is healed by a zinc ointment, this area of skin is treated by light; this treatment with ointment is not necessary for obtaining a good result, but it saves much time for the patient. All ulcerations are kept free from crusts by a cataplasm of a boric acid solution. The mucous membranes are touched with a solution of iodin and potassium iodid (1 : 2 : 2), or are treated with the galvanocautery. Only the skin, the hard palate, the front part of the septum nasi, tongue, and the mucous membrane of the cheek have been healed by this method.

In none of the cases was the treatment without effect, but in about 5 cases the improvement was very slow, either because the disease was progressing so rapidly that it was extending in one place while the treatment went on in another, or because the lupus was so deep that the light could only with difficulty penetrate to it. In all the 350 other cases the result of the treatment has been satisfactory. Of course, it takes some time—until all the diseased tissue is thoroughly treated and the formation of scar tissue has begun—before any improvement is visible; but from the moment it begins it is continued without interruption until the last nodule of the lupus patch has disappeared. In all these 350 cases this result was so certain and so constant that there is even reason to doubt the accuracy of the diagnosis of lupus vulgaris when this method of treatment appears to be ineffective.

The principal advantages of the method are, besides its reliability, its excellent cosmetic results, the infrequency of relapses and their slight extent, and that the treatment is painless. The good cosmetic result is due to the fact that there is no destruction of tissue, healthy or diseased. It is for the same reason that the results in respect to relapse are so favorable. One may, without harm, treat both the diseased tissue and the apparently healthy surrounding skin until one is fairly sure of having destroyed all the disease-germs. When the patient has been treated until there are no distinct nodules of lupus to be seen at the moment, the treatment is discontinued until the swelling and

redness of the skin have disappeared, so that it is easier to determine whether anything is left of the disease or not. If there is nothing visible, the patient is still kept under observation. Many must, however, be submitted to a second course of treatment. Whether the nodules which develop are the result of recurrence, or whether they could not earlier be recognized as lupus nodules, is a matter of little consequence in itself. The principal thing is that there have always until now been a few scattered nodules, which disappear after a short further course of treatment. If the treatment is carried on for some time after the last nodule of lupus seems to have disappeared, recurrence would be more surely guarded against. The fact that the treatment is discontinued as soon as it is thought justifiable to do so, is due solely to the wish to save the time and the money of the patients as far as possible. Inasmuch as the efficacy of the treatment is absolutely certain, and the patients, on account of its painlessness, are very willing to submit themselves to a second course, a recurrence is not nearly so serious a matter as it is after the older methods of treatment.

Lupus Erythematosus.—The treatment of this disease has in many cases given excellent results—permanent recovery and firm scars. Nevertheless, the effect of the treatment is not nearly so sure as it is in the case of lupus vulgaris. A few cases have improved very slowly and with a constant tendency to recurrence. What the cause of this great individual difference may be it is still impossible to determine, if for no other reason, because we have not a sufficiently great material (altogether only 28 patients).

Alopecia Areata.—As the indication for the treatment by concentrated chemic rays of light is that the disease must be superficial, local, and bacterial, and as it is at least possible that alopecia areata is due to an infection, Finsen has tried to treat this disease. In January, 1899, when the first experiments were published in Danish, 7 cases in all had been cured.

On the whole, the trials made until now look promising. Whether all the fresh cases will give results as satisfactory as in those described can be solved only by further experiments. To judge from the later experiments, even the old decalvans form seems to be curable, though only after a long treatment (Bie).

Roentgen rays have been used in same manner and for conditions similar to those treated by Finsen, as well as for epithelioma.

Light Cabinets

These are closed wooden compartments, in which the patient sits or stands, allowing only the head to protrude. Upon the inside of this cabinet is distributed a number of incandescent lamps (25 to 100).

All observers probably agree that the light cabinet is one of the best forms of sweat-bath, in that the perspiration breaks out more quickly and at a lower temperature than in other baths. Following the artificial sweating process there is a reduction in blood-pressure. The indication for treatment may be judged by these two physiological processes.

High power incandescent lamps consist of incandescent lamps of 300 to 600 candle power surrounded by reflectors which cause the rays to cross at certain points, or areas of intensification. They are used with a fair degree of success in the treatment of eczema, pruritis, impetigo, nevus, ichthyosis, herpes simplex, herpes zoster, tinea, psoriasis, carbuncle, acne, furunculosis, etc.

For the treatment of the above conditions the light from these lamps is brought close enough to produce a destructive effect, or far enough away to obtain only a stimulant effect. In the former, the surrounding tissues are protected by asbestos. The applications vary from a few seconds to 15 or 20 minutes.

These lamps are also used for the relief of painful conditions about the joints and muscles. The effect is due chiefly to the heat.

Conclusions

A more recent critical review by Bie leads him to the following conclusions:

Biologic Effects.—(1) The chemic rays, except the red, yellow and green can cause a burn of the skin (Bouchard, Widmark and Finsen). (2) The ultraviolet rays cause an enlargement of the cutaneous vessels which may last at least five or six months. (3) There is nothing to show that light has any influence upon the quantity of hemoglobin in the blood. (4) The assertion of Moleschott and of others that light increases the excretion of carbon dioxid cannot be counted as proved. (5) Chemic rays of light have an exciting influence on lower animals, light has probably a similar exciting influence on men; according to some investigators red light has an exciting effect and the violet rays have a quieting influence on psychic processes, a property which has been made use of with success for quieting maniacal patients. (6) The red light-rays can penetrate the organism deeply; the blue and violet rays can only penetrate the tissues when they are bloodless; the ultraviolet rays cannot penetrate farther than the superficial layers of the skin. (7) The same is true of the power of light to kill bacteria in the organism, a power which pertains almost exclusively to the chemical rays, having, therefore, curative effect only on superficial affections; there can therefore be no use trying to kill tubercle bacilli in the larynx or in the lungs by transmitted light, as some American physicians have proposed doing.

Therapeutic Effects.—(1) Finsen's treatment of small-pox with red light is based on this, that by the exclusion of the inflammatory influence of the chemic rays on the skin the formation of pus in the vesicles and also secondary fever and pocks are prevented. (2) The treatment of other exanthematous diseases by red light has not yet been thoroughly investigated. Bachmann and Chatiriere have obtained favorable results in the treatment of measles, and Krukenberg in the treatment of erysipelas. (3) The incandescent sweat-baths constructed by Kellogg must be considered as nothing more than sweat-baths which have no

specific effects. In this connection, however, there seems to be unity of opinion that they are the most complete of all sweat-baths. (4) The local illumination by incandescent or arc-lamps, made by various Russian physicians, especially Minin, have no claim on our attention. (5) The general light therapy of the future will undoubtedly be sun-baths without subsequent packing, or electric arc light-baths 150 to 200 amperes with sweating. We know at present too little of the general effect of light for us to be able to fix definite indications. (6) The only local application whose efficiency has been proved is Finsen's treatment of skin-disease with concentrated chemic light-rays. The excellent cosmetic results obtained are to be ascribed to the fact that the method is the most complete imaginable; nothing is destroyed; there is no shrinking; the scars are white and smooth; also, as the result of this treatment, not only can the diseased tissues be treated, but the contiguous sound tissues as well; in this way danger of recurrence is lessened; the treatment is painless; the curative effect is remarkable. In 640 patients the treatment had to be stopped on account of bad results in only 1.7 percent while 85 percent show an absolutely favorable result. Only in the case of 15 percent was the improvement so slow that the result could be considered as less favorable. The recurrent conditions are favorable under the treatment. In lupus erythematous the results were somewhat uncertain. In alopecia areata, nævus vascularis, acne vulgaris, acne rosacea, and epithelioma cutaneum very favorable results were obtained, especially when it is considered that the cases were almost always severe, such as could be cured by no other treatment.

PHTHISIS.—See Tuberculosis.

PHYSOSTIGMA (Calabar Bean; Ordeal Nut).—The seed of *P. venenosum*, native of West Africa. The properties of the drug depend upon 2 alkaloids, **physostigmin** or **eserin**, $C_{15}H_{21}N_3O_2$, which paralyzes the motor functions of the spinal cord and stimulates muscle-fiber, and **calabarin**, which acts similarly to strychnin. Physostigma should contain not less than 0.15 percent of alkaloids soluble in ether. Dose, 1 to 3 grains. Applied locally to the eye, physostigmin causes contraction of the pupil and diminishes intraocular tension. On account of its action on muscles it causes increased peristaltic movements of the intestines. In toxic doses death is produced by failure of respiration.

Its therapeutic uses are: In diseases of the eye, as in glaucoma and in iritis, to contract the pupil, and, alternated with atropin, to break up adhesions after iritis; in convulsive diseases, as tetanus and strychnin poisoning; in constipation from atony of the intestines; in bronchitis and dyspnea, from weakness of the bronchial muscles. It is also used as an antidote to atropin and to strychnin.

For poisoning give an emetic and inject atropin. In tetanus:

℞. Extract of physostigma, gr. iij
Powdered ginger, gr. vj.
Make 6 pills. One pill every hour.

To procure sleep in delirium tremens:

℞. Tincture of physostigma, ♏ xx
Water, ʒ j.
To be taken at one dose.

Preparations.—**Extractum Physostigmatis**, an alcoholic extract, of which the usual dose is 1/16 to 1/4 grain, but 1 to 4 grains are used in tetanus. **Tinctura Physostigmatis**, 10 percent. Dose, 5 to 20 minims. **Physostigminæ Salicylas**, *eserine salicylate*, colorless, columnar crystals, of bitter taste and neutral reaction, soluble in 150 of water and in 12 of alcohol. Dose, 1/100 to 1/30 grain. **Physostigminæ Sulphas**, *eserine sulphate*, a white, microcrystalline powder, of bitter taste, very deliquescent in moist air, very soluble in water and in alcohol. Dose, 1/100 to 1/30 grain. See Eserin.

PHYTOLACCA.—The dried root of *P. decandra*. It contains a neutral principle, *phytolaccin*, and an acid, *phytolaccic acid*, also tannin, starch, fixed oil, etc. Dose, as an alterative, 1 to 5 grains; as an emetic, 10 to 30 grains. It is an emetic, cathartic, and motor depressant. Toxic doses cause death by paralysis of the organs of respiration. Its action is antagonized by alcohol, opium, and digitalis. It is serviceable in chronic rheumatism, mastitis, tonsillitis, malignant tumors, eczema, and similar skin affections. It has also been used as a remedy for obesity. Fluidextract of Phytolacca. Dose, as an alterative, 1 to 4 minims; as an emetic, 10 to 30 minims.

PICA.—The craving for unnatural and strange articles of food; a symptom present in certain forms of insanity, in hysteria and chlorosis, and during pregnancy. Pica is especially urgent during the first 2 or 3 months of pregnancy. It is popularly known as "longings" or "pinings." In exceptional cases it may amount to insanity, and injurious substances—sometimes very disgusting ones—are eagerly partaken of. Regulation of the digestive tract, combined with moral suasion and some mental diversion, are about all that can be tried in the way of treatment. With the end of pregnancy the condition ceases.

PICRIC ACID, *carbozotic acid*, *trinitro-phenol*, $C_6H_2OH(NO_2)_3$, occurs in yellow scales which are soluble in 75 of water. Externally it is antiseptic, analgesic, coagulant, and in solution is nonirritant to the tissues, but is too corrosive for internal use. A saturated aqueous solution is highly recommended as a local application in erysipelas and burns, and is an efficient test for albumin in the urine. *Ammonium picrate* has been credited with antiperiodic and anthelmintic powers, and is highly praised in pertussis and in exophthalmic goiter, in doses of 1/8 to 1/2 grain thrice daily.

PILES.—See Hemorrhoids.

PILLS (Pilulæ).—Spherical masses composed of medicinal agents and intended to be swallowed whole. The *mass* consists of the active ingredients and the *excipient*, the latter being the substance which gives the mass its adhesive and plastic qualities.

There are 14 official pills:

Title:	Constituents.	Dose.
Pilulæ		
Aloes.....	Purified aloes and soap, each 13 gm., in 100 pills.	As a laxative, 1, 2, or 3 pills at bedtime; as a purge, 5 pills.
Aloes et Ferri.....	Purified aloes, iron sulphate and aromatic powder, each 7 gm.; confect. rose, q. s., in 100 pills.	2 pills.
Aloes et mastiches (Lady Webster dinner pills).	Purified aloes, 13 gm.; mastic, 4 gm.; red rose, 3 gm.; in 100 pills.	2 pills.
Aloes et myrrhæ..	Purified aloes, 13 gm.; myrrh, 6 gm. aromatic powder, 4 gm.; syrup, q. s. 100 pills.	From 3 to 6 pills.
Asafœtidæ.....	Asafetida 20 gm.; soap, 6 gm.; 100 pills.	3 pills.
Catharticæ compositæ.	Compound extract of colocynth, 80 gm.; calomel, 60 gm.; jalap (resin), 20 gm.; gamboge, 15 gm.; 1000 pills.	2 pills.
Catharticæ vegetabiles.	Compound extract of colocynth, 60 gm.; extract hyoscyam., 30 gm.; resin of jalap, 20 gm.; extract leptandra, 15 gm.; resin podophyllum, 15 gm.; oil of peppermint, 8 c.c. in 1000 pills.	2 pills.
Ferri carbonatis (Ferruginous pills, chalybeate pills. Blaud's pills.)	Ferrous sulphate, 16 gm. potassium carbonate, 8 gm.; sugar, 4 gm.; tragacanth, 1 gm.; althæa, 1 gm.; glycerin and water, q. s. in 100 pills.	2 pills.
Ferri iodidi.....	Reduced iron, 4 gm.; iodin, 5 gm.; powdered glycyrrhiza, 4 gm.; sugar, 4 gm.; ext. glycyrrhiza, 1 gm.; acacia, 1 gm.; q. s. each water, balsam tolu, and ether. (See U. S. P.)	2 pills.
Laxativæ compositæ.	Aloin, 1.39 gm.; strychnin, 0.05 gm.; extract belladonna leaves, 0.80 gm.; ipecac, 0.40 gm.; glycyrrhiza, 4.60 gm.; syr., 100 pills.	2 pills.
Opii.....	Powdered opium, 6.5 gm.; soap, 2.0 gm.; 100 pills.	1 pill.
Phosphori.....	Phos., 0.06 gm.; althæa, 6.00 gm.; acaciæ, 3.00 gm.; phosphorus dissolved in chloroform, and made into a pill with about 4 c.c. of a mixture of 2 vol. glycerin, 1 vol. water. Coated with 10 gm. balsam of tolu dissolved in 15 c.c. ether.	1 pill.
Podophylli, belladonnæ et capsici.	Resin podophyllum, 1.6 gm.; extract of belladonna leaves, 0.8 gm.; capsicum, 3.2 gm.; sugar of milk, 6.5 gm.; acacia, 1.6 gm.; glycyrrhiza syr. q. s. 100 pills.	1 pill.
Rhei compositæ....	Rhubarb, 13 gm.; aloes, 10 gm.; myrrh, 6 gm.; oil of peppermint, 0.5 gm., in 100 pills.	2 pills.

PILOCARPUS (Jaborandi).--The leaflets of *Pilocarpus jaborandi* or of *P. microphyllus*, yielding not less than 1/2 percent of alkaloids. They contain the alkaloids *pilocarpin*, a syrupy fluid, slightly soluble in water, and forming salts; *jaborin*, isomeric with pilocarpin, but antagonistic thereto in action, and does not form crystallizable salts; *pilocarpidin*, which acts like pilocarpin; also a volatile oil, which consists chiefly of *pilocarpene* and a peculiar acid. Dose, 10 to 45 grains.

Therapeutics.—Pilocarpin stimulates the peripheral ends of the secreting nerves going to glands, perhaps also the centers. It thus causes an increased flow of the saliva, marked sweating, secretion of tears, of mucus from the nose and the bronchi; of the gastric and intestinal juices. It also stimulates involuntary muscle. On the vagus it acts as a stimulant, causing slowing of the pulse; in large doses it paralyzes the vagus. Vomiting is produced by jaborandi and sometimes by pilocarpin alone. Pilocarpin causes contraction of the pupil. Its action is antagonized very completely by atropin. Therapeutically, pilocarpin is used chiefly in renal dropsy to produce sweating; also in uremia, for the same purpose. It probably causes an elimination of urea and other waste products, both in the sweat and in the saliva. As a diaphoretic it is also employed in coryza and bronchitis. It has been used most successfully in erysipelas. It may abort the paroxysms of malarial fever, but it is not to be employed in asthenic fevers, as typhoid. In pleurisy with effusion, in catarrhal jaundice of persistent type, in some forms of profuse sweating, and in stimulating hair lotions, it is serviceable. In small doses pilocarpin has been used in tobacco and alcoholic amblyopia. Early in erysipelatous inflammation it may be injected around the border-line of the area of inflammation.

For baldness:

℞. Fluidextract of pilocarpin, ℥ j
Tincture of cantharides, ℥ ss
Soap liniment, ℥ jss.

Apply locally once daily.

Preparations.—**Fluidextractum Pilocarpi,** Dose, 10 to 45 minims. **Pilocarpinæ Hydrochloridum,** white, transparent crystals, deliquescent in the air, very soluble in water or alcohol. Dose, 1/8 to 1/2 grain. **Pilocarpinæ Nitras,** white, shining crystals, permanent in the air; soluble in 4 of water and in 60 of alcohol. Dose, 1/8 to 1/2 grain.

PIMENTA (Allspice).—The immature fruit of *P. officinalis*. It contains an aromatic, pungent, volatile oil that is much used as a flavor and condiment. It is useful in flatulence and to prevent the griping of purgatives. Dose, 10 to 40 grains. **P., Oleum.** Dose, 2 to 5 minims.

PIMPLES.—See Acne.

PINEAL EXTRACT.—The pineal gland is present during the entire life of the individual, and its removal in animals has been followed by structural changes in the central nervous system. It is thought that the substance of this gland may act remedially in organic and functional affections of

the brain attended with failure of cerebral nutrition, as chronic softening, chronic mania, and dementia. See Organotherapy.

PINEAL GLAND.—See Pineal Extract.

PINGUECULA.—A small yellowish growth on the bulbar conjunctiva, close to the cornea, and usually to the inner side. It has no vascular supply, and is pale when the rest of the conjunctiva is congested. Mechanical irritation is the probable cause. There is little discomfort; although it may lead to pterygium no interference is necessary.

PINK EYE.—See Conjunctivitis (Acute contagious).

PINKROOT.—See Spigelia.

PIPER (Pepper).—The dried, unripe fruit of *P. nigrum*. It contains a base, *piperin*, which is official, also a green, acrid, concrete oil, abalsamic, volatile oil, starch, lignin, gum, extractive, etc. Dose, 5 to 20 grains.

Oleoresina Piperis, *oleoresin of pepper*, contains almost all the volatile oil and acrid resin extracted by acetone, with but little of the piperin. Dose, 1/4 to 1 grain.

Piperina, *piperin*, a feeble base obtained from pepper, and other plants of the piperaceæ. Occurs in colorless or pale-yellowish prisms, of neutral reaction, almost insoluble in water, slightly so in ether, but soluble in 30 of alcohol. Dose, 1 to 10 grains.

Pepper when applied to the skin acts as an irritant, internally its effects are similar to those of other aromatics, being a warm carminative and stimulant, increasing slightly the action of the heart, stimulating the kidneys somewhat, and toning up the mucous membrane of the urinary and intestinal passages, by which channels it is eliminated. It has been thought to possess antiperiodic power, and was formerly much employed in intermittents. Its chief medicinal use is to correct flatulence, and to excite action of the stomach, being very commonly taken as a condiment with food. It is occasionally employed in gleet, but more extensively in hemorrhoids and other diseases of the rectum. Its active constituents are the concrete oil or resin and the volatile oil, piperin having very slight action on the system except as an antiperiodic and antipyretic, qualities which it certainly possesses.

PIPERAZIN.—A synthetical basic compound formed by the action of ammonia upon ethylene bromid or chlorid; it occurs as a white, crystalline powder, soluble in water and liquefying when exposed to the air, from which it absorbs water and carbon dioxid. Dose of the base or its hydrochlorid, 5 to 15 grains. It may be injected hypodermically in 3 to 5 percent solution.

Incompatibles are: acetanilid, acetphenetidin (phenacetin), alkaloidal salts, alum, butyl-chloral hydrate, chloral hydrate, copper sulphate, ferric chlorid, ferrous sulphate, mercuric chlorid, phenol, phenocoll, picric acid, potassium permanganate, quinin, silver nitrate, solution of arsenic and mercury iodid, sodium salicylate, spirit of nitrous ether, tannic acid.

It forms with uric acid a soluble compound, is nontoxic, devoid of physiologic effects, and well borne for prolonged periods. It is used in gout, for the prevention of renal and vesical calculi in the uric acid diathesis, to allay the pruritus from uric acid diathesis, and the irritation of the bladder from an excess of uric acid. The usual dose of 15 grains is best given by dissolving this quantity in 1 pint of water, and having the patient drink a wineglassful of this solution frequently through the day. It should not be given in pill nor in powder form. It is patented, and sold at a high price.

PIPERIN.—See Piper.

PIPSISSEWA.—See Chimaphila.

PIRQUET'S (von) TEST.—See Tuberculosis.

PITCH (Pix).—A resinous exudation from the stems of certain trees of the genera *Pinus* (pines) and *Abies* (firs and spruces), and may also be obtained as a residue of the distillation of tar. Its chief constituents are resin and a volatile oil which is a mixture of several isomeric terpenes in varying proportions. The only official form is **Pix Liquida,** *tar*, a product obtained by the destructive distillation of the wood of *Pinus palustris* and other species of Pinus. It is thick, viscid, semi-fluid, blackish-brown, of acid reaction, terebinthinate odor, and sharp, empyreumatic taste; slightly soluble in water, soluble in alcohol, in oils and in a solution of potassa or of soda. Its principal constituents are oil of turpentine, creosote, phenols, pyrocatechin, acetic acid, acetone, xylol, toluol, methylic alcohol, and resins. By distillation it yields an acid liquor, *pyroligneous acid*, and an empyreumatic oil, the residue being pitch. Dose, 5 to 20 grains, in pill, up to 2 drams daily. It is a stimulant to the skin, and is chiefly used locally in skin-diseases, especially those of a scaly nature, such as psoriasis; internally it is of service in chronic bronchitis.

Pix Burgundica, *Burgundy pitch*, the prepared resinous exudation of *Abies excelsa*, the Norway spruce, a native of Europe and Northern Asia. It occurs in hard, brittle, opaque or translucent masses, with a shining, conchoidal fracture, almost entirely soluble in glacial acetic acid; is very fusible, and at the body-heat it softens and becomes adhesive. It is mildly stimulant to the skin, and is used as a basis for plasters. **Oleum Picis Liquidæ,** *oil of tar*, a volatile oil distilled from tar. Dark, reddish-brown (almost colorless when fresh), of tarry odor and taste and acid reaction, readily soluble in alcohol. Contains a great variety of compounds, including cresols, guaiacol, phenol, xylol, toluol, pyrocatechin, methylic alcohol, and acetone. Dose, 1 to 5 minims. **Syrupus Picis Liquidæ,** *syrup of tar*, has of tar 1/2 percent; and is a sweetened tar-water. Dose, 1/2 to 2 drams. **Unguentum Picis Liquidæ,** *tar ointment*, contains of tar 50 parts, yellow wax 15, lard 35. Is irritating unless mixed with finely levigated chalk.

In eczema (dry, scaly):

℞. Solution of coal-tar, } each, ℥ j
Solution of lead subacetate, }
Water, enough to make ℥ vj.

Use as a lotion.

Or the following, in hemorrhoids:

℞. Pitch, ʒ j
Powdered acacia, ʒ ss.

Make into 20 pills. Give 2 pills every night.

PITUITARY EXTRACT.—The complete removal of the pituitary body (or gland) gives rise to symptoms which occur in a definite order, beginning with lowered temperature and loss of appetite, then twitchings, tremors and nervous phenomena, and finally dyspnea and death. Many of these symptoms have abated considerably after the administration of pituitary gland substance or an extract thereof. This organ has been found enlarged in cases of myxedema in which the thyroid was functionally absent, and other observations point to some connection between it and the disease known as acromegaly. Internally administered it causes increase of the cardiac force, and a rapid rise of blood-pressure due to direct contraction of the vessels and slowing of the pulse; also increased elimination of phosphates without corresponding increase of the nitrogenous elements. It has been administered with the view of reestablishing perverted brain nutrition and function, also with the object of supplying tone and structural growth to the entire nervous and muscular systems, on which its secretion seems to act as an alterative. Of 13 cases of acromegaly treated with pituitary preparations 7 showed varying degrees of improvement, 5 none, and 1 became worse. In 2 cases the violent headache and neuralgic pains in the limbs were diminished, and in one case decrease of the affected extremities occurred (Kinnicut). It has been tried in epilepsy, but with no benefit, and there is no condition known in which it is of therapeutic use (Wood).

PITUITARY GLAND.—See Pituitary Extract.

PITYRIASIS.—A term formerly applied to various pathologically dissociated skin affections, the most striking clinical feature of which is the presence of fine, branny desquamation. Also a synonym of Seborrhea (*q. v.*). See Dermatitis, Lichen Ruber, etc.

PITYRIASIS CAPITIS.—See Eczema Seborrhoicum.

PITYRIASIS RUBRA PILARIS.—A rare skin disease, a hyperkeratosis, closely resembling Lichen Ruber (*q. v.*) but differing from that disease in the absence of systemic disturbance, in the paler color of the lesions, in the absence, practically, of itching and atrophic changes, and in the fact that it is not amenable to arsenical treatment.

PLACENTA PRÆVIA.—The attachment of the placenta to any part of the lower uterine segment. It occurs once in about 1500 cases.

Varieties.—Four varieties of placenta prævia are described, dependent upon its relation in situation to the internal os. These are named *central*, *partial*, *marginal*, and *lateral*.

Causes.—These are obscure, the most probable being that it is caused by a low insertion of the ovum, this being due to a preexisting endometritis. It is three times as frequent in multiparæ as in primiparæ.

Symptoms.—The one symptom of placenta prævia is hemorrhage. The time of its appearance, the amount, and the frequency are largely dependent on the variety. In the central variety the bleeding may occur as early as the third month, and may recur so frequently and profusely as to cause speedy death. In the lateral variety hemorrhage may not appear at all. Usually there will be a slight, painless hemorrhage during the latter half of pregnancy, which is followed, as the woman approaches term, by others which appear at decreasing intervals and in increasing amounts.

Physical Signs.—Before the os is dilated, the cervix is found particularly soft and large, and the presenting part is felt through the vaginal vault as though separated from the examining finger by a thick cushion or pad. After the os is dilated, the rough, maternal surface of the placenta is felt in striking contrast to the smooth, elastic membranes.

Prognosis.—This is grave for both mother and child. In general practice the maternal mortality is about 30 percent. Repeated loss of blood during pregnancy and at labor, lessened vitality, and low situation of the placental site, favoring sepsis, are all unfavorable factors. The infant mortality is about 60 percent. Asphyxia, hemorrhage, and accidents during delivery are accountable for this high death-rate.

Treatment.—The treatment of placenta prævia will depend upon the severity of the hemorrhages, and upon the time at which they make their appearance.

If the bleeding occurs early in pregnancy; if it is slight in quantity; and if it is not repeated too frequently, rest in bed and the administration of opium suppositories, 1 grain of the aqueous extract 3 times daily will be sufficient. Should the bleeding continue or increase in quantity, a firm tampon of iodoform gauze must be introduced into the vagina. This usually leads to abortion or miscarriage, and its subsequent treatment is the same as that described under Abortion (*q. v.*).

Should the patient pass successfully the seventh month of gestation, and should serious hemorrhage now occur, the induction of premature labor by rapid dilatation of the cervix and combined version are indicated. The patient is anesthetized, and the vulva and vagina are thoroughly cleansed. The operator introduces his right hand, made aseptic, into the vagina; the cervix is rapidly dilated until 2 or 3 fingers may be introduced into the uterus, when a foot is grasped and the child extracted to the knee. This allows the soft breech of the child to lodge in the lower uterine segment, where it exerts sufficient pressure upon the placenta to prevent free bleeding, and at the same time does not interfere materially with the exchange of blood between mother and child. Labor pains now appear, and the subsequent treatment is the same as in an ordinary breech presentation.

Should the operator feel incapable of performing version, or should the patient be seen in the midst of a most alarming hemorrhage, when further loss of blood might seriously endanger her life, the most effective treatment is a large antiseptic vaginal tampon. This usually excites labor pains,

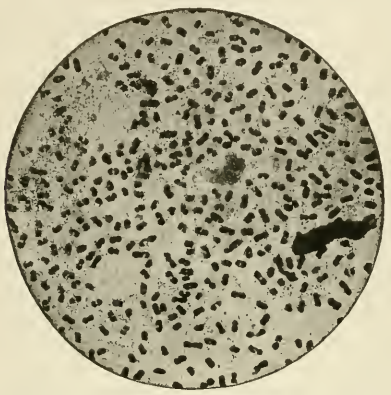
and the tampon is expelled before the advancing head. Should it fail to do this, the tampon will have to be renewed occasionally, until the os is dilated sufficiently to effect easy delivery.

The treatment at term is the same as that previously described—either combined version or a large vaginal tampon. The latter method usually sacrifices the life of the child.

PLAGUE. Synonym.—Pest. It is qualified as Oriental, Egyptian, Levantine, or Pâli plague. Mâhamâri (northwest India) is plague.

Definition.—An acute specific fever, common to man and some of the lower animals, usually attended with painful swelling of a group of superficial lymphatic ganglia, cardiac depression, hemorrhages, and a high mortality. In favorable cases it runs its course in 9 or 10 days and is followed by prolonged convalescence.

Cause.—Invasion and proliferation of *Bacillus pestis*. This bacillus belongs to that group which,



Bacillus of Bubonic Plague.—(*Yersin.*)

while causing several different diseases, is characterized by the production of *septicæmia hæmorrhagica* in all. It is pleomorphic; stains with all the simple dyes, but not by Gram's method; in smear-preparations some bacilli (only) show bi-polar staining. Direct inspection of smear-preparations is a valuable aid to diagnosis, but in doubt critical differentiation of the suspected microbe is essential, and can be made only by an experienced bacteriologist.

The germ gains entrance through the digestive and respiratory tracts, but especially through abrasions of the skin. Filth is a potent predisposing cause. The rat is a medium of transmission from house to house, while man in his travels is the agent of transmission through long distances. Flies, fleas, ants, and other insects may transmit the disease, while almost any of the lower animals are subject to it.

Clinical Varieties.—Three forms are distinguished by prominent clinical features: the *bubonic*, the *septicemic*, and the *pneumonic*. In milder bubonic cases the infection is confined to the lymphatic system; when fatal, however, this form always becomes septicemic, and the bacillus may be demonstrated in the blood-stream during the 24 hours preceding death. In the pneumonic form infection is, perhaps, by the lungs, to which the morbid process is usually limited. To these forms epithets have been applied. (a) "*Black*" has been used of those cases in which subcutaneous hemorrhages impart that coler to the general surface. (b) "*Fulminant*" (*pestis siderans*) denotes those in which death occurs in from 1 or 2 to 24 hours after manifestation of the first signs of illness. (c) "*Ambulant*" is applied when the symptoms, though well marked, are so moderate that the patient is able to attend more or less efficiently to his business, or spends but a single day in bed; this distinction has value only in relation to the widely held opinion that the infection is diffused mainly by human intercourse. (d) The term "*pestis minor*" has been applied to two forms of illness. One is abortive (or larval) plague, which stands on all-fours with abortive smallpox; a transient feverishness and headache are attended with prickling or actual pain in a superficial lymphatic gland, which sometimes becomes swollen, and may even suppurate; reference to presence of a declared epidemic at the same time and place is necessary to support the diagnosis. The other consists in very slight fever, and swelling of an inguinal gland which cannot be referred to any definite cause; it may be met with "before, during, after, or in the absence of, epidemic plague" (Cantlie). There is thus no evidence that it originates in plague-infection; and as it has been described chiefly within the tropics, it has come to be called "*climatic bubo.*"

Incubation.—There is no good evidence that the incubation period ever exceeds 5 days; it is very often limited to 3 days, or somewhat less.

Prodromes and Onset.—Prodromal symptoms are at most but rarely seen, and are but doubtfully distinguishable from the commencement of illness. In the great majority of cases the onset is sudden; often the patient can name to an hour the time at which he was attacked. Rarely it is gradual, and extends over 4 or 5 days of increasing illness, after which the patient suffers in one of the ways to be described below. Such symptoms cannot be described as prodromal; their lenity and gradual ingravescence are applicable by reference to the mode in which infection takes place.

Symptoms.—First, in every epidemic most cases are bubonic. Among colored races the proportion may be roughly estimated at 75 percent, the remainder being of the septicemic form, with a few only of the pneumonic; but among whites it is larger, cases of the septicemic form being fewer, and the pneumonic absent, or but 1 or 2 percent of the total. Second, the bubonic cases present every shade of severity, from the mildness of the ambulant variety upward. An average course is described:

1. The period of onset may be regarded as enduring about 12 hours; it resembles that of the acute infectious fevers in general. Feelings of chilliness or a rigor (in infants a convulsion), with frontal or vertical headache, are accompanied with nausea or vomiting, and sometimes by a slight diarrhea, and thirst. Discomfort or aching is felt in the limbs, and a severer pain in the loins or the lower abdo-

men. The face is flushed, the skin hot and dry; the temperature rises to 38.5° or 39° C. (101.3° to 102.5° F.); the pulse is full, of normal tension, and moderately quickened; respiration is quickened apart from lung-affections; the eyes are suffused; toward the end of the term there may be restlessness, and signs of mental confusion. Before, at, or shortly after an attack stiffness, pricking, or lancinating pain may be complained of in the groin, armpit, or neck; on palpation, tenderness is discovered; no tumefaction may be detected, or a single gland may be found very slightly enlarged, and in size from a pea to half a shelled almond.

2. A period of ingravescence ensues, during which the symptoms are developed in their totality; it may be regarded as lasting about 36 hours. The face is now pale; the expression apathetic, or dazed, or anxious, or terrified; hebetude is succeeded by restlessness, delirium with delusions, or mania; on being roused the patient collects himself with difficulty, and is sometimes angry at being disturbed; questions are intelligently though briefly and tardily answered; speech is frequently but not invariably blurred from incoordination of the muscles, and should the patient gain his legs, the latter is further manifested by staggering. There are sleeplessness, anorexia, and thirst; constipation is the rule; vomiting is continuous, the rejected matters being yellow, greenish, or bluish; except in the severest cases the urine is normal in amount, acid, sometimes offensive. The temperature rises to 41.5° or 42° C. (106.7° to 107.6° F.); the skin remains hot and dry; the pulse alters in character, and becomes rapid, small, easily compressible, and even in cases of moderate severity is often dicrotic. The tongue is swollen, moist, and characteristically furred; the dorsum carries a light creamy coating through which red papillæ show, while the tip and edges are clean and bright red; but during this stage it begins to become brown and dry. The gland which was first the seat of pain enlarges; other glands of the same group become slightly swollen; pain or tenderness becomes severer with the increasing tension, and the patient disposes his limbs so as to lessen pressure; swelling of other groups may begin, but is attended with much less pain.

3. From the third to the sixth or seventh day may be distinguished as the period of state. The temperature usually falls to from 38.5° to 39° C. (101.3° to 102.5° F.), and thereafter, although rising with the occurrence of suppuration in the bubo, never attains the height it had previously reached. The patient presents an aspect of extreme prostration; decubitus is dorsal; the face is pallid or shallow, and pinched, sometimes singularly expressionless from relaxation of the muscles; the eyes are closed, or half open; the conjunctiva injected, especially at the palpebral angles. The tongue is dry, brown, and retracted; sordes appear; constipation continues, but severe diarrhea with tympanites sometimes supervenes and is likely to be followed by death; the urine is not diminished in quantity, but in about 75 percent of cases contains albumin in small quantity, hyaline casts, and renal epithelial cells, and is often slightly tinged with blood. A peculiar odor exhales from the body. Delirium gives place to stupor or coma; but at beginning of this stage, or in milder cases, restlessness attended with desire for change of place continues; all patients require constant watching, and often mild restraint. Cardiac depression becomes marked; the pulse is small, feeble, dicrotic, or running and uncountable. External hemorrhages appear: epistaxis, hematemesis, melena, hematuria, purpura. The bubo often attains a considerable size; it becomes involved in a doughy swelling, which mats together and obscures the whole group of glands; the skin over the large tumor becomes reddened. At any time during this stage a slight bronchitis may develop, and in a considerable proportion of cases scattered patches of pneumonia also occur. Death commonly happens between the fourth and the seventh days; occasionally the intellect remains clear to the end; most often stupor precedes death.

4. But if the patient survive, the period of decline is ushered in by a fall of temperature to normal or a little below it, usually by crisis, sometimes by lysis; whereupon the skin becomes moist and sleep returns; the pulse continues extremely feeble, and the least effort is liable to cause death by syncope. The bubo which occasionally disappears by resolution may usually be opened; but sometimes partial resolution is followed by late suppuration about the twelfth day; the temperature, which has risen again during suppuration, then falls, and remains normal.

5. During convalescence cardiac failure, aphasia, peripheral neuritis, paraplegia, hemiplegia, or facial paralysis may occur; gangrene of the skin may set in; interstitial keratitis and panophthalmitis sometimes lead to loss of sight in one or both eyes.

Septicemic Form.—The attack is violent; the temperature soon attains to 41° or 42° C. (106.7° to 107.6° F.); prostration is extreme from the beginning; early delirium rapidly gives place to coma; there are no buboes; hemorrhages commonly occur; diarrhea and tympanites are frequent. Death often happens within 24 hours, and life seldom extends beyond the fourth day; two-thirds or more of such cases in whites are fatal.

Pneumonic Plague.—In the preceding forms bronchopneumonia frequently occurs; the respiration is then much quickened; the expectoration is abundant, but little aerated, and streaked with blood; later it becomes tenacious, devoid of air, and rusty or mucopurulent. But this, which is due to local arrest and subsequent development of the bacillus, is an incident. Primary plague-pneumonia consists in a bronchopneumonia which is attended by moderate fever, a quickened pulse, only slightly quickened respiration, a slight cough with watery, serosanguinolent expectoration, which is not rusty but blood-stained (prune-juice); the characteristic of this form of plague being prostration and illness out of all proportion to the physical signs. It is almost always fatal, and endures about 5 days.

Postmortem Appearances.—Externally, vibices, petechiæ, or larger ecchymotic patches are commonly present; less often the remains of pustular or

vesicular eruptions (contents sanious, scabs black), carbuncles, infiltrated areas of skin which may be sloughing, occasionally great edema of one limb from pressure on the great veins at the armpit or groin. In the commoner bubonic form a tumor of varying size exists at the angle of the jaw, lower in the neck, in the axilla, under the outer border of the pectoralis major, or in the groin. Internally, the blood is liquid, or ill coagulated, the serum hemoglobin-stained; normal shades of white and yellow are wanting, all the tissues presenting a dirty red tinge which strikes the eye. The primary external bubo is due to enlargement of one gland of the affected set to the size of a bean, or from that to a walnut, and of the rest of the group to a moderate extent. The former is in a state of intense, purple, inflammatory congestion, and is softened or broken down at several points; there is inflammatory congestion of the surrounding tissues; a blood-stained gelatinous effusion, which often penetrates even the subjacent muscles, mats the whole group into one edematous mass in which it is difficult to identify the glandular tissue by inspection; the other glands of the group are less swollen, and congested. All the lymphatic glands of the body are blood-full, rosy to purple on section, one member of some group other than that in which the primary bubo is seated (more rarely, of several groups) may be found rather more enlarged; and deeply congested; these latter are secondary buboes. In primary plague-pneumonia a bubo may be found in the lymphatic glands connected with the lungs. In all internal parts submucous and subserous hemorrhages are seen, from the size of a pin's head to several square inches in area.

The various visceral changes are: *Brain:* Inflammation of the meninges and meningo-encephalitis have been noted. *Lungs:* Hypostatic congestion, almost always; in addition, scattered foci of lobular pneumonia, distinguishable from other varieties only by the intense inflammatory reaction of the surrounding lung tissue; rarely a whole lobe is found solidified. Such patches result from localization of the bacillus; but occasionally the pneumonia is primary, and the manifestations of the disease are then confined to the respiratory system (primary plague-pneumonia). *Heart:* The pericardial fluid increased in quantity, sanguinolent; petechiæ of the visceral pericardium; myocardium pale and softened. *Kidneys:* There is always acute parenchymatous inflammation more or less advanced; hemorrhages in the adrenals. *Liver:* This organ is normal in volume; there is degeneration of the parenchyma and a nutmeg-section; on the upper surface whitish specks and small patches are seen, which indicate necrotic areas. *Spleen:* Enlarged, dark, soft, or diffluent; trabeculæ obscured; rarely it is normal in size and consistence. *Stomach and intestines:* These present petechiæ on both surfaces; internally, submucous edema, with a slight enlargement of the glands. The bacillus may be demonstrated at all centers of localization in all hemorrhages, and in the general circulation. It must be remembered that death not infrequently occurs early, as well as suddenly, from cardiac failure, when most of the above signs are wanting.

Diagnosis of the classic form is not difficult; during an epidemic a careful observer soon learns to recognize the sudden onset, peculiar aspect, early muscular prostration, state of tongue, and increasing depression of the circulation; which, if attended or followed by glandular pain and swelling, then often suffice to establish it. Nevertheless discrimination of plague from streptococcic septicemia is often difficult, especially when the point of entry is not apparent, or, if found, when lymphangitis is absent; and when absolute certainty is desirable (at beginning of epidemics, or in cases in which exposure to plague-infection is possible though not known, as at seaports), bacterioscopy can alone furnish the proof. A sterilized metal box, containing a tube of sloped nutrient agar, and an ordinary hypodermic syringe should be furnished from the hygienic laboratory. If the case be bubonic, the skin should be carefully cleansed with soap followed by alcohol; the swollen gland having been steadied and the skin over it rendered tense, the hypodermic needle should be carefully and steadily thrust into it; the piston is then to be slightly withdrawn half a dozen times, the needle also being partly withdrawn, and thrust into different parts of the gland. In this way sufficient liquid can usually be removed. The contents should then be carefully projected onto the agar surface, and both tube and needle (the latter not cleansed) carefully replaced in the box and transmitted to the laboratory, where the bacteriologist will make smears, cultures, and inoculations into animals. In primary pneumonia, diagnosis turns entirely on demonstration of the bacillus in the sputa, although the remarkable disproportion between the auscultation signs and the patient's evident danger may have aroused suspicion. In septicemic cases the blood may be examined; the bacillus is often discoverable in this form in the peripheral circulation about 24 hours after attack (a little earlier or later as the case may be).

Plague may be confused with malarial intermittent, relapsing, and typhus fevers, and with acute alcoholic poisoning. In *intermittent fever* the patient is likely to have dosed himself with quinin, when no hemamebæ will be found; however, the algid stage is much more intense and longer, while the hot stage is unattended by great prostration, and muscular strength and intelligence are preserved. In *relapsing fever* examination of the blood reveals *Spirillum Obermeieri;* the attack is sudden with vomiting, but there is less prostration; the face is injected, and expresses neither hebetude nor anxiety. During epidemics of plague attention is drawn to many cases in which glandular swellings are present, but unattended by important constitutional symptoms; and in a considerable proportion it will be found impossible to assign any definite cause to them. Some of them may, no doubt, be cases of *pestis minor* at a late stage; but there is a belief that this explanation should be very cautiously accepted; for attention is then arrested by cases which at other times would be

treated with simple remedies without need appearing to investigate their exact cause. However, the banal causes—venereal or scrofulous disease, sepsis, and injury—should in every case be excluded as a matter of routine.

Prognosis.—This should always be very carefully guarded until the eighth day of illness has passed; patients are then unlikely to die of the fever; but the degenerated heart-muscle exposes them to great risk from syncope, which even the effort of rising from the supine to the erect sitting posture in bed may cause. At the commencement of illness it should be borne in mind that the mortality of plague among colored races is always between 80 and 90 percent, in whites it is usually about 33 percent, while primary plague-pneumonia is almost always fatal, as are about two-thirds of all septicemic cases in whites. A sudden fall of temperature to below normal, attended with coldness and dampness of the surface occurring during the period of state, betokens death (the internal temperature continues to rise); sharp diarrhea with or without tympanites, and external hemorrhages, unless in very small amount, are both of grave import. The situation of the primary bubo is important, a fatal issue more frequently attending on buboes in the neck than in the armpit, least frequently on those in the groin. Convalescence is always lengthy. Occasionally recovery from the effects of the acute morbid process fails, and death by exhaustion occurs many weeks later.

Prophylaxis.—It is highly important to exterminate rats by trapping, by a careful disposal of the garbage and other particles of food for the rat, which if available will prevent the inducement of the rat to eat poisoned bait or bait in traps. Where rats are on shipboard fumigations of sulphur dioxid are usually employed. In pneumonic plague the infection is contained in the droplets of sputum projected into the air when the patient coughs. The attendant should be protected by a gauze mask and goggles for the eyes.

General treatment is symptomatic. Attempts may be made to encourage elimination by calomel and diuretics; fever may be reduced by cold or tepid sponging, although failing circulation may render application of heat to the feet necessary at the same time, but drugs, unless free from risk of depressing the heart, are hardly admissible for this purpose. To combat sleeplessness, ice to the head is valuable, but morphin, tetronal, trional, hyoscyamin, hyoscin, and the bromids may be employed, a combination of morphin and atropin, or of morphin and potassium bromid, being specially valuable. Against cardiac depression alcoholic stimulants, especially champagne, are most useful, but to them digitalis and strophanthus given by the mouth to strengthen contraction of the cardiac muscle, with digitalis and strychnin to counteract feebleness of the blood-vessels, must be added. It is said that the best results have followed subcutaneous injections of a combination of strophanthus and strychnin; of which latter, as well as of some other drugs, plague-patients are remarkably tolerant. As to buboes, early incision, leeches, and excision are harmful. Extract of belladonna may be applied to them, but ice gives most relief to pain. As soon as there is clear evidence of pus they should be opened by a free incision, such as will afford exit to sloughs; and antiseptics should be applied to the cavity. Phenol, in doses of 12 grains every 2 hours, diluted, has been used with marked success.

Specific treatment consists in the administration of subcutaneous and intravenous injections of Yersin serum; other serums are known, but this appears on the whole to have yielded so far the best (though still not satisfactory) results. Subcutaneous injection should be made in that area of skin the lymphatics of which converge to the primary bubo, and at a moderate distance below the latter. The quantity injected at one time may be from 40 c.c. to 80 c.c. or more. For intravenous injection a vein on the dorsum of the hand, or one at the bend of the elbow, should be selected; a ligature should be put on the limb so as to bring the vein into prominence; this should be further rendered tense by pressure of the thumb of the hand used to steady the limb, as in venesection; a hollow needle can then be plunged into it. Penetration of the vein is ascertained by beginning to inject before the ligature is removed; if it swells, the latter may be loosened and the injection completed. The quantity injected should not exceed 40 c.c. at any one time, but in severe cases this may (and should) be repeated after 5 or 6 hours. Intravenous administration is the more effectual. The serum causes a fall of temperature; the clinical guide to repetition is a rising temperature. Every case should receive a subcutaneous injection of 40 c.c. as soon as the clinical diagnosis has been made; but in severer cases 40 c.c. should at once be given intravenously, and at the same time another 40 c.c. subcutaneously. These massive doses, repeated at least twice in 24 hours, give the patient a chance of recovery, and seem, on the whole, to have sometimes succeeded; and as even smaller quantities are followed by reduction of temperature and improved arterial tension, the remedy, from which no ill effect need be apprehended, should be pushed. A sterilized diphtheria-antitoxin or other suitable syringe may be employed; the operation must be done with every aseptic precaution. All serums which have been stored present a slight deposit; this may be injected with the serum subcutaneously, but should be filtered out before introduction into a vein; and it need hardly be added that every care to avoid introducing air must be used in the latter case. Injections are liable to be followed by urticaria and joint-pains.

Specific preventive treatment consists in subcutaneous administration of 10 c.c. of Yersin serum, or of Haffkine's prophylactic in the dose for adults which is mentioned on each bottle, and which is usually 5 c.c. The former confers a passive immunity which is manifested immediately; the latter brings about active immunity which does not develop for about 8 days. Hence Yersin's serum should be used for protection of the members of a household among whom an indigenous

case has appeared; their danger will cease either on removal from the premises or as soon as ordinary thorough cleansing and disinfection has been done. But Haffkine's prophylactic should be used for protection of individuals who are subject to prolonged intermittent exposure, by being obliged to visit the infected quarters of a city or to attend on the sick. The inoculation should be done at the back of the upper arm with aseptic precautions; it is not painful. It is followed in a few hours by slight malaise and headache, with feverishness; the ensuing night is often sleepless; the temperature has risen to 38.5° or 39° C. (101.3° to 102.5° F.) the next morning; after about 24 hours the puncture is found to be the seat of a small hard swelling, and there is a good deal of redness and diffuse swelling of the superficial tissues below it; the slight feverishness and malaise disappear in the course of the second 24 hours, having been, as a rule, not such as to interfere with usual engagements, and the redness and superficial swelling a little later; the hard swelling persists for about 3 weeks. Inoculation with prophylactic during the incubation-period does not aggravate the illness when it commences. Its general effects are to lessen liability to attack and to improve chances of recovery if attack should occur.

General Preventive Treatment.—*Bacillus pestis* is the cause of plague; it is found in the bodies of the sick, from which it may escape with excretions and secretions, with the pus of bubonic abscesses, and with discharges from those eruptions and skin-lesions which have the same specific origin. In the vast majority of cases it enters the body by inoculation through the skin; but in primary pneumonic cases it probably gains access through the respiratory mucous membrane. It can survive in viable and even in virulent form outside the human body; but this knowledge has been drawn from laboratory experiments the results of which, as M. J. Rosenau has judiciously observed, must not be applied to the varying conditions of daily life without reserves and cautions. As a matter of fact, the bacillus has been observed outside the human body only in the bodies of animals, among which rats and mice have most importance from their close association with man, and in the bodies of suctorial parasites, among which, again, fleas are of most importance. Then, it is now generally conceded that, as a matter of fact, the infection is very rarely conveyed from the sick suffering from the bubonic and septicemic forms to the healthy; only the pneumonic form is highly infectious, probably (as in tuberculosis) when the healthy inhale specks of saliva and expectoration projected in coughing. These appear to be the important facts touching diffusion of plague as it appears among a civilized population of whites, and from them the general precautions necessary in individual cases can be deduced. Importation to an average poor household (and *multo majore* to better placed households) of a case which has received the infection elsewhere appears to involve no risk to others even in absence of such precautions during the earlier days of illness as are usually taken with the commoner infectious fevers. It being clearly understood, however, that these latter are necessary in prudence, no more need be said on the subject of personal prophylaxis; nevertheless the central health authority (whose operations do not fall within the scope of this article) will properly insist on removal of every case of plague to hospital at the earliest moment, or else, when that is impossible, upon retaining the control of the home nursing-staff in his own hands. Acid sublimate solution 1:500 for mixing with excreta, etc., and the same 1:1000, together with 5 percent carbolic solutions for other purposes are as useful disinfectants as any. Proper sanitation should be established; the dead should be cremated, and all infected articles burned if possible. Rigid quarantine of persons, animals, and goods, should be enforced. Infection has not infrequently been conveyed by rats and cargoes; consequently the cargo of every suspicious ship should be fumigated and all rats aboard as well as on shore should be destroyed. The direct agent in conveying the infection from rats to man being the rat-flea, disinfection of clothing and kit of travelers should be insisted upon.

PLASMODIUM.—See MALARIAL FEVERS.

PLASTER (Emplastrum).—An adhesive, solid or semisolid, medicinal substance spread upon cloth or other flexible material, for application to the external part of the body. **Plasters are usually spread** on muslin, leather, paper, etc., and have as a basis, lead plaster, a gum-resin, or Burgundy pitch. **P., Antiseptic,** a plaster consisting of the ordinary adhesive plaster dipped in a hot solution of carbolic acid (1:60). **P., Black,** lead plaster. **P., Casts,** a model of an object produced by pouring plaster-of-Paris mixed with water into a mold of that object. **P., Court-,** a plaster prepared by dissolving 30 grams of isinglass in enough water to make 360 grams, and spreading the mixture thinly upon silk in two portions, one the watery solution, the other mixed with 120 grams of alcohol and 3 of glycerin. The reserve side of the silk is painted with tincture of benzoin. It adheres firmly to the skin when moistened. **P., Diachylon.** Synonym of P., Lead. **P., English.** Synonym of P., Court-. **P., Isinglass,** a substitute for adhesive plaster, used in superficial wounds. **P., Jacket,** a bandage surrounding the trunk, and made of plaster-of-Paris. It is used in caries of the vertebræ. **P., Logan's,** a plaster containing litharge, lead carbonate, Castile soap, butter, olive oil, and mastic. **P.-machine,** an apparatus used by pharmacists for spreading plasters. **P., Mahy's,** one containing lead carbonate, olive oil, yellow wax, lead plaster, and Florentine orris. **P., Miraculous,** one containing red oxid of lead, olive oil, alum, and camphor. **P., Mull,** a plaster made by incorporating mull or thin muslin with a mixture of gutta-percha and some medicament dissolved in benzin. **P., Mustard,** one made by spreading powdered mustard, or a mixture of mustard with flour or other powder, reduced to the consistency of paste by the addition of water, upon muslin. **P., Pitch,** a plaster containing Burgundy pitch, frankincense, resin, yellow wax, oil of nutmeg, and olive oil. **P., Rademacher's,** a plaster composed of red lead,

olive oil, amber, camphor, and alum. **P., Resin,** a plaster composed of resin, lead plaster, and yellow wax or hard soap. See PLASTER (Adhesive). **P., Rubber,** a plaster in which the adhesive material is spread on thin muslin, and which sticks without being previously warmed. **P., Spice,** a plaster composed of yellow wax, suet, turpentine, oil of nutmeg, olibanum, benzoin, oil of peppermint, and oil of cloves. **P., Sticking-,** emplastrum resinæ. **P., Stomach.** See P., Spice. **P., Strengthening,** emplastrum ferri. **P., Surgeon's,** adhesive plaster. **P., Thapsia,** one containing yellow wax, Burgundy pitch, resin, terebinthina cocta, Venice turpentine, glycerin, and thapsia resin. **P., Vesicating,** cantharides plaster. **P., Vigo,** one containing lead plaster, yellow wax, resin, olibanum, ammoniac, bdellium, myrrh, saffron, mercury, turpentine, liquid storax, and oil of lavender. **P., Warm, P., Warming,** emplastrum picis cum cantharide.

There are seven official plasters:

TITLE.	CONSTITUENTS.
EMPLASTRUM;	
Adhæsivum..... Adhesive plaster.	Rubber, 20 gm.; petrolatum, 20 gm.; lead plaster, 960 gm
Belladonnæ. (Should not contain less than 0.38 percent. nor more than 0.42 percent of mydriatic alkaloids.) Belladonna plaster.	Extract of belladonna leaves, 300 gm.; adhesive plaster, 700 gm.
Capsici..... Capsicum plaster.	Oleoresin of capsicum, 0.25 gm.; adhesive plaster, q. s.
Hydrargyri..... Mercurial plaster.	Mercury, 30 gm.; oleate of mercury, 1 gm.; hydrous wool-fat, 10 gm.; lead plaster, 59 gm.
Opii..... Opium plaster.	Extract of opium, 6 gm.; water, 8 c.c.; adhesive plaster, 90 gm.
Plumbi (Diachylon plaster.) Lead plaster.	Soap, 100 gm.; lead acetate, 60 gm.; water, sufficient quantity.
Saponis..... Soap plaster.	Soap, 10 gm.; lead plaster, 90 gm.; water, sufficient quantity.

PLASTER, ADHESIVE.—The lead adhesive plaster was universally used before the introduction of the rubber adhesive plaster, and which, because it is less irritating to sensitive skins, is still preferred by some practitioners. It is made by adding to 80 parts of lead plaster 14 parts of resin and 6 parts of yellow wax. It is then spread on muslin prepared for the purpose. Adhesive plaster, while based upon the lead plaster, is rarely, if ever, used for the purposes of exhibiting the impression of oxid of lead.

To obtain the best results from adhesive plaster, the material must be freshly cut from a roll which has been kept in a tin box or other close-fitting receptacle. The plaster is best heated over an alcohol lamp or against the side of a vessel containing hot water (the smooth or nonadhesive side being placed in contact with the heated surface until the plaster is thoroughly softened), when it must be immediately applied to the skin. Placing a strip of adhesive plaster around a stove-pipe, with the adhesive side out, will often prove practicable in private practice. When strips are used, which, from their great length it is inconvenient to heat, the plaster surface may be softened by rubbing it over with a bit of raw cotton moistened with chloroform or ether.

Adhesive plaster may be worn for weeks at a time without producing cutaneous irritation. Hence it is to be preferred to rubber plaster for making extension for fracture of the thigh, or for affections of the hip-joint. Firmly applied over an ulcer and supported by a bandage, it forms a reliable method of dealing with leg ulcers due to varicose veins. Adhesive plaster is extensively employed in the treatment of fractured ribs and contusions of the chest. A number of strips about 2 inches wide are applied parallel to the ribs, beginning at the lowest and passing up to the axilla. Each strip is to be applied with firm traction, and extend from the vertebral column to a point a little beyond the median line in front. Marked relief is afforded by this procedure. In fracture of the clavicle in children a dressing of adhesive plaster will be found a satisfactory means of keeping the ends of the bone in position. Sayre's dressing for fractured clavicle is made of adhesive plaster. Sprains are often strapped with adhesive plaster.

PLASTER-OF-PARIS.—Gypsum or calcium sulphate is used for making stiff or immovable bandages and dressings, and for the preparation of casts. An ordinary creolin or loose-web bandage is well rubbed with fine plaster-of-Paris. The bandage is then applied to the part wet, additional plaster is rubbed in, and the cast thus formed is allowed to dry or "set."

The method of testing the quality of plaster-of-Paris by taking a small pinch of the powder between the thumb and finger and gently rubbing it; if small particles of grit are felt, it indicates that parts of the plaster have already absorbed water, and it is therefore unfit for use. The same test may be observed by taking a pinch of the powder again and placing the fingers under water, and then rubbing in the same way as before. If, however, in both of these tests no grit is felt, and, under water, a thin, creamy substance is formed which is easily rubbed off the fingers, the plaster is in a proper condition for use. When plaster has been kept for a long time, or when it is gritty, its condition can be very greatly improved. It may be redried by putting it in a metal dish, such as a pie-plate or iron pot, and placing it in an oven of a hot stove or over a gas-jet. As soon as it becomes heated, it will be observed that a process identical with boiling water is taking place. When this ebullition has entirely ceased, the powder is freshly kiln-dried. If the method of testing is again resorted to, it will be found that the gritty appearance and feeling will have disappeared in a very large measure, leaving only the now dry powder ready for use. If there are any lumps remaining, they may be removed by the use of a sieve. Plaster-of-Paris must always be kept in a hermetically sealed jar, or in a very dry place.

To Remove a Plaster Dressing.—In order to facilitate the removal of plaster-of-Paris dressing from limbs, the following plan should be followed:

After application of the usual thin layer of absorbent cotton around the limb, parchment paper, which has been previously moistened, is wet and applied. Over this, in the direction that the dressing is to be sawed open, a good sized string which has been well rubbed with vaselin is laid on and the dressing then applied. The ends of the string are then tied together over the bandage. When in the course of time the plaster dressing is to be laid off, the ends of the cord are untied, one, tied to the end of a sufficiently long steel wire, which has been closely nicked, is drawn through the channel filled by the oiled string, and after each end of the wire has been attached to the handles of a chain saw, it is drawn to and fro until the plaster has been sawed through. Then the dressing is easily removed.

PLASTIC SURGERY.—Plastic surgery is that branch of the operative art by which congenital or acquired defects and deformities are repaired. With the extension of surgery, plastic operations have been extended from the skin, to which they were long limited, to the various mucosæ, to bone, to tendon, and to nerve. The present article will be limited to its considerations as applied to the skin alone.

The rationale of all plastic surgery is based on the inherent vitality of tissues after they have been removed from their original site and implanted in a new position, whence they thereafter obtain nutrition. In dermatoplastic operations two chief methods are to be considered:

Gliding Pedicle, or Flap.—Those procedures in which the skin to be utilized for filling a gap retains, for a time at least, some connection with its original site.

Skin-grafting Proper.—In this method of plastic surgery the integument utilized may be taken from the body of the patient himself. For this the term autoplasty is used. Heteroplasty is reserved for the utilization of tissues from a person other than the patient, or from an animal.

For the relief of many defects—as, for example, of the lip, the eyelid, or a part of the nose—the first method is still the only one applicable. The area of the defect is first to be freshened by clean incisions extending through the entire thickness of the skin. All scar tissues must be removed. By doing this the defect will be seemingly greatly increased. The margins and floor of the wound should be made as smooth as possible, and all bleeding checked before proceeding to shape the skin structures which are to cover the gap. In fashioning the skin to be transferred, one of two plans may be followed: (1) That of gliding, and (2) that of making a flap to be nourished by a pedicle.

The gliding method of closing a defect by traction on the vivified edges of the skin surrounding it, is based on the extent to which skin can be stretched and yet retain its vitality. Oval or triangular defects, or such as can be converted into either shape, are best suited for a gliding operation. To facilitate the gliding of the skin destined to cover the gap it is undermined for a varying distance. This is a safe method; it leaves no new defect and the broad attachment of the skin assures its viability even under considerable tension from traction. When the form and size of a defect preclude its closure by traction alone, the skin in the immediate vicinity may be dissected up in a patch of requisite size and by a process of gliding be brought edgewise into the position of the part to be repaired, when, after proper adjustment, it is retained by sutures. Triangular or rectangular defects, such as follow partial removal of the lip or of the eyelid, can best be repaired in this way.

When the gliding method is impracticable, **flap formation** must be resorted to. The defect is vivified, as in the gliding operation. The flap is taken from the most available part. Usually it is taken from near the defect. It may, however, be taken from a distance, as in rhinoplastic operations, where the skin flap is taken from the arm. To cover large defects of the extremities, as after burns of the elbow or wrist, the integument may be taken from the abdomen or side of the chest. Mr. Croft's operation, in which this is done, is of greatest value in the conditions named. In this procedure a flap of skin 6 or 8 inches long, and 2 or 3 inches wide, is raised from the underlying tissues of the abdomen and retained by bridges of skin above and below. For a week or 10 days the under surface is allowed to granulate. Now only is the lower attachment of the flap severed and brought into the freshened gap—as, for example, of the elbow or wrist—and sutured there. Until firm union has resulted, the arm is firmly bandaged to the side of the body. After another 10 days, the upper bridge is severed, and the flap finally placed in its new position.

Viability of the flap is the first requisite of success. It should be fashioned to insure a sufficient blood supply. It should contain the entire thickness of the skin and a part of the underlying subcutaneous layer. Bleeding flaps are viable. From the natural contractility of the skin, flaps shrink considerably. They should, therefore, be cut one-third larger than the defect to be filled. In formal plastic operations the pedicle should measure not less than 1 inch in width. Excessive torsion of the pedicle must, for obvious reasons, be avoided. The fixation of the flap by sutures forms the final step of the plastic operation. Accuracy of apposition is essential. The absence of blood within the wound and strict aseptic and antiseptic precautions tend to assure success. In plastic operations about the face the buried subcuticular suture is particularly to be advocated. The after-treatment is simple. A dry gauze dressing, held in position by bandage or strips of adhesive plaster, will go far toward supporting the parts and assuring primary union.

Skin-grafting.—In 1869 **Reverdin** first published a method of rapidly causing the closure of superficial wounds and ulcerated surfaces by implanting in them small grafts of epidermis that had been entirely removed from the body. The grafts were the size of a pin's head, and deposited in little depressions made with a knife in the surface to be covered. From these grafts the epidermis developed in minute islands, which, as they grew,

coalesced, and eventually covered the entire surface. The method of Reverdin was often uncertain and slow in achieving a result. For this reason it failed of general adoption, and was entirely superseded by that of **Thiersch**, advanced in 1886. This is based on the viability of strips of the superficial layers of the skin when entirely removed from their original sources of nutrition, and their tendency to form permanent attachment to denuded surfaces. Wolfe, in 1868, and after him a number of ophthalmic surgeons, transplanted large portions of the skin from the arm in plastic operations on the eyelids.

Among the conditions in which skin-grafting by large films is indicated may be mentioned: (1) Indolent ulcers, as of the leg, or those following burns. (2) Fleshy denuded areas resulting from the removal of neoplasm, as after the excision of superficial epitheliomata or lupus patches from the face. Immediate closure of the wound can thereby be accomplished. (3) After excision of extensive growths, as for mammary cancer, when the wound cannot be closed by traction suture without dangerous tension. (4) Areas of the bone that have recently lost their covering of soft parts, and can be covered in no other way. Areas of bone exposed after necrotomy operations. Skin-grafts unite readily to aseptic bone surfaces.

Operation.—The locality where the skin is to be grafted must be a flesh wound, or, in the case of an ulcer, it must be so converted by removing all granulations by the use of the sharp spoon. All hemorrhage must be checked by hot salt solutions and compression. The presence of blood under the graft would, more than all else, endanger the success of the procedure. Unevenness in the floor of the defect does not militate against the adherence of the grafts.

The epidermal strips are usually taken from the anterior surface of the thigh or from the outer surface of the arm. This part should be sterilized as for ordinary operations, some time before the strips are cut. When everything is ready for cutting the strips, the skin is made tense by the left hand of the operator or by an assistant. A constant flow of salt solution likewise is directed against the field of operation. With a sharp, broad razor, preferably plane on one surface, the surgeon cuts strips of the epidermis and papillary layer of the skin. The cutting is done parallel to the surface, and by a to-and-fro or sawing movement. The strips are cut of requisite length and width, and may be made an inch or more wide, and 5 or 6 inches long. Each strip is at once transferred to its new habitat and placed in position with raw surfaces in opposition. The edges of the graft have a marked tendency to curl in a manner that would bring the epidermis underneath. This can easily be corrected by gently using a probe and mouse-tooth forceps. As many strips as may be needed are cut and placed in position. The edges should be made to slightly overlap. When there has been no bleeding under the grafts, adhesion takes place rapidly, probably as a result of atmospheric pressure.

Dressings after skin-grafting should be aseptic, not antiseptic. Solutions of corrosive sublimate are harmful. The dressing may be that of rubber protective or silver-foil or oiled silk moistened with salt solution. An excellent dressing is gutta-percha tissue in that it can be readily sterilized by formaldehyd fumes, is pliable and free from odor, and is not disintegrated by body temperature and moisture. The gutta-percha tissue cut in narrow strips is applied directly to the newly grafted surface. Over this the ordinary gauze and cotton dressing are retained by a bandage. The gauze dressing is removed daily and sterile normal saline solution is applied with a camel's-hair brush to clear away an exudate that appears between the strips.

In exceptional cases the entire thickness of the skin is utilized for the graft (**Wolfe's method**). A flap of the desired size and form is outlined by an incision to the fascia. The edge of the skin is raised with mouse-tooth forceps, and the flap removed from the subcutaneous layer by long and even strokes of the knife. Fat lobules are to be carefully removed from the flap before it is placed in its new position.

As a rule, the skin is very pale and continues so for a number of days after transplantation. Sutures are, as a rule, unnecessary, if not harmful. The after-treatment is the same as for the epidermal graft. With many operators, gold-beaters' skin or silver foil is made to take the place of the moist rubber protective dressing.

PLETHORA.—Abnormal fulness of blood or superabundance of blood. Serous plethora is an excess of serum in the blood. The best drug for affections of plethoric subjects is aconite, and it is decidedly the best remedy for apoplexy in the plethoric. When there is a determination of blood to the head, arsenic may be used to advantage, while sulphur is to be used as a mild purgative for plethora from cessation of the menses. For abdominal plethora, saline and hydragog cathartics are of service. The purgative saline waters, such as Vichy or Saratoga, are also valuable. Grape-juice has helped many cases. Dry diet is indicated in dyspepsia and hepatic enlargement from excessive beer-drinking. Avoid much bread, salted or twice-cooked meats, rich sauces, solid vegetables, especially soups, cucumbers and fruits. Biscuits, fresh meats, lemons, fish, fowl, and game may be used.

Venesection (*q. v.*) is sometimes employed.

℞. Resin of podophyllin, gr. vj
Compound extract of colocynth, gr. xij
Alcoholic extract of belladonna leaves, gr. iij.
Divide into 12 pills. Give 1 pill every night.

PLEURA, INJURIES.—Rupture of the costal pleura probably occurs spontaneously in every case of fractured rib or severe contusion of the thorax, but, owing to the skin being unbroken, the injury is repaired at once, with only a transient or local pleurisy at the most; and though such com-

plications as hematothorax from rupture of an intercostal or internal mammary artery and pneumatocele may occur, they are very rare. When there is an external wound, the pleura only may be injured, without the lung, if the weapon is blunt and enters the thorax slowly, so that it pushes the lung in front of it, or if the wound is in the tenth or eleventh interspace; for though the pleura usually extends as low as the last rib, the lung, unless it is emphysematous, only reaches the tenth. In this case, however, the diaphragm and the subjacent viscera are very likely to suffer. Other complications depend upon the size and extent of the wound. If it is merely a puncture or a small incision, the diagnosis is often never made; but if it is extensive, the lung may protrude without injury through the opening (*hernia*); it may collapse and fall back, leaving the pleura full of air (*pneumothorax*); the cavity, as already mentioned, may be partly filled with blood, and the air may either pass in and out freely through the wound (*traumatopnea*), or it may be forced into the cellular tissue under the skin, and spread over a considerable area (*emphysema*). This, however, is seldom extensive unless the lung is wounded. Finally, at a later period, pleurisy may set in, and even run on to empyema. See CHEST (Injuries), LUNG (Injuries), PLEURISY.

PLEURISY.—Inflammation of the pleura.

Varieties.—According to cause, it may be divided into primary or secondary; according to extent, into unilateral, bilateral, or local; according to time, into acute or chronic; and according to the exudation, into serofibrinous, fibrinous, or purulent.

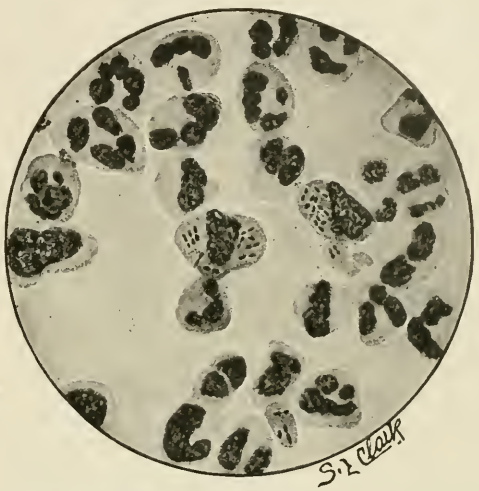
Etiology.—(1) It may be idiopathic from exposure to the cold and wet; (2) traumatism; (3) it is usually associated with lobar pneumonia and pericarditis; (4) it is secondary to certain infective and toxemic conditions, such as acute rheumatism, pyemia, typhoid fever, gout, nephritis, and tuberculosis (common); (5) cancerous (rare).

The exciting cause is said to be infection by pneumococci, staphylococci, or streptococci.

Pathology.—Pleurisy consists of three stages: (1) Stage of congestion; (2) stage of effusion; (3) stage of organization or absorption. In the early stage, to the naked eye the pleura is red, swollen, and covered with flakes or curds of yellowish or whitish lymph (dry pleurisy). The process may stop in this stage, or the effusion may accumulate in large quantities in the pleural sac (serofibrinous). It may be only covered with a film of deposit mostly fibrinous (fibrinous), or it may become infected, giving rise to purulent pleurisy (empyema).

Serofibrinous Pleurisy.—The amount of fluid varies greatly from half an ounce to several pints. As the liquid accumulates in the stage of effusion, it gravitates toward the lower portion of the pleura sac, compressing the lung upward and backward. The diaphragm is displaced downward and the heart toward the opposite side of the lung affected. The fluid may be absorbed, may be organized into new tissue, or may become purulent.

Fibrinous Pleurisy.—In this form the deposit is scanty, thick, whitish or yellowish in color, and generally circumscribed. A considerable amount of cellular infiltration may occur, giving rise to the formation of new tissue and causing the two surfaces of the pleura to be bound together (adhesive pleurisy). If the process is a progressive one, the lymphatics may become involved, spreading to the lung and causing bronchopneumonia.



CELLS FROM EXUDATE, CASE OF EMPYEMA.—(*Coplin*). The large hyaline cells (macrophagocytes) contain many pneumococci.

Purulent pleurisy (empyema) generally results by metastasis during the course of pneumonia or tuberculosis. An empyema, however, may be primary or may become purulent by infection during the course of a serofibrinous pleurisy. The septic process may cause erosion of the visceral layer, thus extending to the lung and finally the bronchi, when the purulent collection may be discharged during the act of coughing. If the rupture takes place in the parietal layer, the pus burrows its way externally, producing an abscess in one or more of the intercostal spaces, generally near the sternum. In young patients this process generally causes great deformity of the chest after the pus has been evacuated. See COLON BACILLUS INFECTION.

Hemorrhagic Pleurisy.—Effusion of blood in the pleural sac, resulting from cancer, tuberculosis, scurvy, and grave forms of anemia.

Symptoms and Clinical Course. Acute Pleurisy.—The onset is generally marked by chilly sensations, slight cough, the act of which gives rise to a sharp pain (stitch) in the affected side. The temperature is somewhat elevated (100° to 102° F.), pulse full and only moderately increased in rate, and frequently not corresponding to the height of fever. The respirations are increased, often being painful, especially on taking deep inspirations. The cough is distressing, generally being cut short by the sharp pain in the side. The sputum is occasionally tinged with blood; in certain cases the sputum may be profuse, while in others it may be

suppressed. As the disease progresses, dyspnea becomes apparent, and the patient lies on the affected side to relieve the intense pain set up during the course of the disease. As the fluid accumulates, this symptom gradually abates, the fever becomes lower, while the respirations still remain embarrassed.

Physical Signs. Stage of Congestion.—There are diminished expansion and, perhaps, decreased tactile fremitus over the affected area. On auscultation a to-and-fro grazing, creaking, or crackling friction sound is heard. The crackling sound is often mistaken for crepitant or subcrepitant râles. If due to râles, the sound is generally removed by coughing, while in the former instance the sound is not modified.

Stage of Effusion.—There is diminished expansion over affected area, often bulging of intercostal spaces and displacement of apex-beat to the right or left, according to pleura affected. Palpation confirms inspection; diminished vocal (tactile) fremitus. Percussion elicits movable dulness. If the upper level is at the third intercostal space when the patient is in sitting posture, it will be at fourth interspace of lower when lying down. The line of dulness is usually curved, being higher posteriorly. Above the line of dulness a zone is found which yields a hyperresonant (tympanitic) note, or Skoda's resonance. On auscultation the respiratory murmur is weak, the expiratory breath-sound frequently being inaudible in the stage of effusion. Earlier in the disease bronchial breathing is present, most marked along the spine and interscapular region. A friction sound may be detected above the level of the fluid anteriorly in some cases. Vocal resonance is diminished in the stage of effusion, but when bronchial breathing is present in cases of moderate effusion, bronchophony may be heard. The unaffected lung is doing vicarious work, and both inspiration and expiration are harsh in quality on that side which also yields a hyperresonant note. When there is a small amount of fluid present, egophony is elicited, most marked near the angle of scapula of the affected side. Mensuration shows increase in anteroposterior diameter on affected side. Aspiration detects the presence and character of fluid, whether serofibrinous or purulent. The white blood-corpuscles, red cells, and hemoglobin remain about normal.

The Stage of Absorption.—There is gradual return to the normal physical signs. Occasionally friction redux is detected.

Physical Signs of Chronic Fibrinous Pleurisy.—Chronic pleurisy may result from the acute form, the fluid not being absorbed, and therefore yields the same physical signs as in acute form. In dry or plastic pleurisy (chronic) on inspection the chest is greatly deformed on affected side. Palpation yields diminished vocal (tactile) fremitus. On percussion there is impaired resonance. Auscultation detects pleuritic grazing or creaking friction sounds, and diminished vocal resonance. The respiratory murmur is diminished in intensity.

Symptoms of Purulent Pleurisy (Empyema).—There are hectic symptoms, sweats, chills, high irregular fever, dyspnea, expectoration of very offensive material, edema and redness in the intercostal spaces, and on aspiration the purulent fluid is obtained.

Diagnosis depends upon the subjective and objective symptoms.

Acute Pleurisy.	Lobar Pneumonia.	Intercostal Neuralgia.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*
1. Onset marked by chilly sensations, sharp cough.	1. Onset marked by shaking chill, cough, dyspnea.	1. Onset marked by stitch in side, pain along intercostal spaces.
2. Cough often checked by darting pain in side.	2. Cough gives rise to pain in throat and general chest pains.	2. Cough absent.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*
1. Fever slight (100°) and very irregular.	1. High fever (104°) with diurnal variation.	1. Fever absent.
2. Slight dyspnea (20 to 30 respirations a minute). Patient lies on affected side.	2. Dyspnea great (40 to 50 respirations a minute). Patient uncomfortable in all positions.	2. Respiration normal. Patient lies on affected side.
3. *Inspection.* — Diminished expansion of affected area and bulging of interspaces; heart displaced.	3. Physical signs observed in pleurisy are different.	3. Diminished expansion during inspiration.
4. *Palpation.* — Diminished tactile (vocal) fremitus.	4. Increased vocal fremitus.	4. Normal vocal fremitus.
5. *Percussion.*—Percussion-note dull over effusion, movable dulness, Skoda's resonance from effusion.	5. Percussion note dull.	5. Percussion-note normal.
6. *Auscultation.*—Respiratory murmur diminished, egophony at angle of scapula, grazing or crackling pleuritic friction sound.	6. Bronchial breathing, crepitant râle on inspiration, increased vocal resonance (bronchophony).	6. Respiratory murmur normal.
7. *Mensuration.*—Affected side increased in diameter.	7. Diameter both sides of chest equal.	7. Diameter of chest equal.
8. Sputum may contain streaks; of blood (uncommon).	8. Sputum contains blood ("rusty colored") and diplococci.	8. Sputum normal.
9. Aspiration detects fluid.	9. No fluid withdrawn on aspiration, as a rule.	9. No fluid on aspiration.

Prognosis.—For acute pleurisy in adults the prognosis is favorable. In children great deformity of chest may ensue. In purulent pleurisy the prognosis should be guardedly favorable if the fluid is removed early. In tubercular pleurisy the prognosis is unfavorable.

Treatment demands absolute rest in bed and a light diet, such as sweet milk, soup, beef-juice, soft-boiled eggs, rice, bread and butter. The chest may be enveloped in flannel or a light cotton jacket,

Pain is relieved by hypodermic injections of morphin (1/4 grain) with atropin (1/125 grain), and by strapping chest with adhesive plaster. If the pulse is strong and bounding, the tincture of veratrum viride (20 minims) or the tincture of aconite (10 minims) may be given every 3 hours until 5 or 6 doses have been taken. Late in the disease, when the effusion is great, these drugs are dangerous on account of the profound depression induced by their action. In the early stages blisters add to the distress of the patient; late in the disease a series of small blisters do good. As in ascites, catharsis may have some influence in diminishing the amount of fluid in the pleural cavity. Of the different remedies, possibly magnesium sulphate (4 drams) is the best. It should be given before breakfast. Compound jalap powder (20 to 40 grains) every 4 hours may be taken instead of the salts. Three bowel movements a day are sufficient. If the fluid shows no signs of absorption before the second or third week of the onset of disease, one of two methods remains to be chosen: First, to get rid of the effusion by means of blisters and cathartics; second, to aspirate. Each method has its advocates.

Removal of Effusion by Blisters and Cathartics.—As has been mentioned, possibly magnesium sulphate (4 drams), preferably taken before breakfast, is the most reliable drug. At the time of administration of the purgative it is best to restrict the amount of water and liquid food to the minimum. A series of small blisters (1/2 by 2 inches) may be induced by cantharidal plaster over the affected region; when signs of healing are noticed, a new site may be selected for the blisters. The daily application of the tincture of iodin may be substituted for the blisters. The administration of potassium iodid (6 grains 3 times a day) is also recommended.

Removal of the Fluid by Aspiration.—Aspiration is always indicated in the following conditions: (1) When the level of fluid extends above the third rib; (2) when the dyspnea is intense; (3) when it remains unabsorbed from 2 to 3 weeks of onset, or after subsidence of the fever; (4) when the disease is bilateral and the total amount of fluid present is equal to the volume of one pleural sac; (5) when the fluid is purulent (empyema). Resection offers the most hope to the patient in the last instance.

The patient should take the sitting posture. The point for introduction of aspirating needle is either at the outer angle of scapula in eighth interspace, or near the posterior axillary line in the seventh interspace. Either point may first be rendered as aseptic as possible, and after anesthetizing the part by means of a few drops of a solution of cocain (5 percent), the needle is introduced with a quick thrust into the pleural sac and the cannula withdrawn. If the fluid does not at once drain away, it may be due to the needle being plugged with fibrin—inserted too far or not far enough. It is not a good plan to rotate the needle in different directions for fear of lacerating the parts. If the quantity of fluid is excessive, about two-thirds should be drawn off, and the remainder allowed to remain for 2 or 3 days. During the latter part of the process the patient frequently feels faint, and a small quantity of whisky should be at hand to combat the exhaustion.

Thoracoplasty, or **Estlander's operation**, consists in removing a portion of several of the ribs, for the purpose of allowing the chest-walls to fall in, in cases of empyema where, after the pleura has been drained, the lung, in consequence of adhesions, does not expand. An incision 3 or 4 inches in length may be made obliquely downward and inward over the side of the chest, just in front of the latissimus dorsi, across the ribs the portions of which it is intended to excise. The edges of the wound being retracted to expose the ribs, an incision is next made through the periosteum along the course of each rib for the required distance, the periosteum separated with a raspatory from both the outer and inner surface, and the rib then cut through with the saw or bone-forceps at each end of the incision, the soft parts being protected by a spatula passed beneath the rib.

Autoserotherapy.—The withdrawal of a syringeful of the exudate and hypodermic injection of it immediately is apparently efficacious, especially in acute cases. Repeated injections may be necessary in severe cases.

Vaccine and open-air treatment has recently been used with success, the vaccine administered being autogenous.

PLUMBUM.—See LEAD.

PNEUMATIC CABINET.—See PNEUMOTHERAPY, under TUBERCULOSIS, Pulmonary; LUNGS (Surgery).

PNEUMOCOCCUS INFECTIONS. Specific Treatment by Means of Antipneumococcic Serum.—Recently as a result of the experimental and clinical studies made at the Rockefeller Institute, the specific treatment of acute lobar pneumonia with antipneumococcic serum has been recommended. An essential to the successful use of antipneumococcic serum is the recognition of the fact that pneumococci morphologically and culturally alike, differ vastly in their immunological reactions. According to their immunological reactions they have been divided into four groups. The antipneumococcic serum used is derived from animals immunized against the specific type. In this way a serum of high potency has been obtained against organisms of Type 1, serum of less potency against organisms of Type 2, a serum of very slight potency against organisms of Type 3, and a serum of no potency against organisms of Type 4. Clinically the application of the serum, therefore, is of practical value only in cases due to pneumococci of Types 1 and 2. Sixty percent of the cases of pneumonia belong to these types (Cole). Fortunately there are few cases of Type 3, although the mortality is high and of the remaining number belonging to Type 4, the mortality is relatively low. Cole reports that "cases of Type 1 infection so far treated with serum is not large, but the results have been very encouraging. Seventy-two cases have now been treated by this method. Before beginning serum about one-third of the patients died. Of the 72 since serum treatment was com-

menced, 6 have died, a mortality of only a little over 8 per cent. Moreover, of these 6 fatal cases, one patient died late in convalescence from a pulmonary embolism, one died on the fifty-fourth day of the disease from a complicating general streptococcus infection, and two received serum treatment only when they were "*in extremis.*" (*Penn. Med. J.*, Feb., 1917.) Cole states further that in regard to the administration of the serum "the amount required has differed in the different cases, depending on the severity. Our plan is to give 80 mils and repeat this dose every 12 hours until the temperature and pulse rate fall. Some cases have received 500 mils or even more; in other cases one to two doses have been sufficient. To guard against the administration of serum to patients who are sensitive to such injections, it is our custom to give to all pneumonia patients on admission to the hospital 0.5 mil of horse serum subcutaneously in order to desensitize them. By the time the type of organism is determined, in 6 to 8 hours, we have considered it safe to go ahead with the treatment. So far in over 100 cases receiving serum of the various types there have been no alarming or unfavorable results. A large number of the patients receiving the large doses of serum suffer from serum sickness after a week or 10 days. The symptoms, while sometimes distressing, are never serious, and if the serum is efficacious, this disturbance is of course negligible."

PNEUMOGASTRIC NERVE, DISEASES.—Anatomy.—The pneumogastric nerve arises from the oblongata, between the origins of the glossopharyngeal and spinal accessory nerves. It passes through the jugular foramen, and is joined by branches of the spinal accessory. Giving off small branches, it passes down the neck behind and in the same sheath with the carotid artery, enters the thorax on the right side over the subclavian artery, and on the left between the subclavian and the carotid arteries. It passes through the thorax, beside the esophagus, and ends in branches to the stomach, spleen, and intestines. The most impotant branches are the pharyngeal, the superior laryngeal, the recurrent laryngeal, which passes back—the left around the arch of the aorta, the right around the subclavian artery. Branches pass to the esophagus and pulmonary branches to the lung and to the cardiac plexus for the heart. The nerve may be affected at its nucleus of origin, in its trunk, or in the terminal branches.

Etiology.—The nucleus most frequently is affected with bulbar paralysis, while tumors or aneurysms compress it within the skull, or it may be involved in meningeal thickening, whether syphilitic or otherwise. In the neck it may be compressed by aneurysm or glandular tumors, and is most liable, especially in the recurrent branch, to be ligated or wounded. When wounded it is necessary to remember that its fibers are composed of accelerator and depressor motor fibers for respiration, depressor fibers for the heart, motor and sensory fibers for the esophagus, and some sensory and motor fibers for the stomach.

Symptoms.—When the pharyngeal branches are affected, there is difficulty in swallowing, as they supply the constrictors of the pharynx and the levator palati muscle. When the laryngeal branches are affected, the voice usually becomes hoarse; coughing is impossible, and the glottis cannot be closed. Paralysis of the muscles of one side of the larynx is a prominent symptom when the trunk of the vagus in the neck or the recurrent is affected. In locomotor ataxia bilateral paralysis occurs, when the spinal accessory nuclei are affected—as is also the case in diphtheria and in bulbar paralysis. Bilateral spasm is often produced reflexly. In epilepsy the cry is produced by a tonic contraction of the vocal cords, and is part of the cortical discharge occurring locally. The "laryngeal crises" of locomotor ataxia are due to local irritation of the spinal accessory nucleus.

Spasm of the pharynx is paroxysmal in character, and is almost always part of functional nervous diseases. It forms part of the spasm of hydrophobia, and occurs in hysteria. In emotional states, as in fear and intense grief, swallowing may be impossible from such spasm.

Spasm of the laryngeal muscles is manifested in the adductors. When the recurrent branch is affected, direct spasm usually affects only one vocal cord.

Treatment.—The general treatment of diseases of the pneumogastric nerve depends upon the different causal conditions. Central disease is, as a rule, beyond the range of treatment. Potassium iodid will often remove suspected causes of pressure. In laryngeal paralysis electricity, locally applied, is often of benefit. Strychnin injections are also sometimes useful. In spasmodic affections, sedative inhalations, especially of chloroform, are useful, and applications of cocain will diminish afferent impressions of the larynx. Bromids and morphin lessen the irritability of the nerve-centers.

PNEUMONIA, CATARRHAL.—See BRONCHOPNEUMONIA.

PNEUMONIA, CROUPOUS (Lobar Pneumonia; Fibrinous Pneumonia; Acute Pneumonia; Pneumonitis).

Definition.—Pneumonia is an acute specific disease, due to infection with the diplococcus pneumoniæ (pneumococcus of Fraenkel) and, rarely, with other microorganisms, characterized by a fibrinous exudation into the pulmonary air-cells and bronchioles, and following a course that is more or less typical, the chief symptoms being those of toxemia and of interference with the respiratory and circulatory functions. Streptococcus-pneumonia is regarded as a more or less distinct form of pneumonia.

Etiology.—The greatest predisposition to pneumonia is in early adult life; it is less common as a primary disease before 20 and after 50 years. Women are nearly four times more liable to it than men, and it is more prevalent among the negroes in America than among the whites. There are more cases in the winter and early spring, and fewest from June to December, and it is relatively more rife in the Southern than in the New England

States. Surgical operations, ether narcosis, and previous attacks are also predisposing causes.

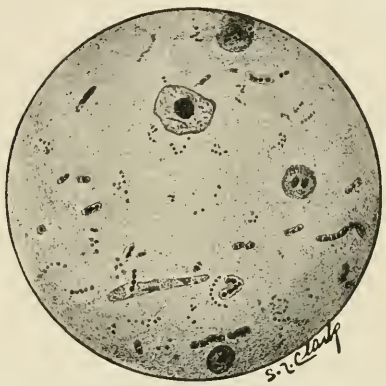
As a secondary disease it is associated with epidemic influenza, typhus and enteric fever, variola and other exanthems, diphtheria, erysipelas, puerperal septicemia, acute dysentery, whooping-cough, tuberculosis, acute and chronic nephritis, diabetes, malaria, gout, and chronic alcoholism. Emphysema, asthma, and chronic valvular heart-disease are said to confer a certain immunity.

Bacteriology.—It is now believed that the essential cause of pneumonia is a microorganism, and that the disease is a specific one. Although prolonged exposure to cold and sudden chilling are followed by attacks, yet if the accepted theory of pneumonia is true, such incidents prepare the tissue of the bronchioles and alveoli for infection, but do not in themselves cause the disease. The same may be said of contusions, fracture of the ribs, and other traumatic causes which are sometimes followed by pneumonia. The diplococcus of pneumonia is found in health in the mouth and upper air-passages, but infection does not take place unless some other influences, such as those mentioned, are brought into play. The microorganisms usually gain access to the alveoli through the bronchial tubes, but they may reach the lung through the circulation; this is shown by the presence of the pneumococcus in the exudate of meningitis, pericarditis, endocarditis, and in other lesions complicating fibrinous pneumonia, and by its occasional discovery in the blood.

Pneumococcus of Fraenkel in Sputum of Pneumonia Gram's Stain and Eosin.—(*Williams.*)

The specific microorganism most frequently found in typical fibrinous pneumonia is the diplococcus pneumoniæ (the pneumococcus of Fraenkel). There are cases presenting the characteristic symptoms and physical signs in which other bacteria have been found, as Pfeiffer's influenza bacillus, the streptococcus pyogenes, the staphylococcus aureus, and the typhoid bacillus. In view of these facts and of the failure of Fraenkel's parasite to produce pneumonia in animals by inoculation, it cannot be asserted that there is one specific cause of pneumonia. (See, too, Colon Bacillus Infection.)

Pathologic Anatomy.—The general distribution of lesions in pneumonia proves that it is a general disease. The lung presents the most serious changes, but the blood, serous membranes, kidneys, and spleen show decided alterations.



Sputum, Croupous Pneumonia.—(*Coplin.*)
In the extreme upper part of field is a leukocyte showing chromatolysis but containing englobulated cocci. Below and slightly to the left of this cell is a squamous cell from the mouth. To the right of the latter and slightly below is a polymorphonuclear leukocyte, and in the extreme lower part of the field is a small hyaline cell. The field also contains numerous encapsulated pneumococci a few streptococci and unarranged cocci that cannot be identified with accuracy.

Lungs.—It is usually stated that the lower lobe of the right lung is involved in three-fourths, and alone affected in one-half, of all the cases. Pye-Smith's figures give a different conclusion from this. Out of his 434 cases, the right base was the seat of disease in 140, the left base in 151, the right apex in 60, and the left apex in 20 cases. There were 8 cases of central and 55 of double pneumonia. Apical pneumonia is much less common than pneumonia of the base. Double pneumonia occurs in about one-sixth of the cases; it may involve both bases, or the apex of one and the base of the other lung. The inflammation spreads upward from the base and downward from the apex, and the tendency of the disease is to implicate the whole lobe or the entire lung.

The changes through which the lung passes are conveniently divided into three stages: (1) Congestion or engorgement; (2) consolidation or hepatization; (3) resolution.

1. Stage of Congestion and Serous Exudation.—The affected lung in this stage is congested, more resistant to touch, has somewhat increased weight and density, and is darker in color. On section a bloody liquid exudes, the tissue is brighter red than normal, and there is less crepitation on pressure. Toward the end of this stage the color is darker red, the density is greater, and there is even less crepitation, but pieces of the affected part

still float in water. From the resemblance of the lung to splenic tissue, this condition is called splenification. The increased density and changed color are found, microscopically, to be due to overdistention of the blood-vessels of the alveolar septa, and to the exudation of serum with the escape of leukocytes and a few red blood-cells into the alveoli and bronchioles.

2. **Stage of Fibrinous Exudation and Solidification (Hepatization).**—In this stage, beginning on the second or third day, the lung is increased in bulk and 3 or 4 times in weight; it is inelastic and liver-like in density and appearance (red hepatization). The cut surface is dark red or brownish-red, dry, and granular; crepitation is absent, and pieces sink in water. The tissue is friable and breaks down under rough handling.

The corresponding pleura, both parietal and costal, is covered with a layer of thick, soft lymph. At this period the alveoli and smallest bronchi are completely filled with a fibrinous exudate, seen with the microscope as a network of thread-like lines, with entangled leukocytes, red blood-cells, exfoliated alveolar epithelium, and diplococci or other microorganisms. It is this exudate which is the essential and characteristic feature of fibrinous pneumonia; by filling and then coagulating within the alveoli and minute bronchi, it renders the lung airless and solid. Later in this stage, the exudate compresses the alveolar capillaries and makes the tissue bloodless. Thus, "gray hepatization" is brought about, the lung remaining solid, but the color changing to grayish or yellowish-gray. Thrombi fill up the branches of the pulmonary artery as far back as the large vessels, but the nutritive vessels are pervious.

3. **Resolution.**—Between the fifth and eighth days, usually, the exudate begins to soften, and the entangled cells, among which are many leukocytes, undergo fatty degeneration. Liquefaction is followed by absorption, and, when the latter is completed, the alveoli are open and the lung is restored to a normal condition. In this process the lung becomes gradually softer, less resistant, and finally elastic. The whole of the affected lobe is not going through these stages at the same time: while the first part attacked is becoming consolidated, neighboring areas are in the state of congestion. The sudden crisis of the third stage, however, puts an immediate end to all processes. The nonpneumonic portions of the lung and the opposite lung may be congested and edematous; the bronchi are congested or in a catarrhal state, and the bronchial lymph-glands are congested, soft, and swollen.

In drunkards and cachectic individuals the exudate is hemorrhagic, and does not solidify, so that the stage of complete consolidation is not reached. In cases that have been prolonged, pressure on a cut surface leaves a pit that fills up with a purulent fluid; this condition, supposed to be a perverted and delayed resolution, has been called "purulent infiltration." In the terminal stage resolution sometimes does not occur, and by the breaking down of the septa an abscess cavity is formed; this empties into a bronchus, or is encapsulated. Gangrene of the lung is a very rare termination, as is also a fibrous alteration called fibrous pneumonia or carnification. An abundant serous effusion may take place into the pleura (pleuropneumonia), and not infrequently, especially after influenza pneumonia, empyema is a final stage.

Next in importance to pulmonary lesions are those of the **heart**, for it is upon the relative integrity of this organ that the fate of the patient most frequently depends. The right heart, as a rule, contains red or white clots that extend into the branches of the pulmonary artery; the left cavities may be empty. The heart-muscles may undergo parenchymatous degeneration. Pericarditis, especially in left-sided pneumonia, and endocarditis are not unusual. This last has the malignant form, and is rapidly fatal. In both lesions, as well as in all exudates, the pneumococcus has been found.

In the **kidney** the cells of the tubules show cloudy swelling or granular degeneration, and in a few cases there is acute nephritis.

The liver is congested, and the **spleen** large and soft.

The nervous system shows few changes, meningitis being the most common.

Symptoms.—Primary fibrinous pneumonia is always a serious disease; and has a necessary intensity, conforming more or less in uncomplicated cases to a definite type. Every variation from this type is unfavorable, whether in the direction of greater or less intensity, or in the loss of essential characteristics. A prodromal period of 2 or 3 days is noted sometimes, with nasal or pharyngeal catarrh, epistaxis, or loss of appetite and diarrhea.

First Stage.—The onset is sudden, with a chill, lasting a half-hour or longer; it is most common and most severe in young adults, but is absent in the aged and in children. After the chill the patient has flushed cheeks, a hot and dry skin, and a rapidly rising temperature; he complains of a sharp stitch in the region of the nipple, in the midaxillary line, or just anterior to the angle of the scapula; inspiration increases the pain, and an involuntary effort is made to relieve it by making the respirations shallow and irregular. A short and sharp cough is accompanied by a viscid sputum in small masses without air-bubbles, and of a peculiar, yellowish-red or "rusty" color. It consists of mucus, blood discs, leukocytes, and minute casts of the bronchioles. In stained preparations the diplococci or other microorganisms are seen.

Some importance as a symptom is to be given to a group of herpetic vesicles on the upper or lower lip, chin, or cheek. The tongue is coated; the urine is scanty, high colored and acid, depositing lithates on cooling, with more lessening of urea, chlorids, phosphates, and sulphates than in other febrile disorders. Headache, a sense of illness and prostration, insomnia, and slight delirium may be present from the beginning. Early in the attack the number of leukocytes in the blood is increased from the normal 8000 or 10,000 to 20,000 and 30,000 or even to 60,000.

They grow in number up to the crisis, and then quickly drop to the normal proportion. These are the symptoms of the stage of congestion and last about 2 days.

The physical signs during this period are diminished expansion, with normal vocal fremitus; the percussion-note is less clear, passing into dulness as consolidation begins; the respiratory murmur is feeble or suppressed; moist or dry râles may be found, and later there is bronchovesicular breathing. Crepitation, the only pathognomonic physical sign, may or may not be heard on inspiration. A pleural friction sound is rarely present.

Second Stage.—No well-defined line separates the symptoms of the second stage from those of the first, but by the second or third day an aggravation of all the symptoms has developed. The patient wears a more anxious expression, one or both cheeks have a dark, sometimes livid red color, the nostrils expand with inspiration, and the lips are often dark red, and in some cases purple. The temperature at the close of the first or second day reaches 104° F. to 105° F., and remains at about this maximum with diurnal variations. The pulse is 110 to 120, its tension and fulness lessening with the progress of the disease and growing feeble and intermittent.

The cough is less frequent than at first, and may, by the third or fourth day, cease altogether. The same is true of the sputum as well as of the local pain; both disappear when the lung is consolidated. The dyspnea, on the contrary, increases; the respirations are shallow, and are 30 to 40 or more to the minute, being relatively more frequent than the pulse. The tongue has a thick white fur, and there is constipation. In some cases jaundice occurs.

The nervous symptoms are very variable, but are often the most striking clinical features. Headache and general aching may disappear with the onset of delirium, which is maniacal or of the low muttering character; the active form occurs in drunkards and in cases of apical pneumonia; the typhoidal form may be present from the beginning or toward the end of the first week, and is accompanied by tremor of the limbs and tongue. In some instances there is mild delirium at night only, the mind being clear during the day, but at all times there is an absence of natural sleep.

The intense toxemia, in addition to the asphyxia and disturbance of the heart and circulation, bring about a very rapid change in the patient's appearance. The flushed cheeks, dilating nostrils, rapid breathing, and restless movements indicate the serious nature of the illness, and the changes for the worse, from day to day, are very decided.

The physical signs of the second stage are: The affected side expands less, and vocal fremitus, unless there is pleural effusion, is exaggerated. There is percussion dulness, with increased resistance over the solid lung, whether base or apex, and this extends upward or downward. Bronchial breathing and bronchophony are heard first over the locality of beginning consolidation, whence they spread over the whole of the pneumonic area.

Third Stage.—The beginning of resolution is a true crisis, and is shown in the sudden drop of the temperature and in the change in all the symptoms. It comes between the fifth and ninth day, being sometimes preceded by pseudocrisis; a normal or subnormal point is reached in from 5 to 15 hours, and is followed by a natural sleep, free sweating, and relief from suffering. The patient then enters upon convalescence.

On *physical examination* a subcrepitant râle (râle redux) is heard in the midst of the bronchial breathing, and the signs of consolidation gradually disappear with multiplying moist râles. Percussion dulness may last for some time, owing to the pleuritic exudate. By the twelfth or fourteenth day the lung has returned to its normal state.

Death may occur in 36 or 48 hours, or it may come in the last days of the first or beginning of the second week. Muscular and nervous exhaustion, with increasing feebleness of the pulse, delirium and coma, burning dry heat of the skin, cold extremities, and cyanosis are symptoms preceding death. It may be due to intense infection affecting the nerve-centers and the heart, to hyperpyrexia, or asphyxia due to loss of respiratory surface, or to some complication.

Variations.—Temporary hyperpyrexia during the first 4 days is not uncommon; in about one-fourth of the cases a temperature of 105° F. or over is maintained for 2 or 3 days, and in fatal cases this may be continued to the end. In children vomiting or a convulsion takes the place of a chill; nervous symptoms predominate, and the physical signs are slow in developing. As a rule, there is no localized pain, cough, or expectoration. In the aged the onset is insidious, the fever is less, cough and sputum may be absent, and the physical signs appear slowly. In alcoholics cerebral symptoms and fever may be the only indications to be relied on, the physical signs alone giving sure evidence of the disease. In the cachexias or in enfeebled constitutions consolidation of the lung is not complete; there is great prostration, with prune-juice expectoration.

Instead of resolution occurring on or about the ninth day, the progress may be delayed by the continuance of fever of irregular course and by persisting moist râles. It is under these circumstances that the lung is believed to be in the condition of "purulent infiltration." Delayed resolution and the continuance of the physical signs of consolidation with fever may end after some weeks in the sudden discharge from the lungs, through the bronchial tube, of a large quantity of pus—the so-called abscess of the lung. A much graver termination is gangrene of the lung, which is brought about by the closure of a nutrient vessel supplying the pneumonic area; this condition is shown by fetor of the breath, an offensive thin sputum, great prostration, and sometimes by the physical signs of a cavity.

The symptoms differ more or less from this description when pneumonia develops during the progress of, or at the end of, the various acute or chronic diseases enumerated under the head of etiology. It is then frequently the closing event,

and the picture is modified by the peculiar symptoms in each case. The anatomic condition of the lung and the physical signs are the same, however, as in the primary form. In secondary pneumonia the chill is usually absent and the temperature range is less constant, and, in many cases, not so high as in primary pneumonia. Cough, sputum, and localized pain may also be absent. The breathing is always much embarrassed and the serious nature of the illness is shown in the rapid decline of strength.

Complications.—In the respiratory organs the complications of pneumonia are laryngitis, general bronchitis, collateral hyperemia, and edema of the opposite lung. The fibrinous pleurisy that is a necessary part of pneumonia may be attended by the effusion of serum (pleuropneumonia) and empyema in from 1 to 5 percent of all cases, and may develop after the pneumonic symptoms have subsided. Pericarditis has been noted in 2 to 8 percent of cases, and endocarditis was present in 16 out of Osler's 100 cases, but in only 7 of Pye-Smith's 425 cases. The daily examination of heart would probably disclose a large proportion of cardiac lesions. Symptoms in pericarditis have not the same value as physical signs; endocarditis has, however, the characteristic and rapidly progressive asthenia of the malignant form. Meningitis occurs in intense general infection, and is associated not infrequently with malignant endocarditis; the symptoms are cerebral—active delirium passing into the low muttering form with coma. Other and rarer complications are acute nephritis, catarrhal, membranous, or ulcerative colitis, icterus, arthritis, otitis media, parotitis, thrombosis of the femoral vein, and peripheral neuritis.

Diagnosis.—Pneumonia developing in a previously healthy adult is recognized by the sudden chill, the high temperature, side pain, rusty or bloody sputum, and by physical signs that point to the lung as the seat of attack. Stained specimens of the sputum reveal the diplococcus in most cases. The subsequent course of fever, with the consolidation of the lung, the nervous and other symptoms, make a picture that is not easily mistaken. If any doubt exists, the critical change, at a more or less fixed date, clears up all uncertainty. Blood examination is of great value, as a leukocytosis of from 20,000 to 30,000, and ranging as high as 60,000, is invariably found; it varies with the seriousness of the attack, and continues up to the crisis. In secondary pneumonia the features are so modified by the primary disease that the diagnosis is often difficult. Physical signs have the most value, and the daily examination of the thorax will often explain the nature of symptoms that bear but little likeness to those of pneumonia. In drunkards, children, and old persons, fever alone, or associated with cerebral disturbance, may be the only symptom of a pneumonia that would escape detection if the lungs were not examined.

Pleurisy is distinguished from pneumonia by the lessened movement of the chest, the absence of fremitus, and by egophony. The symptoms, too, are less acute, and the characteristic sputum is wanting. If pleurisy with effusion complicates pneumonia, a judicious interpretation of the united symptoms and physical signs makes the diagnosis not a difficult one. In cases of great uncertainty an aspirator can be used without any danger.

Bronchopneumonia or catarrhal pneumonia is more common than fibrinous pneumonia in infancy and in advanced life, and as a sequence to pertussis and measles. It is preceded by the symptoms and physical signs of bronchial catarrh, the consolidation is in both lungs, although not always at the same time; the sputum is mucopurulent, and contains no pneumococci, but streptococci and staphylococci; the temperature is lower and more irregular than in lobar pneumonia, and the symptoms are without any definite duration, lasting longer, as a rule, than in fibrinous pneumonia and coming to an end gradually without crisis.

In hypostatic congestion with edema, cough, frothy, bloody expectoration, and dyspnea are present, but there is no chill and little or no fever. Slight dulness on percussion and subcrepitant râles are found on both sides.

Apical pneumonia and **tuberculosis** are sometimes confounded; both have local pain, cough, bloody expectoration, and fever; the physical signs of consolidation are the same, although advancing at a different rate and running a different course. But the fever in pneumonia is continued, and in tuberculosis is remittent or intermittent; bacilli in the sputum, and the absence of leukocytosis also favor the existence of tuberculosis. After 2 weeks have passed there can no longer be any question if the local signs and the symptoms continue unchanged. **Cancer** of the lung, a rare condition, resembles pneumonia up to a certain point, but the onset is gradual, without chill or much fever, and there are constant pain and rapid emaciation. In **appendicitis** pain and rigidity may be reflected through the lower intercostal nerves and simulate lobar pneumonia.

Croupous Pneumonia.	Pleurisy.	Typhoid Fever.	Acute Phthisis.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*
1. Onset sudden, with severe chill.	1. Onset sudden, with chill or chilly sensations.	1. Gradual onset, with vague pains, epistaxis, diarrhea, and eruption.	1. Onset sudden, with severe chill; history of phthisis in family.
2. Pain in affected side not so great as in pleurisy.	2. Sharp pain (stitch) in affected side.	2. Pain on pressure in right iliac region; tenderness about spleen.	2. Same as pneumonia.
3. Cough which increases pain in affected side.	3. Severe cough often cut short by "stitch" in side.	3. Slight cough.	3. Same as pneumonia.
4. Delirium after first two days.	4. Delirium uncommon.	4. Delirium frequent.	4. Same as pneumonia.

Croupous Pneumonia.	Pleurisy.	Typhoid Fever.	Acute Phthisis.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*
1. High fever 104°, and very regular.	1. Moderate irregular fever.	1. Moderate fever and regular.	1. High irregular fever, frequently varying several degrees.
2. Pulse full, bounding; rate moderately increased.	2. Pulse full; rate slightly increased.	2. Pulse dicrotic; rate gradually increased.	2. Pulse rapid and feeble.
3. *Inspection.*—Diminished expansion.	3. Same as pneumonia.	3. Expansion normal.	3. Same as pneumonia.
4. *Palpation.*—Increased vocal (tactile) fremitus.	4. Diminished vocal fremitus.	4. Fremitus normal.	4. Same as pneumonia.
5. *Percussion.*—Note in first stage hyperresonant; subsequent dulness at base of lung.	5. Percussion-note dull.	5. Percussion-note normal.	5. First stage same as pneumonia; later dulness at apex of lung.
6. *Auscultation.*—Bronchial breathing; crepitant râle; bronchophony, occasionally pectoriloquy.	6. Respiratory murmur almost inaudible; pectoriloquy.	6. Sonorous and sibilant râles are common.	6. Bronchial breathing; mucous small râles; later gurgling râles.
7. *Mensuration.*—Normal on each side.	7. Increase in anteroposterior diameter on affected side.	7. Normal.....	7. Normal or decreased diameter.
8. Sputum "rusty color," containing diplococci.	8. Sputum whitish, frequently streaked with blood.	8. Sputum normal.	8. Sputum often contains blood and tubercle bacilli.

Prognosis.—The fatality of primary fibrinous pneumonia varies from 15 to 25 percent. Among young, healthy men composing armies, it is much less; in 40,000 cases in the German army the death-rate was 3.6 percent. In children under 5 years it is not above 3.3 percent; after 50 years it reaches 50 percent and upward. This difference is due to the lessened resistance of the aged, and especially to senile degenerations in the heart, kidneys, and other organs. In hospitals the mortality is higher than in private practice, in the proportion of 26.1 (Osler to 12 percent. Previous conditions of ill health and the drinking habit are the chief causes of this difference; the latter has a most fatal influence in pneumonia. More deaths occur in the autumn and winter than in the spring and summer. In individual cases the danger lies in the toxemia and in the mechanic interference with respiration and circulation. Pneumonia of one lobe is much less serious than of the whole lung, and this is less so than double pneumonia, which has a death-rate of 50 percent and upward.

Unfavorable symptoms are a temperature above 105° F., increasing frequency and weakness of the pulse, feeble heart-sounds, prune-juice sputum, early delirium of the maniacal or the low muttering form, muscular tremor, profuse sweating (except at the crisis), excessive tympanites and hiccup, cold extremities, and cyanosis and abundant bronchial and tracheal râles.

A slight leukocytosis, below 14,000, or a very high leukocytosis with a low temperature, are discouraging indications. Complications of the heart, kidneys, and meninges of the brain add greatly to the danger.

Secondary pneumonia has no fixed death-rate, the result depending upon the nature of the previous or coexisting illness; but in all cases the mortality is higher than when pneumonia begins in previously healthy persons.

Treatment.—Experiments on animals and the inoculation of cases of pneumonia with the blood-serum of immunized rabbits and of convalescents from pneumonia have given much hope that ultimately an antipneumotoxin may be found. An abortive or distinctly curative treatment cannot be employed generally until a successful antitoxin is as readily obtainable as the antitoxin of diphtheria. See Pneumococcus Infections.

In the meantime pneumonia must be recognized and treated as an acute, infective disease, tending to self-limitation, the chief dangers of which are, first, toxemia, with the resulting high fever and exhaustion of the heart and nervous system; and, secondly, the lessened air-space and obstruction to circulation through the right heart and pulmonary vessels. Fresh air is of vast importance. The patient should be placed in a well-ventilated room, with an open fire and open window; the temperature of the room should be kept below 70° F.—65° F. being the minimum. In no disease is a trained nurse more needed, and strict sick-room discipline should be maintained from the beginning. The strength should be husbanded by the use of the bed-pan, and by not permitting the patient to sit up for food or for examinations of the chest. Milk is the best food—3 to 4 ounces every 3 hours, so as to amount to 2 or 3 pints in the 24 hours. Tympanites and undigested casein in the stools call for a less quantity and for dilution of the milk with barley or Vichy water. If there is a distaste for milk, koumiss, matzoon, or farinaceous gruels may be given as substitutes. The disease is of short duration, and but little food can be digested and assimilated; fever, prostration, and dyspnea will be increased by excessive feeding. The craving for liquids must be gratified by the free use of cold water, or by any of the effervescent waters.

The eliminative treatment is important. Perspiration should be promoted and a purgative may be prescribed at the start—calomel is the best, followed by a saline. No other drug, as a rule, is needed in the first stage, and in many cases none will be called for throughout the entire illness. A. H. Smith believes in the efficacy of "an attack upon the pneumococcus through the

medium of the blood, the object being that the exudate, when it escapes into the air-cell, shall be impregnated with a substance that will unfit it to serve as a culture medium." To effect this may be given calomel, 20 to 30 grains in one dose; chloroform or creosote (creosotal preferably) by the mouth or by inhalation; quinin, or a salicylate. Creosotal is given in 10 minim doses in capsule or emulsion every 4 hours. Sodium salicylate or aspirin is to be preferred, 60 to 120 grains in 24 hours, after the plan of Robert Liegel.

It is claimed for the external applications of cold water that, as in typhoid fever, they not only reduce temperature, but eliminate the toxins, and thus strengthen the heart and relieve the nervous symptoms. For adults this can best be done by applying to the front and back of the entire chest a compress made after the pattern of the oil-silk jacket, wrung out of water at 60° to 70° F., and covered with flannel. This is reapplied every half-hour or hour, according to the height of the temperature and the effect produced; it should be discontinued when 99.5° F. has been reached.

Mays uses large, flat, rubber ice-bags—2 to the head and 2 or more to the chest. He claims a mortality of 4.25 in 400 collected cases treated with ice applications. It must be taken into account, however, that a number of these cases were in children.

The cold tub-bath is objectionable, because it fatigues and excites the patient. Tepid or warm baths are preferable. In some cases the warm or cold wet-pack, with an ice-bag to the head, has a most happy effect, especially in the onset of pneumonia in children, with cerebral excitement and high temperature. The patient may be left in the pack from one-half an hour to an hour. Cold sponging my take the place of the compress or pack if a less decided effect is desired.

In serious cases hypodermoclysis is efficacious, 1/2 to 1 pint of normal hot salt solution (0.6 per cent) being injected daily or oftener.

Optochin (ethyl hydrocuprein) has been recommended. It is said to reduce the death rate, but it may produce disagreeable symptoms such as deafness, dimness of vision, and even blindness. See Optochin.

Insomnia is inevitable, and a too vigorous effort should not be made to relieve it. It is best treated by hydrotherapy, but if there is no sleep in 24 hours, alcohol, sodium bromid, chloralamid (10 to 20 grains), or hyoscin hydrobromid (1/100 grain) hypodermically, may be given at night. Morphin, however, is most to be relied on for this purpose, given hypodermically in doses of 1/32 to 1/16 grain, and repeated in 1 to 2 hours, the dose to be increased on subsequent nights if found to be too small. In cases of feeble heart it can be combined with strychnin or other cardiac stimulants. Dover's powder has no advantage over morphin.

The treatment of delirium is covered by the foregoing suggestions. In alcoholic cases it is necessary to give stimulants according to the degree of habitual use.

The heart and pulse must be sustained from the beginning. Alcohol and strychnin, 1/60 to 1/20 grain, repeated every 3 to 6 hours, are the best remedies for this purpose. Atropin, caffein, strong coffee, or strophanthus may be used as aids or substitutes. Nitroglycerin has a special influence and value in cases of weak heart, with venous congestion of the organs; the rule as to dosage should be to give enough of it to produce a desired effect and to sustain this effect as long as necessary.

Digitalis has been by turns condemned and praised. Theoretically, there are objections to its use; it increases arterial tension and does not relieve the pulmonary stasis, but it has the property of neutralizing the pneumococcus toxin, and has been given with good effect in large doses by Petresco, of Bucharest, and by Maragliano. The former gave 60 to 90 grains of the dried leaf daily. Maragliano gave 60 grains in infusion on the first day, repeated in lessening doses as the pulse becomes slower. But little support has, as yet, been given to this heroic procedure.

For the relief of dyspnea and cyanosis, oxygen inhalations are usually employed. Their effect, however, is rarely what theoretic considerations would lead one to look for. In the severe cases in which such effect is most needed, the improvement in the character of the pulse, in the breathing and color of the lips, is temporary and not definite and complete. Still, it should always be used in such cases in conjunction with cardiac stimulants.

Secondary pneumonia, as a rule, needs early alcoholic stimulants and a treatment modified by the preceding disease. In influenza pneumonia great irregularity and weakness of the heart are a greater danger than the condition of the lung, and call sometimes for strychnin and nitroglycerin in large doses until improvement is assured. In the pneumonia of typhus and typhoid fever and other secondary forms, hydrotherapy is much less efficient than in primary cases. Each complication must be met, when possible, by treatment. Paracentesis may be needed in pericarditis and in pleurisy; and in empyema, section of the rib and drainage should be done as early as the diagnosis is made.

A word should be said about bleeding in pneumonia. As a rule of treatment, it received its death-blow from J. Hughes Bennett, and has not been since advised except as a resort in exceptional cases. In young, vigorous, and plethoric adults, with hyperpyrexia and a pulse of high tension, it may be beneficial in the first 48 hours. A small bleeding of 6 or 8 ounces has been advised in later stages, when there is cyanosis from overdistention of the right heart. The advocacy of venesection is only half-hearted, and its use is hedged about with so many restrictions that the rule of never bleeding, under any circumstances, is a safer one to follow. To restore faith in bleeding, even as a resort in exceptional cases, severe therapeutic trials are needed to prove the value of the favorable, but limited, individual support of this lost art. Instead of bleeding veratrum viride is highly praised by some.

The "*open air treatment*" is beneficial. The patient must be well wrapped up and protected, and then allowed all the fresh air that is available. See Pneumococcus Infections.

PNEUMONOKONIOSIS.—A general term indicating chronic disease of the lungs due to the inhalation of dust. Various names have been devised denoting the kind of dust causing the inflammation; *anthracosis* or coal-miner's disease; *siderosis*, due to inhalation of iron dust; *chalicosis*, due to inhalation of mineral dust as of lead in lead miners' phthisis; *lithosis* or *silicosis*, stone-grinders' or potters' phthisis, due to inhalation of particles of silica. Steel-grinders' phthisis is probably due to the particles of grindstone that are inhaled. Ganister disease is due to the dust of a siliceous rock. The dust particles, when they can no longer be disposed of by the natural protective agencies of the lungs, find their way into the peribronchial and periarterial lymph-spaces, where they set up an inflammation. This is characterized by a marked tendency to fibroid change, manifesting itself in the formation of hard, indurated nodules of various size. The fibroid areas may soften and break down, forming the so-called ulcers of the lung. Tuberculosis is prone to develop for the pulmonary lesions form a favorable nidus for the tubercle bacillus.

PNEUMOTHERAPY.—See TUBERCULOSIS (Pulmonary).

PNEUMOTHORAX.—Air in the pleural sac.

Etiology.—(1) Perforation of the pleura adjacent to a phthisical cavity; (2) perforation of the diaphragm from malignant disease of the stomach or esophagus; (3) rupture of the lung by overstraining; (4) rupture of empyema into the lung; (5) traumatism.

Pathology.—There is effusion of air into the pleural sac. Coexisting with pneumothorax there is frequently an effusion of fluid into lung tissue—pneumohydrothorax, or pneumopyothorax, if purulent. The disease is usually unilateral, and may cause great displacement of the heart. The lungs are usually smaller than normal, due to the compression.

Symptoms and Clinical Course.—Sudden pain, dyspnea, cyanosis, or collapse (subnormal temperature, rapid pulse, and cold extremities) may mark the onset of the disease. When slight, no special symptoms are produced in many cases. If pleurisy is present, the characteristic stitch in the side is pronounced.

Physical Signs. Inspection.—There is bulging of the intercostal spaces, usually limited to one side, and displacement of apex-beat.

Palpation shows diminished vocal (tactile) fremitus.

Percussion-note is tympanitic over affected area, while immediately below this area dulness is elicited on account of presence of fluid. On turning patient to opposite side, the fluid gravitates and dulness may be replaced by tympany.

Auscultation shows an absence of the respiratory murmur and normal vocal resonance. If due to rupture of phthisical sac, amphoric breathing is heard. At times metallic tinkling is detected. This is due to the dropping of fluid from above downward in an inclosed sac.

Succussion detects splashing sound.

Bell tympany is frequently present. It is elicited by placing the flat surface of a coin on the bare chest over affected area, and on being struck by another similar coin while listening over opposite side of chest in same relative position, a clear metallic sound is heard.

Diagnosis.—Pneumothorax may be mistaken for a diaphragmatic hernia, but the stomach-tube would indicate the displacement. In dilated stomach the tympanitic note is continued downward to umbilicus, as well as upward.

A large phthisical cavity simulates pneumothorax closely, and in many cases is identical with it. Usually phthisical cavities do not produce bulging of the intercostal spaces, are circumscribed, and the dulness is not movable.

Prognosis is unfavorable.

Treatment is symptomatic. If collapse threatens, strap the chest by means of adhesive plaster, and give hypodermics of whisky, strychnin (1/4 grain), and atropin (1/125 grain). Keep up bodily temperature by application of hot-water bag or hot blankets to extremities.

PODAGRA.—See GOUT.

PODODYNIA.—Pain in the foot, and especially in the sole of the foot; the word is now usually limited to painful heel—a neuralgic condition about the heel, attended with little or no swelling, no discoloration, and no affection of the joints. The pains are very severe, though often limited to a very small area. It may be associated with rheumatism or gout, and with certain occupations requiring much standing.

PODOPHYLLUM (May-apple).—The root of mandrake, *P. peltatum*. Its active principle is a *resin* which is official and contains two isomeric glucosids, *podophyllotoxin* and *picropodophyllin;* also podophyllinic acid and protocatechuic acid. Podophyllum probably contains the alkaloid *berberin*, which is found also in berberis, hydrastis and other plants. It is a tonic astringent, cholagogue, and purgative, and is likely to produce nausea. It is recommended in remittent fever, bilious vomiting, and malarial jaundice. Dose of the root, 5 to 20 grains; of the resin, 1/8 to 1 grain. **P., Fluidextract.** Dose, 2 to 20 minims.

Pilulæ Podophylli, Belladonnæ et Capsici, have in each pill 1/4 grain of the resin, with 1/8 grain extract of belladonna and 1/2 grain capsicum. Dose, 1 to 2 pills.

For constipation:

℞. Resin of podophyllin, Powdered aloes, } each, gr. iij to vj
Extract of nux vomica, Extract of belladonna, } each, gr. iv.

Make 24 pills. One pill night and morning.

POIKILOCYTOSIS.—See BLOOD.

POISONING.—According to Reese, a poison is a substance capable of producing noxious and even fatal effects upon the system, no matter by what avenue it is introduced; and this, as an ordinary result in a healthy state of the body, and not by a mechanic action.

Witthaus defines a *poison*, as "a substance which being in solution in, or acting chemically upon, the blood may cause death or serious bodily harm;" and a *corrosive*, as "a substance capable of causing death or injury by its chemical action upon a tissue with which it comes in direct contact."

The most energetic poisons are hydrocyanic acid, potassium cyanid, nicotin, strychnin, phenol, and some reptile venoms. The poisons usually selected by poisoners for criminal purposes on others are those which produce effects resembling the symptoms of natural disease, as arsenic, colchicin, tartar emetic, strychnin, morphin and aconite. Those generally chosen for suicidal purposes are such as may be most readily obtained by the laity, namely—phenol, morphin, illuminating gas, charcoal gas and potassium cyanid, the first being easily purchased for disinfecting purposes, while the last is commonly used in the arts.

Diagnosis.—If diagnosis cannot be made from direct history, the process of exclusion should be instituted.

The following lists have been compiled by Murrell, but no attempt has been made to render them complete, and they must be taken as being merely suggestive:

The Patient is Dead.—Prussic acid (death in a few minutes at the outside); cyanid of potassium (usually kills very quickly); strong ammonia (may kill in a few minutes); carbonic acid gas (if pure, may kill almost at once); carbonic oxid; oxalic acid. Almost any active poison if given in a very large dose.

The Patient is Comatose.—Opium; morphin; alcohol; chloral; chloroform; camphor.

The Patient is in a Condition of Collapse.—Strong acids; alkalies; aconite; antimony; arsenic; tobacco; lobelia. Most poisons cause collapse toward the last.

The Patient is Delirious.—Belladonna (noisy, pleasing delirium, "the insane root that takes the reason prisoner"); hyoscyamus; stramonium; cannabis indica; alcohol; camphor.

The Patient is Tetanized.—Nux vomica; strychnin (think of vermin-killers); antimony; arsenic. There may be a condition approaching tetanus from excess of pain—in poisoning by strong ammonia, for example.

The Patient is Convulsed.—This may mean anything, the term being used vaguely. Antimony; arsenic; carbonic oxid; aconite. Strong acids, such as acetic or sulphuric, or strong alkalies, such as ammonia.

The Patient is Paralyzed.—Physostigmin; conium (from below upward); gelsemium; aconite; arsenic; lead.

The Pupils are Dilated.—Belladonna and atropin; hyoscyamus; stramonium; opium (in last stage); aconite; alcohol; chloroform (when taken in liquid form); conium.

The Pupils are Contracted.—Opium (very strongly if a large dose); physostigmin; chloral (during sleep).

The Skin Dry.—Belladonna and atropin; hyoscyamus; stramonium.

The Skin Moist.—Opium; aconite; antimony; alcohol; tobacco; lobelia. Almost any poison during the stage of collapse.

Rash on the Skin.—Belladonna (resembles rash of scarlet fever); stramonium (much like the belladonna rash); chloral (urticaria); arsenic (eczema, or may be like scarlet fever); antimony (pustular, like small-pox, but rare); opium (itching, followed by urticaria or papulous or roseolous patches, not common). Many other drugs excite cutaneous eruptions. For example, bromid of potassium and tar produce acne; copaiba, cubebs, and salicylic acid give rise to urticaria, and iodid of potassium may bring out a crop of petechiæ. Croton oil, tartar emetic, sulphur, hydrastis, and arnica are well-known rash-producers when applied locally. Murrell has known croton chloral hydrate, given for whooping-cough, to bring on urticaria. The discoloration of the skin resulting from the long-continued administration of silver requires no detailed mention.

Odor of the Drug on the Breath.—Prussic acid; laudanum; alcohol (brandy, whisky, etc.); carbolic acid; acetic acid; ammonia; chloroform; creosote; iodin; phosphorus; camphor; nitrobenzol. The odor is not always a reliable guide; for example, laudanum is not uncommonly taken in porter.

The Mouth and Tongue Dry.—Belladonna and atropin; hyoscyamus; stramonium; opium.

Salivation.—Arsenic; ammonia; cantharides. Most drugs which produce a corrosive action on the mucous membrane of the mouth or esophagus. Mercury, jaborandi, and muscarin may also be mentioned.

The Mouth Bleached.—Carbolic acid (mucous membrane white and hard); ammonia (epithelium coming off in flakes); potash; soda; nitric acid (white, soft, or yellow); corrosive sublimate. The numbness of the lips, mouth, and tongue, produced by aconite, will not be forgotten.

The Patient is Vomiting.—Arsenic (brown, mixed with blood); antimony (white, stringy mucus, may be tinged with blood); digitalis (vomited matter has a grass-green color); aconite; colchicum; colocynth; ammonia (stringy saliva mixed with blood, fumes with hydrochloric acid); phosphorus (vomited matter luminous in the dark).

The Patient is Purged.—Arsenic (continuous, with much pain, stools mixed with blood); antimony; corrosive sublimate (green in color, mixed with blood); cantharides (blood and slime); digitalis; colchicum; colocynth.

The Patient is Suffering from Colic.—Lead (about navel, eased by pressure); copper; arsenic; colocynth.

The Patient is Suffering from Cramp.—Arsenic; antimony; lead.

The Drug was Given Hypodermically.—Morphin; atropin; strychnin.

The Poison was Inhaled.—Ammonia; prussic acid; chloroform; ether; benzin; carbonic acid gas; carbonic oxid; coal-gas; sewer gas; cesspool gas and emanations.

Poisons Commonly Used for Murder.—Arsenic; antimony; aconite; digitalis; opium; strychnin; prussic acid.

Poisons Commonly Employed for Suicidal Pur-

poses.—Opium and its preparations commonest of all poisons); oxalic acid; rat paste; prussic acid; chloral; sugar of lead; strychnin. Patent medicines of all kinds unintentionally.

Drugs Used Popularly as Abortifacients.—Ergot; rue; gin and pennyroyal; savin; bitter apple (colocynth, very popular); hickery pickery (hiera picra, or holy bitters, a mixture of 4 parts of aloes and 1 of canella bark); Spanish fly (cantharides); yew-tree tea; green tea in large quantities; quinin is often supposed to exert a specific action on the pregnant uterus; actæa racemosa (cimicifuga racemosa) is sometimes said to be an abortifacient, but there is very little truth in the statement; at all events, 1/2 of a dram of the tincture 3 times a day is safe enough even in the later months of pregnancy. Pulsatilla is supposed to be capable of producing abortion, but this again rests on very imperfect evidence. "A handful of parsley chopped fine in a bottle of gin, allowed to stand a week, and a wineglassful 3 times a day" (Hospital Patient). Parsley contains apiol, which is a powerful oxytoxic. Jaborandi was at one time supposed to exert a powerful action on the uterus, but the idea is now exploded.

Indigenous Poisonous Plants.—Woody nightshade (*Solanum dulcamara*); garden nightshade (*Solanum nigrum*); deadly nightshade (*Atropa belladonna*); aconite, monk's-hood, wolf's-bane or blue-rocket (*Aconitum napellus*); foxglove (*Digitalis purpurea*); spotted hemlock (*Conium maculatum*); arum (*Arum maculatum*); colchicum (*Colchicum autumnale*); bryony (*Bryonia dioica*); henbane (*Hyoscyamus niger*); fly agaric (*Amanita muscaria*); mezereon, or spruge olive (*Daphne mezereum*); laburnum (*Cytisus laburnum*); and a host of others. These will be found figured in Stephenson and Churchill's "Medical Botany," and in Bentley and Trimen's "Medicinal Plants."

General Principles of Treatment (Potter)

(1) Lose no time. (2) Use the best remedy obtainable at once. (3) Get rid of the poison. (4) Stop its action. (5) Remedy the mischief already done. (6) Fight against the tendency to death (Tanner). In the treatment of poisoning, whether by mineral or vegetable substances, if the poison is known the first indication is to administer the proper chemical *antidote,* so as to render it harmless or comparatively so. Next, the stomach should be emptied and washed out, lest the newly-formed compound be absorbed after a time; also to remove any poison which may have escaped the action of the antidote. Next, the appropriate *antagonist* should be administered, to counteract the effects of such portion of the poison as may have been absorbed. Lastly, such *antagonistic measures* should be employed as may sustain the action of any organic function showing signs of failure. In most cases of alkaloidal poisoning absorption has proceeded so far before professional assistance is obtained that antidotes are of no value, hence reliance can be placed only upon the physiological antagonist and such supporting measures as will tend to maintain vitality until the poison can be eliminated by the natural channels.

Antagonists are agents which oppose each other in their physiological action, and may be employed against each other as counterpoisons, to neutralize their effects upon the organism. They do their work in the blood and tissues, after absorption, and are especially available against poisons administered hypodermically, in which cases antidotes are useless. *Substances* so employed are generally the active principles of plants, a few being chemicals, as oxygen and choral. *Antagonistic measures* include such proceedings as tend to neutralize the remote effects of poisons, as artificial respiration, faradism of the respiratory muscles, hot and cold applications, douching, constant motion or absolute repose, and the use of physiological (normal) salt solution to maintain circulation and increase elimination.

Antidotes affect a poison, either physically or chemically or both, so as to remove it from the body or alter its character before absorption, and thereby prevent its toxic action upon the organism. They do their work in the alimentary canal or in the respiratory passages, and are applicable to vegetable as well as mineral poisons, but they are not available against poisons administered hypodermically. Among them are emetics, cathartics, washes, injections, ligatures, poultices, the use of the stomach- pump, of tourniquets, etc., which are termed *mechanical antidotes;* and the *chemical* or *true antidotes,* which include albumin, milk, charcoal, soap, starch, oils, tannin, turpentine, acids, alkalies, potassium permanganate, carbonates, hydrates, sulphates, sodium chlorid, iodin, iron preparations, etc.

Acids.—Vegetable acids, as acetic (or vinegar), citric (or lemon-juice), and tartaric, are employed as antidotes against the poisonous alkalies and alkaline carbonates. Sulphuric acid, well diluted with water, is antidotal to the soluble salts of barium and lead, with which it forms insoluble sulphates; also as a prophylactic against lead poisoning.

Albumin is an ideal chemical antidote, being harmless, easily procured, and forming compounds (which are more or less insoluble) with most of the metallic salts, corrosive alkalies and mineral acids, as also with iodin, bromin, chlorin, creosote, anilin, and alcoholic solutions of most of the alkaloids. It is especially suitable against inorganic poisons, and was recommended by Orfila for invariable use, even on the mere suspicion of poisoning. It should be well diluted, the whites of four eggs to a quart of lukewarm water; and should be followed by emetics and cathartics, as many of its compounds are soluble in an excess of itself.

Ammonia, diluted, used by inhalation, is an efficient antidote against the vapors of corrosive acids and nitrobenzol, also against chlorin, bromin, and hydrocyanic acid.

Calcium hydroxid and carbonate, in the form of lime-water, chalk, eggshells or powdered oystershells are used against acids, both mineral and organic, and especially against oxalic acid and the acid oxalates, which they neutralize and convert into the insoluble calcium oxalate.

Carbonates and bicarbonates of sodium and potassium are employed against most of the

poisonous metallic salts, especially those of zinc, which they immediately decompose, forming insoluble basic compounds; also against iodin, bromin, and potassium dichromate, forming the neutral chromate with the latter and harmless salts with the former. They are useful in dilute solution against acids, but are less easily tolerated than magnesium sulphate. They are contraindicated in poisoning by oxalic acid, with which they form dangerous compounds. Ammonium carbonate, in dose of 5 grains, administered hypodermically in the vicinity of wounds caused by poisoned arrows, was repeatedly used by Dr. Parke, the surgeon of Stanley's last expedition in Africa, with entire success in saving life when it was employed immediately after the injury. Persons so wounded, if they were at too great a distance to receive this treatment, invariably died within a short time.

Cathartics are generally employed after the use of a chemical antidote, to remove the compounds formed thereby from the intestinal canal. The best are castor oil, croton oil, senna, and magnesium sulphate (Epsom salt). *Castor oil* protects the mucous membrane and obstructs absorption, but is contraindicated in poisoning by phosphorus, phenol, copper salts, or cantharis, the absorption of which is aided by oils and fats. *Croton oil* is rapid and powerful in the dose of from 1 to 5 minims, in a bread pill. *Magnesium sulphate*, in the dose of 1 to 4 ounces, well diluted, is of special service in chronic lead poisoning and to remove antidotal compounds from the intestines. Senna, gamboge, and other drastics are the best cathartics in narcotic poisoning.

Charcoal has some antidotal value against many alkaloids, the metallic salts, and phosphorus, slowing their toxic action and postponing their effects, probably by a protective action upon the gastric walls. It has the valuable property of absorbing gases, but enters into no fixed compound with any mineral or vegetable poison. Fresh animal charcoal is the best, though wood charcoal is efficient, but in less degree.

Chlorin in the form of chlorin water, Labarraque's solution, or Javelle water, is employed externally as an antidotal wash for snake-bites and other poisoned wounds; also, well diluted, internally against alkaloids and other vegetable and animal poisons; and as a spray for antidotal inhalation against coal gas (carbonic oxid), ammonia, phosphoreted and sulphureted hydrogen, also hydrocyanic acid.

Copper carbonate, in dose of 3 to 6 grains, with sugar and water, preceded and followed by an emetic, is recommended in phosphorus poisoning, being supposed to coat the particles of phosphorus first with a layer of copper phosphide and then with one of copper itself, thus preventing their solution in the fluids of the stomach.

Emetics, when employed, should be used without delay. They are often rendered needless by vomiting induced by the poison itself, or by the free use of diluent drinks; and are contraindicated when there is severe corrosion of the alimentary canal or when abdominal inflammation exists. The best emetics are: *Zinc sulphate*, for stomachal administration, being non-nauseating, 20 to 30 grains in water, 5 grains for children. *Apomorphin*, 1/16 to 1/8 grain, hypodermically, when narcosis prevents the use of emetics by the mouth. It should be administered hypodermically, as it is very uncertain in action when given otherwise. The following may be used: Copper sulphate, 1 to 5 grains in water; ipecac, in powder; emetin, 1/12 to 1/3 grain; tartar emetic, 1 1/2 grain, acts slowly and is depressant; turpeth mineral; cadmium sulphate; sodium chlorid (common salt), 2 teaspoonfuls in a pint of water; mustard, 2 teaspoonfuls in a cup of warm water; also olive oil, soap-suds, snuff, melted fats, and tickling the fauces with the finger or a feather. *Sodium chlorid* as an emetic is contraindicated in poisoning by tartar emetic or corrosive sublimate, and so also are oils and fats and substances containing them, in poisoning by phosphorus, cantharis, phenol or copper salts.

Gelatin is of especial value against iodin, bromin and the alums, but requires too much time for its preparation, as it should be broken up, soaked in water for half an hour and reduced to the consistency of honey.

Gluten is of value against corrosive sublimate, but is less so than albumin and is not easily obtained.

Gum arabic, in the form of mucilage, is chiefly used as a protective against corrosive poisons, and has been recommended in copious draughts against poisoning with the bismuth salts.

Iodin, in very dilute solution, is used as an antidote against alkaloids and their salts, other vegetable poisons, and snake-venom. All its compounds are more or less soluble and toxic, and must therefore be removed from the system as soon as possible. *Bouchardat's antidote for vegetable poisons* consists of 3 grains of iodin, 30 grains of potassium iodid and 11 ounces of distilled water. The dose, which is from 1 1/2 to 3 ounces, should be repeated frequently.

Iron.—The **hydroxid** $Fe(OH)_3$, is by far the best antidote to arsenic in solution or in a soluble form, as it combines with the latter to form a ferrous arsenate, and also protects the gastrointestinal mucous membrane against the local action of the poison. In the proportion of 10 parts to one of arsenic the union is very complete, but its union with the salts of arsenic is limited even when it is in great excess, though much more effectual if there is added to it a small amount of ammonia or other caustic alkali, or if the basic ferric acetate is mixed with it. For the preparation of the official arsenic antidote see Arsenic. Dialyzed iron, saccharated iron, and the basic ferric acetate have all been used with more or less success in arsenic poisoning.

Magnesia (MgO), is obtained by heating magnesium carbonate, which is a compound of the hydroxid and carbonate of magnesium with water. When the carbonate is heated at a low temperature it becomes calcined, losing CO_2 and H_2O; then mixed with 25 times its weight of warm water it becomes gelatinized, in which condition it is best for antidotal purposes, in doses of from 1 1/2

to 2 ounces, at short intervals for a few doses, then at longer intervals. An excess does no harm, but rather benefits the patient by its cathartic action. Magnesia is the most efficient antidote against acids and the acid salts, also against oxalic acid and the acid oxalates, in the absence of the calcium antidotes therefor. It is also valuable against arsenic, phosphorus, mercury, corrosive sublimate and other metallic salts in solution, precipitating the corresponding oxids or basic salts.

Milk is a good substitute for albumin, its antidotal action being nearly the same in range and due to its casein, albumin and free alkali. It is particularly valuable against metallic salts, corrosive acids and alkalies (especially ammonia) and the alkaline earths, but it is contraindicated when fatty antidotes are to be avoided, by reason of its richness in fat.

Oils and Fats are efficient against the corrosive acids and alkalies, the metallic oxids and salts; but are contraindicated in poisoning by phosphorus, cantharis, phenol, or copper salts, the absorption of which they promote. With the caustic alkalies they unite to form soaps, liberating glycerin; they are inferior to albumin against the metallic salts, and as their action is slow they are less efficient than acids against alkalies. Those used are olive, cotton-seed, linseed and almond oils, also melted butter and lard.

Potassium ferrocyanid, given in doses of 30 to 60 grains in water, is of special value against the copper salts, but albumin is equally efficient and more easily obtained.

Potassium permanganate is the best antidote against organic poisons, if used promptly, before absorption has taken place, as it rapidly destroys them by oxidation. It has been used successfully against morphin and strychnin salts and phosphorus in the stomach, and locally for snake-poison.

Soap, as Castile soap, dissolved in 4 times its bulk of hot water, to make "suds," and given by the cupful, is one of the most efficient antidotes against corrosive acids and metallic salts, especially corrosive sublimate, potassium dichromate, and salts of tin and zinc. It is inferior to albumin against these, but is preferred to caustic alkalies against acids, as of itself it has no corrosive action. It should not be used against alkalies.

Sodium borate (borax), in milk (5 percent), is recommended as a convenient and efficient general antidote; acting by the alkaline effect of the sodium, which precipitates metallic hydroxids from solutions of their salts, and also precipitates alkaloids from their salts. The milk acts by virtue of its albumin, forming albuminates and casein compounds with the poisons. The stomach should always be evacuated after the use of this agent, as the compounds formed are soluble in the digestive fluids.

Sodium chlorid (common salt), in dilute solution, is the best antidote against the silver salts, converting them into the insoluble chlorid of silver. It may be given with albumin, which is also a very efficient antidote in this form of poisoning.

Sodium thiosulphate in doses of 15 grains, in very dilute solution and frequently repeated, is a valuable antidote against bleaching powder (calcium hypochlorite), Labarraque's solution (sodium hypochlorite), and Javelle water (potassium hypochlorite), which it reduces to chlorids, itself undergoing oxidation to the sulphate.

Starch, in paste, 1 to 15 of water, is the antidote for iodin and bromin, with which it forms compounds which are almost harmless. It has some value against corrosive acids, corrosive sublimate, and zinc and copper sulphates, but it is not so efficient as albumin, which is preferred for these poisons as well as for iodin, since it has a greater affinity than starch has therefor.

Stomach pump and **stomach siphon** are efficient, and do not weaken the patient as emetics do, but they are not always available, and cannot be used when there is corrosion of the stomach or esophagus, for fear of perforation. Washing of the stomach at regular intervals is a measure of great importance in the case of soluble poisons, some of which are excreted into the stomach. These appliances are almost useless when the poison is in solid form and in large pieces (as meat, sausage, fish, cheese).

Sulphates of magnesium and sodium (Epsom and Glauber's salts), the soluble sulphates, are particularly efficient against phenol and the salts of barium and lead.

Tannin (tannic acid), precipitates the alkaloids and their salts, with which it forms compounds (tannates), which, though comparatively insoluble are not entirely inactive, and should be removed at once from the alimentary canal by emetics and drastic purgatives. It acts well against many metallic salts, though inferior to albumin for these, except against tartar emetic, which albumin does not affect, but tannin renders harmless. It is given in doses of 15 to 45 grains in a 2 percent solution, every quarter of an hour; and if combined with about 10 percent of its weight of iodin its antidotal effect on vegetable poisons is greatly increased. If not itself obtainable, decoctions or infusions of substances containing it may be used, as tea and coffee, nut-galls, kino, rhatany, catechu, and the barks of oak, willow and cinchona.

Turpentine, after long exposure to the air, therefore containing much oxygen, is one of the antidotes against phosphorus. It should be administered immediately after the ingestion of that poison, alone or in hot water, and in quantity 100 times that of the phosphorus supposed to be present.

Antidote bag, designed by Martindale, of London, contains the following-named articles, labeled, with directions for use, viz.: Dialyzed iron, syrup of chloral, chloroform, spirit of chloroform, calcined magnesia, aromatic spirit of ammonia, oil of turpentine, acetic acid, tincture of digitalis, tannic acid, amyl nitrite, zinc sulphate, ipecacuanha, potassium bromid, potassium permanganate. Solution of ferric sulphate, 40 c.c. in 125 c.c. of water. Magnesia, in solution, 10 grams in 750 c.c. of water, in a bottle of 1000 c.c. capacity. These two, mixed together, make the official antidote against arsenic. Also a hypodermic

syringe, and solutions or pellets therefor of morphin sulphate, atropin sulphate, apomorphin hydrochlorid, pilocarpin nitrate, strychnin nitrate.

General antidotes have been devised for use when the nature of a poison is unknown, with the object of a "shot-gun prescription," intended to hit something. One of the best is Jeaunel's, composed as follows: Liquor ferri sulphatis (specific gravity, 1.45), 2 1/2 ounces; magnesium oxid, 2 ounces; carbo animalis, 1 ounce; aqua, 20 ounces. These ingredients should be kept separate—the solution of the sulphate in one vessel, the others together. When needed, the former should be added to the latter and violently agitated. Dose, 1 1/2 to 3 ounces. This is a perfect antidote to arsenic, zinc, digitalin. It delays the action of salts of copper, morphin, and strychnin, and slightly influences compounds of mercury. It is valueless for cyanid of mercury, tartar emetic, hydrocyanic acid, phosphorus, or the caustic alkalies.

Bellini, of Florence, considers the iodid of starch a valuable antidote to alkaline sulphids, earthy sulphids, vegetable and caustic alkalies, and ammonia. In the first two cases he considers it superior to all other antidotes.

A fresh mixture of the sulphids of iron and sodium with magnesia is said to be a perfect antidote for copper salts, corrosive sublimate, and mercuric cyanid. If the nature of the poison is entirely unknown, a harmless yet effectual antidote in most cases is one composed of equal parts of magnesia, wood charcoal and the ferric hydroxid, given freely in plenty of water.

The following table of poisons includes the names of the various poisonous substances, the particularly prominent symptoms, the mode of producing death, and the antidotes and general treatment. Tables showing the anatomic distribution of lesions in death from poisoning and the lesions characteristic of the more important poisons are given under Poisoning (Medicolegal Duties in Fatal Cases).

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Acetanilid	Cyanosis; peculiar discoloration of the blood due to formation of methemoglobin.	Sudden cardiac failure.	Strychnin, oxygen, and warmth; heart-stimulants.
Acetic Acid. See *Acid, Acetic.*			
Acetphenetidin. See *Phenacetin.*			
Acid, Acetic	Vomiting, purging; pain in the stomach, foul breath.	Asphyxia	Alkalies; soap; demulcent drinks; opium.
Acid, { Arsenous / Arsenic } See *Arsenic.*			
Acid, Boric	Nausea, vomiting, erythema, rapid, feeble pulse, collapse.	Cardiac paralysis.	
Acid, Carbolic (*Phenol*)	Immediate burning pain from mouth to stomach; giddiness, loss of consciousness, collapse; subnormal temperature; partial suppression of urine, which is dark in color; pupils very much contracted; characteristic odor.	Respiratory and cardiac paralysis.	Wash out stomach with alcohol and water; hypodermic of apomorphin; magnesium sulphate; atropin.
Acid, Chromic	Yellow stains; abdominal pain; vomiting and purging; collapse.	Cardiac paralysis.	Evacuate; chalk, milk, or albumin; demulcent drinks.
Acid, Hydrochloric (*Muriatic*).	Pain throughout digestive tract; vomiting, feeble pulse, clammy skin, collapse; eschars externally; yellow stains on clothing, but none on skin.		Alkalies; demulcent drinks; oil; stimulants (intravenous injection).
Acid, Hydrocyanic (*Prussic*).	Sudden unconsciousness, slow labored respirations, slow pulse, staring eyes, purple face, general convulsions, then relaxation and collapse, odor of peach kernels; death may be almost instantaneous.	Asphyxia	Stomach tube if possible. Dilute ammonia; opium, to relieve pain; alternate cold and warm affusions; atropin and heart-stimulants; artificial respiration.
Acid, Lactic	Violent irritation of alimentary canal		Alkalies and demulcents.
Acid, Nitric	Yellow stains on skin; otherwise similar to *Acid, Sulphuric.*		Alkalies; demulcents; soap; stimulants.
Acid, Nitrohydrochloric	Same as *Acid, Nitric.*		
Acid, Oxalic	Hot, acrid taste; burning, vomiting, collapse; sometimes general paralysis, numbness and stupor.	Paralysis of respiration and of heart.	Lime or chalk.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Acid, Prussic. See *Acid, Hydrocyanic.*			
Acid, Pyrogallic.....	Vomiting, diarrhea, rigors, fever, black urine, great dyspnea.	Formation of thrombi.	Mineral acids; alkalies; salts of iron.
Acid, Salicylic.....	Mydriasis; quick and deep respiration; delirium; dyspnea; lessened arterial pressure; deafness; olive green urine.	Respiratory paralysis.	
Acid, Sulphuric.....	Black stains; pain throughout digestive tract, vomiting often of tarry matter, feeble pulse, clammy skin, profuse and bloody salivation.	Asphyxia.....	Chalk; magnesia; soap; demulcent drinks.
Acid, Sulphurous.....	Cough, bloody expectoration, pulmonary inflammation.	.....	Air; cold to head; artificial respiration; bleeding.
Acid, Tartaric.....	Pain in abdomen; vomiting, etc.....	.....	Magnesia; lime; soap.
Aconitum napellus (*Monkshood*). Aconite.	Sudden collapse, slow, feeble and irregular pulse and respirations, tingling in the mouth and extremities, giddiness, great muscular weakness, sometimes pain in the abdomen, pupils generally dilated, but may be contracted, marked anesthesia of skin, mind clear, convulsions at times.	Asphyxia.....	Tannic acid solution for washing out stomach; digitalis, atropin, and stimulants; artificial respiration; warmth and friction.
Actæa spicata (*Baneberry*)...	Vomiting; diarrhea; cardiac depression; faintness; dizziness; foul breath; dryness of pharynx.	Cardiac paralysis...	Heart-stimulants.
Agaricus. See *Fungi.*			
Alcohol.....	Confusion of thought, giddiness, tottering gait, slight cyanosis, narcosis from which patient can be aroused; full pulse; deep stertorous breathing; injection of eyes, dilatation of pupils, low temperature, convulsions, coma, death often hours or even days after apparent recovery.	Paralysis of heart..	Evacuat stomach; coffee; battery; amyl nitrite; hot and cold douches.
Aloes.....	Tenesmus, weight in pelvis, profuse diarrhea.		
Amanita muscaria (*Truffles*). See *Fungi.*			
Ammonium and its compounds.	Intense gastroenteritis, often with bloody vomiting and purging; lips and tongue swollen and covered with detached epithelium; violent dyspnea; characteristic odor.	Asphyxia.....	Vegetable acids; demulcents.
Amygdalus communis (*Bitter Almond*).	Similar to *Acid, Hydrocyanic, q. v.*		
Amyl Nitrite.....	Throbbing headache, flushed face, sense of heat, tumultuous heart's action; diminished sensibility, mobility and reflexes.	Paralysis of respiratory centers.	Evacuate; air; recumbent position; artificial respiration; stimulants; strychnin; ergot; digitalis.
Amylene Hydrate.....	Sleep and coma.....	Paralysis of medulla.	Remove vapor; air; stimulants; artificial respiration.
Anilin.....	Giddiness, apparent intoxication, sweating, blue color of mucous membrane of mouth; odor of anilin; coma.	Asphyxia.....	Removal of cause; stimulation; oxygen; artificial respiration.
Antifebrin. See *Acetanilid.*			
Antimony and its compounds.	Metallic taste, violent vomiting becoming bloody; feeble pulse, pain and burning in the stomach, violent serous purging, becoming bloody; dysphagia; cramps in extremities; thirst; great debility; sometimes prostration, collapse, unconsciousness, and convulsions without vomiting or purging.	Paralysis of the heart.	Tannic acid; demulcent drinks; opium; alcohol; external heat.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Antipyrin (*Phenazon*).....	Headache, nausea, vomiting, a rash like that of measles, vertigo, drowsiness, deafness, confusion of ideas, cyanosis, collapse.	.....	Recumbent position: warmth; strychnin; stimulants; oxygen; artificial respiration.
Apocynum androsalmifolium (*Dogsbane*).	Vomiting, nausea, drowsiness.....	.....	Evacuate; stimulants.
Apomorphin.....	Violent vomiting, paralysis of motor and sensory nerves, delirium, depression of respiration, heart-depression.	Cardiac failure.....	Cardiac and respiratory stimulants.
Aristolochia clematis (*Birthwort*).	Nausea; griping pains in the bowels; vomiting; dysenteric tenesmus.	.....	Evacuate; demulcent drinks.
Arnica montana (*Leopardsbane*).	Transient excitement, headache, unconsciousness, pupils dilated, paralysis of the nervous system, collapse.	Paralysis of the nervous system.	Cardiac stimulants.
Arsenic and its compounds...	Violent burning pain in the stomach, retching, thirst, purging of blood and mucus with flakes of epithelium; tenesmus, burning in the urinary organs with suppression of urine; sense of constriction with dryness in throat; pulse small and frequent.	.....	Hydrated sesquioxid of iron; precipitated carbonate of iron; emetics; castor oil; demulcents.
Artemisia absinthium (*Absinthe*).	Tremor, stupor, epileptiform convulsions, involuntary evacuations, stertorous breathing.	.....	Emetics; stimulants; demulcents.
Aspidium (*Male Fern*).....	Vomiting, purging, great pain in the abdomen, collapse; giddiness; coma; amaurosis; cramp in extremities.	.....	Evacuate; stimulants.
Atropa belladonna (*Deadly Nightshade*). Atropin. Belladonna. Homatropin.	Heat and dryness of the mouth and throat; pupils widely dilated, scarlet rash; quick pulse, at first corded, later feeble; rapid respirations, early strong, late shallow and feeble; retention of urine; sometimes convulsions, collapse, and paralysis; suppression of saliva, difficulty in swallowing; great thirst, indistinct vision, noisy delirium; skin dry.	Paralysis of the heart.	Evacuation of stomach and bladder; stimulants; coffee; pilocarpin; artificial respiration; physostigmin may be of benefit.
Barium and its compounds...	Pain in the abdomen, purging, vomiting, feeble pulse, short and labored breathing, cramps, convulsions, collapse.	.....	Evacuate; Glauber's or Epsom salts; dilute sulphuric acid; warmth.
Bitter Almond (*Amygdalus*)..	Similar to *Acid, Hydrocyanic, q. v.*		
Bittersweet. See *Solanum.*			
Bloodroot. See *Sanguinaria.*			
Boric Acid. See *Acid, Boric.*			
Bromin and its compounds.	Respiration and heart's action lessened; reflexes sluggish; diminished sensibility; motility and sexual function impaired; acne; fetid breath; mental faculties impaired.	Cardiac and muscular paralysis.	Heat; stimulants; digitalis; ergot; atropin; strychnin; artificial respiration.
Brucin. See *Strychnin.*			
Bryonia dioica (*Bryony*).....	Giddiness, delirium, vomiting, diarrhea, with watery motions, dilated pupils, coma.	Heart-depression...	Emetics; mustard; salt; ipecacuanha; stimulants, freely.
Caffea arabica. See *Caffein.*			
Caffein.....	Burning pain in the throat, giddiness, faintness, nausea, numbness, abdominal pain, great thirst, dry tongue, tremor of extremities, diuresis, weak pulse, cold skin, collapse.	Paralysis of respiration.	Emetics; stimulants; warmth; morphin and atropin.
Calabar Bean. See *Physostig ma.*			

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Calcium. See *Lime.*			
Camphine. See *Turpentine.*			
Camphor.....	Characteristic odor; languor, giddiness, disturbance of vision, delirium, convulsions, clammy skin, smarting in the urinary organs, pulse quick and weak; no pain, no vomiting, no purging.	Asphyxia.....	Evacuate stimulants; warmth; hot and cold douches.
Cannabis indica (*Indian Hemp*).	Pleasurable intoxication; sense of prolongation of time; anesthesia with loss of strength especially in legs; rapid pulse; increased sexual desire; pupils dilated; heavy sleep.	.....	Strychnin; faradization; evacuate; stimulants.
Cantharis vesicatoria (*Spanish Fly*). Cantharides.	Burning in mouth and stomach, vomiting and purging, soon becoming bloody, and abdominal tenderness, tenesmus, the vomit containing shining particles of the powder; incessant desire to urinate, but only a little blood or albuminous urine passed at each attempt; priapism, abortion, convulsions, coma, and insensibility.	Paralysis of the respiratory centers.	Evacuate stomach; demulcent drinks; morphin; hot bath for the strangury; anesthetics may be necessary for the pain.
Carbolic Acid. See *Acid, Carbolic.*			
Carbon Disulphid.....	Headache, vertigo, nervous excitement, anesthesia with great muscular rigidity, characteristic odor of breath, urine, and feces.	Paralysis of the respiratory centers and of the heart.	Evacuate; stimulants; warmth; artificial respiration.
Castor-oil. See *Ricinus.*			
Chelidonium majus (*Celandine*).	Catharsis; vomiting; cardiac debility.....	Paralysis of the heart.	Evacuate; heart-stimulants.
Cherry Laurel. See *Prunus.*			
Chloral Hydrate.....	Deep sleep, loss of muscular power, lividity, reflexes diminished, pulse weak, respirations slowed, pupils contracted during sleep, but dilated on waking, temperature low.	Arrest of respiration or paralysis of the heart.	Evacuate; heat to the extremities; massage; coffee by the rectum; strychnin; amyl nitrite; artificial respiration.
Chlorin.....	Irritation of the throat, cough, tightness across chest, inability to swallow.	Asphyxia.....	Air; steam-inhalations; dilute ammonia-inhalations; ether or chloroform.
Chlorodyne. See *Opium.*			
Chloroform.....	Two methods of introduction, inhalation and swallowing; symptoms in latter case delayed. 1. Slight stimulation; 2. excitement and incoherence; 3. insensibility and relaxation.	Usually paralysis of the heart.	Draw tongue forward; air; artificial respiration; faradic current; hot and cold douches; amyl nitrite; atropin; evacuation of stomach if chloroform has been taken by mouth.
Chromium and its compounds. See *Acid, Chromic.*			
Cicuta maculata (*American Hemlock*).	Similar to those of *Conium, q. v.*		
Cicuta virosa (*Water Hemlock*).	Similar to those of *Conium, q. v.*		
Citric Acid. See *Acid, Citric.*			
Coal-gas.....	Headache, giddiness, loss of muscular power, unconsciousness, pupils dilated, breathing labored, coma, odor of gas.	Asphyxia.....	Fresh air; artificial respiration; ammonia; stimulants; oxygen; coffee; hot and cold douches.
Cocain.....	Faintness, giddiness, nausea; pulse small, rapid, and intermittent; severe prostration; respiration slow and feeble.	Spasm of heart and muscles of respiration.	Stimulants; amyl nitrite; artificial respiration.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Cocculus indicus (*Fish-berries*). Picrotoxin.	Nausea, vomiting, muscular debility, somnolence, sometimes convulsions, occasionally scarlatinal rash.	Paralysis of heart in diastole.	Evacuate; chloral hydrate; bromid of potassium.
Colchicum autumnale (*Meadow Saffron*).	Not unlike those of malignant cholera; griping pain in the stomach, vomiting and continuous purging of seromucous material; intense thirst, muscular cramps, great prostration; pinched face, profuse perspiration, collapse; dilated pupils; pain in the extremities.	Paralysis of the respiratory centers.	Evacuate; tannic or gallic acid; demulcent drinks; stimulants; morphin.
Colocynth.....	Persistent vomiting and purging, exhaustion, cold extremities, weak pulse, collapse.	.....	Evacuate; camphor, opium; stimulants; demulcent drinks; warmth.
Conium maculatum (*Hemlock*).	Weakness of the legs, gradual loss of all voluntary power, nausea, ptosis, pupils dilated, inability to speak or swallow.	Paralysis of the respiratory muscles.	Evacuate; tannic or gallic acid; stimulants; warmth; artificial respiration; atropin.
Convallaria majalis (*Lily of the Valley*).	Similar to *Digitalis*, *q. v.*.....	Cardiac paralyzant; arrests heart in systole.	
Convolvulus jalapæ. See *Jalap.*			
Convolvulus scammonii.			
Copper and its salts.....	Metallic taste in mouth, griping and colicky pains, nausea and vomiting, purging with straining, jaundice, hurried breathing, small, rapid pulse, weakness, thirst, giddiness, coma.	.....	Evacuate; barley-water; morphin; poultices to abdomen.
Coriaria myrtifolia (*Myrtle-leaved Sumach*). See *Sumach.*			
Creosote.....	Similar to *Acid, Carbolic*, *q. v.*		
Croton tiglium (*Croton-oil*)..	Intense pain in the abdomen, vomiting, purging, watery stools, pinched face, small and thready pulse, moist skin, collapse.	.....	Evacuate; demulcent drinks; camphor; stimulants; morphin; poultices to abdomen.
Cubebs.....	Nausea, vomiting, colicky pains; in some cases purging; in some an eruption resembling urticaria.		
Cucumis colocynthis. See *Colocynth.*			
Curare (*Indian War-poison*).	Complete paralysis of the voluntary muscles, slowing of the heart, gradually diminished respiration.	Arrest of the respiratory movements.	Artificial respiration; stimulants; ligate and wash wound; evacuate bladder frequently.
Cyanogen and its compounds.	Similar to *Acid, Hydrocyanic*, *q. v.*		
Cyclamen europæum (*Sow-bread*).	Inflammation of the alimentary canal; bloody stools; cold sweats; convulsive movements.	.....	Evacuate; opium; poultices to abdomen.
Cytisus laburnum (*Laburnum*).	Come on rapidly; purging, vomiting, great restlessness; drowsiness and insensibility, convulsive twitchings.	Asphyxia.....	Evacuate; stimulants; coffee per rectum; hot and cold douches.
Daphne gnidium (*Sponge Flax*).	Pain; vomiting; purging.....	.....	Evacuate; demulcent drinks; heart-stimulants.
Daphne mezereum (*Mezereon*). See *Mezereon.*			
Datura stramonium (*Thorn-apple, Jamestown Weed*).	Symptoms and treatment similar to those of *Atropin*, *q. v.*		
Delphinium staphisagria (*Stavesacre*). See *Staphisagria.*			

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Digitalis purpura (*Fox-glove*).	Purging, with severe pain, violent vomiting; vertigo; feeble pulse, although heart's action is tumultuous; headache; lethargy followed by delirium and convulsions; eyes prominent, pupils dilated, sclera blue; skin cold, coma.	Heart-paralysis....	Evacuate; tannic and gallic acids; stimulants; aconite; recumbent position.
Dog-bite. See *Saliva*.			
Duboisia (probably identical with *Hyoscyamus*).			
Elaterium (*Elaterin*).....	Purging, vomiting, salivation, prostration, clonic spasms; dyspnea.	.....	Emetics; stomach-pump; demulcent drinks; opium.
Ergot.....	Tingling in the fingers and feet, cramps in the extremities, dizziness, weakness, pupils dilated, pulse small, vomiting, retching, and diarrhea.	.....	Evacuate, quick purgatives, castor-oil or Epsom salts; tannic or gallic acid; recumbent position; stimulants; amyl nitrite.
Erythroxylon coca. See *Cocain*.			
Eserin. See *Physostigma*.			
Ether.....	Sense of strangulation; cough, stage of excitement (*cerebral intoxication*). Tetanic convulsive stage, complete insensibility, muscles relaxed, reflexes abolished, cerebral functions suspended.	Paralysis of respiration.	Withdraw vapor; lower the head; draw tongue forward; atropin; artificial respiration; amyl nitrite; ammonia; warmth.
Ethidene Dichlorid.....	Stertorous breathing, dilated pupil, pleasant dreams, depression of pulse.	.....	Remove vapor; draw tongue forward; artificial respiration; lower the head.
Ethyl Bromid.....	Very similar of those of *Chloroform*, *q. v.*		
Euphorbia officinarum (*Euphorbia Spurge*).	Pain; nausea; vomiting; purging; weak pulse.	Paralysis of cardiac and respiratory centers.	Evacuate; heart-stimulants.
Eqalgin.....	Numbness and tingling, cyanosis, salivation, vomiting, intense dyspnea feeling of alternate expansion and contraction of the head.	Paralysis of respiration.	Emetics; strychnin; stimulants.
Filix mas (*Male Fern*). See *Aspidium*.			
Fish, Poisonous. (Several kinda of fish, particularly shell-fish, are constantly poisonous, while some are so only to particular constitutions.)	Nausea, vomiting, irritation of eyes, depression, severe urticaria, or nettle-rash.	.....	Evacuate; quick purgative; stimulants.
Fish-berries. See *Cocculus*.			
Fly, Spanish. See *Cantharis*.			
Foxglove. See *Digitalis*.			
Fungi. (Several forms of fungi, known as mushrooms, toadstools, truffles, etc., are directly poisonous.)	Gastrointestinal catarrh, nausea, heat and pain, vomiting and purging, fainting, convulsions, small and frequent pulse; pupils dilated; delirium, stupor, death.	.....	Evacuate; quick purgative; Glauber's or Epsom salts; stimulants.
Fusel-oil.....	Rigidity of muscles, respiration shallow and slow, pupils small, odor of breath resembling amyl nitrite.	.....	Evacuate; heart stimulants.
Gamboge.....	Violent irritation of alimentary canal; vomiting; griping.	.....	Evacuate; demulcent drinks; opium.
Gaultheria procumbens (*Wintergreen*).	Very similar in action to *Acid, Salicylic*, *q. v.*		
Gelsemium sempervirens (*Yellow Jessamin*).	Symptoms appear in about 20 minutes; great muscular weakness; dimness of vision, ptosis, diplopia, labored respiration, weak pulse.	Paralysis of the respiratory centers.	Evacuate; atropin; stimulants; artificial respiration; hot and cold douches.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Glass	Purely irritant; may have hematemesis		Bread in crumbs, then emetic.
Gold	Causes a pink stain upon the skin		Sulphate of iron; albumin; evacuate.
Gratiolus officinalis (*Hedge-hyssop*).	Violent purging; pain		Evacuate; demulcent drinks.
Hedeoma (*Pennyroyal*)	Unconsciousness, extremities cold, pulse small, pupils slightly dilated, vomiting, delirium, opisthotonos.		Evacuate.
Hellebore, Green and White. See *Veratrum.*			
Helleborus niger (*Black Hellebore*).	Resemble malignant cholera; abdominal pain, vomiting, purging, vertigo, cold sweats, and collapse.	Paralysis of heart	Stomach-pump; tannin; mucilaginous drinks, heart-stimulants.
Hemlock. See *Conium.*			
Henbane. See *Hyoscyamus.*			
Holly Berries (*Ilex aquifolium*).	Vomiting, pain in the head and abdomen, purging, contraction of pupils, loss of consciousness, collapse.		Evacuate; stimulants; warmth; coffee.
Homatropin. See *Atropa.*			
Hura crepitans (*Sand-box*)	Irritation of alimentary tract; vomiting; purging.		Evacuate; demulcent drinks; opium.
Hydrophobia. See *Saliva.*			
Hyoscyamus albus (*White Henbane*). Hyoscyamus niger (*Black Henbane*). Hyoscyamin, Hyoscin.	Giddiness, sense of weight in head, general loss of power, pupils dilated, diplopia, presbyopia, flashes of light, incoherence of speech, delirium, insensibility, coma.	Paralyzes respiration.	Evacuate; quick purgatives.
Insects, Poisonous. (The bite or sting of several varieties of insects is poisonous.)	In most cases slight; in cases of tarantula and scorpion may be more serious; pain, swelling, fever, erysipelas, suppuration, and gangrene, with death.		In *milder* cases ammonia, soap, or other alkali to the wound. In *graver* cases similar to that of snake-bite, *q. v.*
Iodin and its compounds	Pain in throat and stomach; vomiting, purging; vomit yellow from iodin, or blue if starch be present in the stomach; giddiness, faintness, convulsive movements.	Paralysis of the heart.	Evacuate; starch; amyl nitrite; morphin.
Iodoform	Slight delirium; drowsiness; high temperature, rapid pulse; resembles meningitis.		
Ipecacuanha (*Ipecacuanha*)	Vomiting, hematemesis, and hemoptysis		Evacuate.
Iron and its compounds	Metallic taste, pain, vomiting, and purging; vomited matter black.		Magnesia and diluents; ice and opium.
Jaborandi. Pilocarpin.	Copious sweating, dizziness, salivation, vomiting, diarrhea, tearing pain in eyeballs, myopia, pupils much contracted.		Evacuate; stimulants; atropin or belladonna.
Jalap	Copious watery stools, tormina, and tenesmus.		Evacuate; demulcent drinks.
Jamaica Dogwood. See *Piscidia.*			
Jatropha curcas (*Indian Nut*).	Purging; vomiting		Evacuate; demulcent drinks.
Jatropha manihot (*Cassava*)	Same as those of *Prussic Acid, q. v.*		
Juniperus sabina. See *Savin.*			
Juniperus virginiana (*Red Cedar*).	Gastritis; nephritis; strangury; nervous disturbances; violet-like odor in urine; copaiba-like erythema.		Evacuate; demulcent drinks; stimulants.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Lactic Acid. See *Acid, Lactic.*			
Lactuca virosa (*Strong-scented Lettuce*).	Somewhat similar to those of *Opium, q. v.*		
Laudanum. See *Opium.*			
Lead and its compounds.....	Dryness of the throat, metallic taste, great thirst, colic relieved by pressure, abdominal muscles usually rigid, constipation, cramps in the legs, paralysis of the extremities, convulsions; in the chronic forms, a blue line at margin of the gums.	.....	Evacuate; dilute sulphuric acid; Epsom and Glauber's salts; milk; morphin; iodid of potassium to eliminate the poison; poultices to the abdomen.
Lime.....	Burning pain in the abdomen, great thirst, obstinate constipation.	.....	Vegetable acids; demulcent drinks.
Lobelia inflata (*Indian Tobacco*).	Severe vomiting, with intense depression and prostration, giddiness, tremors, convulsions, collapse.	Paralysis of respiration.	Evacuate stomach; tannic or gallic acid; stimulants; strychnin; warmth; recumbent position.
Lolium temulentum (*Darnel*).	Vertigo; dizziness; headache; sleepiness.		
Lytta vittata (*Potato-fly*)....	Similar to those of *Cantharis, q. v.*		
Male fern. See *Aspidium.*			
Meat. (Putrefactive changes in meat and some other forms of food produce active poisonous agents known as ptomains.	Gastrointestinal irritation sometimes very marked; occasionally death.	.....	Evacuate; irrigate stomach; sedatives; supportive treatment when prostration.
Melia azedarach (*Pride of China*).	Giddiness, dimness of vision, stertorous breathing, dilated pupils, stupor.		
Mercury and its compounds..	Acrid metallic taste, burning heat in throat and stomach, vomiting, diarrhea, with bloody stools, lips and tongue white and shriveled, pulse small and frequent, death in coma or convulsions; pain may be absent. Secondary symptoms; hectic fever, coppery taste, fetid breath, gums swollen, salivation.	.....	Albumin in some form; raw white of egg or flour; evacuate; potassium iodid; opium; calcium sulfid.
Methylene Bichlorid.....	Symptoms and treatment similar to those of *Chloroform, q. v.*		
Mezereon.....	Violent purging, vomiting, nephritis, and gastroenteritis; an exceedingly powerful local irritant.	.....	Evacuate; aperient and demulcent drinks; opium.
Milk. See *Tyrotoxicon.*			
Momordica elaterium (*Squirting Cucumber*).			
Morphin. See *Opium.*			
Mushrooms. See *Fungi.*			
Mussel. See *Fish.*			
Mydalin. See *Meat.*			
Myristica fragans (*Nutmeg*)...	Thirst; tightness in the chest; vomiting....	.....	Coffee and stimulants.
Mytilotoxin (*Mussel-poison*). See *Fish.*			
Naphthalin.....	Cyanosis, twitching over body, urine dark-brown changing to inky black, strangury.	.....	Demulcent drinks; stimulants.
Narcein. See *Opium.*			
Narcissus pseudonarcissus (*Daffodil*).	.....	.....	Evacuate; demulcent drinks; stimulants.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Nerium oleander (*Oleander*).	Similar to those of *Strophanthus, q. v.*		
Neurin. See *Meat.*			
Nicotiana tabacum. See *Tobacco.*			
Nightshade. See *Atropa.*			
Niter (*Potassium Nitrate*). See also *Potassium and its compounds.*	Pain in the abdomen, vomiting, coldness in the limbs, partial paralysis, tremors, convulsions, collapse.	Paralysis of the heart.	Evacuate; mucilaginous drinks, stimulants; warmth; amyl nitrite; atropin.
Nitric Acid. See *Acid, Nitric.*			
Nitrobenzin..... Nitrobenzol.	May be delayed; weariness, numbness in the head, confusion, marked cyanosis, lips nearly black, convulsions, pupils dilated.	Asphyxia.....	Cold to head; dilute ammonia; hydrated oxid of iron; stimulants; artificial respiration.
Nitroglycerin.....	Throbbing headache; pulsation over entire body, dicrotic pulse, flushed face, mental confusion, anxiety, sudden collapse.	Respiratory paralysis.	Recumbent position; cold to head; ergot; atropin.
Nitrohydrochloric Acid.	See *Acid, Nitrohydrochloric.*		
Nitrous Oxid.....	.....	Respiratory paralysis.	Pull tongue forward; air; artificial respiration; douche; oxygen.
Nux vomica. See *St. Ignatius' Bean.*			
Opium..... Morphin. Narcein. Codein. Laudanum.	Preliminary mental excitement, acceleration of heart; soon headache, weariness, sensation of weight in the limbs, sleepiness, diminished sensibility, contracted pupils; pulse and respirations slow and strong; patient can be roused with difficulty; later this becomes impossible; reflexes abolished, jaw falls; respiration slow, irregular, and stertorous; pulse rapid and feeble.	Respiratory paralysis.	Evacuate stomach; apomorphin; rousing; ammonia; coffee; douche; atropin; amyl nitrite; artificial respiration; external heat; battery; strychnin; potassium permanganate; oxygen.
Oxalic Acid. See *Acid, Oxalic.*			
Papaver somniferum (*Poppy*). See *Opium.*			
Paraldehyd.....	Similar to chloroform-narcosis.....	Paralysis of respiratory center.	Respiratory stimulants; coffee; atropin; battery.
Paris Green. See *Arsenic.*			
Peach-kernel—contains *Acid, Hydrocyanic, q. v.*			
Petroleum.....	Burning in course of alimentary tract; excreta covered with layer of oil; skin cold; pulse feeble, but regular; respiration sighing; thirst; restlessness.	.....	Evacuate; stimulants; warmth; stimulation of skin; artificial respiration.
Phenacetin (acetphenetidin)..	Very similar to *Antipyrin* and *Antifebrin, q. v.*		
Phenol. See *Acid, Carbolic.*			
Phosphorus.....	Vomiting and pain; vomit may be luminous in the dark; characteristic odor; after several days deep jaundice, coffee colored vomit, hepatic tenderness, failure in pulse and respiration; coma or delirium; albumin in the urine.	Failure of respiration and circulation.	Sulphate of zinc or copper; Epsom salts; *never give oil or fat.*
Physostigma venenosum (*Calabar Bean*). Eserin.	Giddiness; prostration; loss of power in the lower limbs; muscular twitching; contracted pupils; mind clear.	Asphyxia.....	Evacuate; atropin; strychnin; stimulants; artificial respiration.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Phytolacca decandra (*Poke*).	Nausea; vomiting; depression; heart, as well as respiration, slowed; tetanic convulsions.	Paralysis of respiration.	Evacuate; alcohol; opium; ether; digitalis.
Picrotoxin. See *Cocculus.*			
Pilocarpin. See *Jaborandi.*			
Pinkroot. See *Spigelia.*			
Piper cubeba. See *Cubeb.*			
Piscidia erythrin (*Jamaica Dogwood*).	Muscular relaxation; accelerated pulse; lowered sensibility; dilated pupils; deep sleep.	Asphyxia.....	Same as for *Opium, q. v.*
Pituri.....	Slightly narcotic; powerful respiratory poison.	.....	Similar to *Atropin, q. v.*
Plumbago europa (*Toothwort*).	Violent emesis.....	.....	Evacuate; demulcent drinks; heart-stimulants.
Poison-oak. Poison-vine. } See *Rhus.*			
Poke-berries. See *Phytolacca.*			
Poppy. See *Opium.*			
Potassium and its compounds.	The hydrate produces the symptoms of other caustic alkalies, *e. g.*, lime; the other poisonous compounds are to be classed under their various acids.	.....	*For caustic potash.* Vegetable acids; demulcent drinks.
Potato-fly (*Lytta vittata*). See *Cantharis.*			
Privet (*Ligustrum vulgare*)...	Purging; intestinal inflammation.....	.....	Hot water in large draughts; warmth; stimulants.
Prunus laurocerasus (*Cherry Laurel*). Prunus virginiana (*Wild Cherry*).	Both contain *Acid, Hydrocyanic, q. v.*		
Prussic Acid. See *Acid, Hydrocyanic.*			
Ptomains. See *Meat.*			
Pulsatilla.....	Lowers heart's action, reduces respiration and temperature; dilates pupils; paralyzes motion and sensibility.	Paralysis of heart..	Alcohol; opium; digitalis.
Pyrogallic Acid. See *Acid, Pyrogallic.*			
Resorcin.....	Giddiness, tingling; insensibility, profuse perspiration; tongue dry; pupils normal; teeth clenched, temperature low; urine black.	Paralysis of respiration.	Evacuate; albumin; stimulants; warmth; atropin; amyl nitrite; red wine.
Rhus radicans (*Poison-vine*). Rhus toxicodendron (*Poison-oak*).	Cutaneous irritation; itching, swelling, vesicular eruption; may involve the throat, producing cough; thirst, vomiting, colicky pains, fever, delirium.	.....	Grindelia robusta locally; also carron-oil and solution of acetate of lead; also phenol 5 percent. solution or cocain 5 percent. solution or ichthyol; rest; low diet; laxatives; opium.
Ricinus communis (*Castor-oil*).	Burning, nausea, vomiting, colicky pains, small pulse, great prostration; purging may or may not occur.	.....	Evacuate; morphin, hypodermatically; warmth; stimulants; starch and opium enemata.
Rue..... Ruta graveolens (*Rue*).	Violent gastroenteritis, extreme prostration, convulsions, strangury, suppression of urine.	.....	Evacuate; demulcent drinks; diuretics; heart stimulants.
Salicylic Acid. See *Acid, Salicylic.*			

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Saliva of Rabid Animals....	Rarely come on in less than three weeks; may occur between that and years; pain in the bitten part; uneasiness, languor, difficult respiration, difficulty in swallowing, horror of water; violent convulsions; tongue swollen and often protruding; flow of viscid saliva.	.....	*Preventive:* Immediate ligature above wound; excision; cautery; inoculation. *Of hydrophobia:* Chloroform internally; morphin hypodermatically; cocain to throat; nutritive enemata.
Sambucus canadensis (*Elder*).	Emesis; purging.....	.....	Demulcent drinks; evacuate.
Sanguinaria canadensis (*Bloodroot*).	Salivation, catharsis, and vomiting, reflexes lowered; pupils dilated; temperature low; great thirst; collapse.	Paralysis of the cardiac and respiratory centers.	Evacuate; opium; amyl nitrite; atropin.
Santonin.....	Disturbance of color-vision—objects first assume a bluish tinge, then yellow; tinnitus; dizziness; pain in the abdomen; failure of respiration; convulsions; stupor.	Asphyxia.....	Evacuate; stimulants; chloral.
Savin.....	Pain, vomiting, tenesmus, and bloody stools; disordered respirations; coma, and convulsions.	.....	Evacuate stomach; castor-oil in large dose; morphin: poultices to the abdomen.
Scammony.....	Vomiting, purging, griping, tenesmus.....	.....	Evacuate; stimulants.
Scilla maritima (*Squill*).....	Vomiting, purging, strangury, bloody urine, paralysis, and convulsions.	Paralysis of heart in systole.	Evacuate; demulcent drinks; diuretics; stimulants.
Secale cornutum. See *Ergot*.			
Silver and its salts.....	Pain, vomiting, and purging; vomit white and cheesy, rapidly turning black in the sunlight; vertigo, coma, convulsions, paralysis, and marked disturbance of respiration.	Paralysis of respiration.	Salt and water; evacuate stomach; a large amount of milk; albumin.
Snake-bite. (The bite of many varieties of serpents is directly poisonous.)	Vary in severity, but are, in the main, sharp pain in the bitten part, rapidly spreading; great swelling of the wounded member, which becomes livid and gangrenous later; fainting, vomiting, and convulsions; pulse small, frequent, and irregular; breathing difficult.	Paralysis of cardiac and respiratory centers.	Removal of poison by sucking or cupping; ligature above wound; cautery or excision; ammonia to wound and internally; warmth; in some cases large doses of ammonia or whisky internally, transfusion of blood.
Soda (Sodium).....	Symptoms and treatment similar to those of other caustic alkalies, as *Lime*, *q. v.*		
Solanum dulcamara (*Bittersweet*).	Thirst, headache, giddiness, dimness of vision, dilated pupils, convulsions, vomiting, purging.	Asphyxia.....	Evacuate; stimulants; warmth.
Sorbus acuparia (*Mountain Ash*).	.....	.....	Same as for *Opium*, *q. v.*
Spanish Fly. See *Cantharis*.			
Spigelia marilandica (*Pinkroot*).	Vertigo, dimness of vision, dilated pupils, spasms, convulsions; delirium; dryness of throat.	.....	Evacuate; stimulants; coffee.
Squill. See *Scilla*.			
Stalagmitis cambogioïdes. See *Gamboge*.			
Staphisagria.....	Heart slow and feeble; breathing difficult; pupils dilated; abdomen distended and painful.	Paralysis of spinal cord and asphyxia.	Cardiac and respiratory stimulants.
Stavesacre. See *Staphisagria*.			
Stramonium. See *Datura*.			
Strophanthus (*Arrow-poison*) Strophanthin.	Weakness of pulse; increase of urine, rigidity of the muscles; spasms.	Paralysis of the heart in systole.	Cardiac stimulants.

POISONS, TABLE OF

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
St. Ignatius Bean..... Strychnos ignatia..... Strychnos nux vomica (*Nux romica*). Nux vomica. Strychnin. Brucin.	Tetanic convulsions coming on in paroxysms at varying intervals of from five minutes to half an hour; opisthotonos during paroxysm; eyeballs prominent; pupils dilated, respiration impeded, pulse feeble and rapid; anxiety.	Asphyxia during paroxysm, or collapse.	Evacuate stomach; tannic acid ad lib.; follow with emetic; catheterize; keep patient quiet; bromids and chloral; amyl nitrite or chloroform to control convulsions; artificial respiration if indicated.
Sulphonal.....	Giddiness, weakness, ptosis, cyanosis, suppression of urine.	.....	Stimulants; diuretics.
Sulphuric Acid. See *Acid. Sulphuric.*			
Sumach. See *Rhus.*			
Tanacetum vulgare (*Tansy*).. Tansy.	Convulsions, insensibility, dilated pupils, respirations hurried and stertorous; pulse full, gradually failing; characteristic odor of breath.	Heart-paralysis....	Heart-stimulants; evacuate.
Tartar Emetic. See *Antimony.*			
Tartaric Acid. See *Acid, Tartaric.*			
Tin.....	Metallic taste, vomiting, and diarrhea; pain; depressed action of heart.	.....	Evacuate; magnesium; mucilaginous drinks.
Tobacco..... Nicotin.	Nausea, vomiting, weakness, weak pulse, cold and clammy skin, collapse, pupils contracted, then dilated.	Paralysis of respiration; sometimes paralysis of heart.	Evacuate stomach; tannic acid; strychnin; stimulants, warmth; recumbent position.
Truffles. See *Fungi.*			
Turpentine.....	Characteristic odor; intoxication; contracted pupils; stertorous breathing; coma; collapse; tetanic convulsions; the urine has the odor of violets.	Paralysis of respiration.	Evacuate; magnesium sulphate; demulcent drinks; morphin.
Tyrotoxicon.....	Nausea, vomiting, cramps, diarrhea, collapse.	.....	Evacuate; intestinal antiseptics.
Urethan.....	Vomiting; slowing of heart; temperature lowered; muscular resolution and general anesthesia.	Asphyxia.....	Evacuate; cardiac stimulants.
Vaselin.....	Cramps in lower limbs, severe and persistent vomiting; collapse.	.....	Evacuate; stimulants.
Veratrum album (*White Hellebore*). Veratrum viride (*Green Hellebore*).	Burning and pain in course of alimentary tract; inability to swallow; vomiting and diarrhea; palpitation; slow, weak pulse; respiration labored; pupils generally dilated; may be convulsions.	Paralysis of respiratory centers.	Evacuate stomach; ether hypodermically; opium; stimulants; coffee; warmth; recumbent position.
Verdigris. See *Copper.*			
Wild Cherry. See *Prunus.*			
Wintergreen. See *Gaultheria.*			
Woorara. See *Curare.*			
Yew.....	Vomiting and delirium; pain in abdomen; irregularity of the heart's action; death may be sudden.	.....	Evacuate; quick purgation; stimulants.
Zea mays (*Maize*).....	Slow heart; dilated pupils; tonic convulsions.	Tetanus of respiratory muscles, or exhaustion.	Cardiac and respiratory stimulants.
Zinc.....	Corrosion of lips or mouth; pain and burning; incessant vomiting, the vomit blood-stained; acceleration of pulse and respiration; dyspnea; dilatation of the pupils; epileptiform convulsions; paralysis; coma.	.....	Sodium or potassium carbonate; milk; eggs; tannic or gallic acid; morphin hypodermatically; poultices to abdomen.

Household Antidotes.—When the other articles to be used as antidotes are not in the house, give 2 tablespoonfuls of prepared mustard in a pint of warm water. Also give large drafts of warm milk, or water mixed with oil, butter, or lard.

For bed-bug poison, For corrosive sublimate, For blue vitriol, For lead-water, For saltpeter, For sugar of lead, For sulphate of zinc, For red precipitate, For vermilion,	Give milk or white of eggs, large quantities.
For Fowler's solution, For white precipitate, For arsenic,	Give prompt emetic of mustard and salt, tablespoonful of each; follow with sweet oil, butter, or milk.
For antimonial wine, For tartar emetic,	Drink warm water to encourage vomiting. If vomiting does not stop, give a grain of opium in water.
For oil of vitriol, For aquafortis, For bicarbonate of potassium, For muriatic acid, For oxalic acid,	Magnesia or soap dissolved in water, every 2 minutes.
For caustic soda, For caustic potash, For volatile alkali,	Drink freely of water with vinegar or lemon-juice in it.
For carbolic acid,	Give flour and water, glutinous drinks, and a form of alcohol.
For chloral hydrate, For chloroform.	Pour cold water over the head and face, with artificial respiration, galvanic battery.
For carbonate of sodium, For copperas, For cobalt,	Prompt emetics; soap or mucilaginous drinks.
For laudanum, For morphin, For opium,	Strong coffee followed by ground mustard or grease in warm water to produce vomiting. Keep in motion.
For nitrate of silver,	Give common salt in water.
For strychnin, For tincture of nux vomica,	Emetic of mustard or sulphate of zinc, aided by warm water.
For iodin and iodids,	Prompt emetic; sclution of starch; flour and water.

POISONING, MEDICOLEGAL DUTIES IN FATAL CASES.—The duties of the medical examiner are:

1. To establish the presence or absence of conditions characteristic of any poison.

2. To preserve all necessary material for analysis, taking care that nothing thereby is done to introduce causes of error.

3. To recognize or exclude natural causes of death.

4. If necessary, to perform experiments upon animals to demonstrate the toxic effect of substances separated by the chemist.

5. To record carefully all personal observations and to state clearly the conclusions as to the cause of death.

Information as to the circumstances of the death, while guiding the medical examiner in his mode of proceeding, must not bias his scientific opinion.

The most difficult cases are those in which the postmortem appearances are negative or consistent either with disease or poison. In these, however, the postmortem evidence, though necessary, is only of indirect value. Want of harmony between the clinical, anatomic, and chemic evidence is a most serious obstacle to a decisive result in court, and witnesses for the prosecution are sometimes singularly blind to very obvious defects of this kind in State evidence. The scientific value of medical opinion in poisoning cases has been considerably overrated in the past, and when its limitations have become more clearly recognized on all sides, the present undignified conflict of scientific opinion in court will probably become a thing of the past. Overpositiveness is the root of nearly all evil in medical testimony.

In any medicolegal autopsies with negative results, poisoning should be borne in mind, and the necessary materials preserved until the case is cleared up, in case an analysis may be necessary. Finding of an immediate cause of death of another nature does not always exclude poisoning. For instance, a man may be drugged previous to a fatal assault, or the death of a sick person hastened by poison.

In making a report, after fully stating all facts established by the autopsy, but without introducing extraneous circumstances, the conclusions should be concisely drawn up. These should be limited to what is proved by the report beyond contradiction, and may usually be expressed in one or other of the following formulas:

1. The autopsy does not show cause of death. To determine whether poisoning has occurred, an analysis will be necessary.

2. Conditions found are *characteristic* of poisoning by . . . . . .

3. Conditions found *are consistent with* poisoning by. . . . . .(or *are not consistent*).

4. Death is due to. . .(natural cause), poisoning by. . . . . .is *excluded* (or *not excluded*, or *not demonstrated*).

Preliminaries.—The following general precautions are to be observed: The autopsy should be done by two medical men, with some one to take notes. Persons suspected must not be present at the autopsy, but may be represented. The identity of the body should be carefully established. In exhumations the pathologist should be present when the coffin is opened, and samples of soil above and below the coffin should be taken. Linings or shavings within the coffin, if soaked with fluid from body, should be preserved. Provide a sufficient number of clean new glass jars (the "gem" jar pattern will answer)—at least a dozen should be available. Materials for analysis should be kept under personal supervision and delivered by hand to the chemist—not sent by mail or express. Provide facilities for examining the organs without contact with substances which would interfere with chemic analysis. If new and clean porcelain dishes are not available, pieces of freshly sawed boards will answer. Decomposition is best prevented by freezing the organs. If available, a cold-storage chamber is best. When absolutely necessary to prevent decomposition, pure alcohol is recommended, a control sample being reserved for analysis (probably formalin will prove a better preservative, but its possible influence on the results of analysis is not yet known). A sample

of the jar used should be kept. The jars are to be sealed by attaching tape to both jar and cover by means of sealing-wax, the seal being retained. Jars containing decomposing tissues should be loosely stoppered to prevent bursting. A signed and dated label should be placed on each jar. By knowing the tare weight of the jars, or by using a counterpoise, organs may be weighed while in the jars.

The autopsy should be made as soon after death as possible, but preferably not by artificial light. The modern undertaker's fondness for embalming bodies is a serious inconvenience, but, fortunately, the arsenical preparations are being superseded by formalin. In some States legislative restrictions specifically forbid the embalming of bodies pending judicial inquiry.

Poisons introduced after death may diffuse through the tissues and enter remote organs, though most concentrated at point of insertion. The compounds formed by rapid putrefaction at high temperatures are less likely to be confused with alkaloidal poisons than those slowly formed at low temperature.

When practicable, the chemist may, with advantage, be present at the autopsy, but unless he is personally accustomed to postmortem work, the results of this assistance may be disappointing. Want of familiarity with ordinary cadaveric odors interferes much with the recognition of those characteristics of volatile poisons. On the other hand, the pathologist should be present at the opening and examination of the stomach and intestines if this is done by the chemist.

Technic. External Examination.—The surroundings of the body may give important information. Any substances which might contain poison found in the vicinity should be seized and preserved; the surface of the body should be examined for traces of corrosion or evidences of poison spilt. The mouth, lips, and tongue need careful examination, and the whole surface should be examined for hypodermic punctures. At all stages of the autopsy characteristic odors should be watched for. These may be masked by the odor from intestines, and hence may be best detected in the brain before the other cavities are opened. In a well-equipped laboratory facilities for making preliminary tests should be at hand.

Internal Examination.—Authorities differ as to the best order for examination of the organs. In Germany official regulations insist on the ligation and removal of the stomach and duodenum as the first step in the autopsy, to be done before opening the thorax. This has the advantage of interrupting the continuity between esophagus and stomach. French authorities insist strongly on the preservation of the blood for analysis of the dissolved gases, also on the separate preservation of the urinary organs, as in these alkaloids are found in the greatest state of purity. American toxicologists lay stress—and that rightly—upon large quantities of the tissues being preserved, and, especially in chronic poisoning, of analysis of large quantities of muscle and bone. Witthaus advises preserving, in separate jars, (1) the stomach and duodenum and contents, ligated and unopened; (2) the rest of the intestine and contents, ligated and unopened; (3) the entire liver; (4) the blood from the heart and vessels; (5) both kidneys; (6) the urine; (7) the entire brain; (8) a large piece of muscle from the thigh; portions of the bones and spleen may also be taken with advantage. Fairly satisfactory analyses, however, may be made with amounts considerably less. If only a few jars are available, group together (1) stomach and intestine with contents; (2) liver; (3) brain, blood, spleen, and kidneys, etc.; (4) bone or muscle. When the autopsy is done under very unfavorable surroundings, it may be safer simply to eviscerate all the organs, placing them in a large enamel vessel for immediate transport to the laboratory.

Proof of poisoning has been established by chemists by analysis of muscles or one kidney, when all the other tissues have been removed and got rid of by the suspected parties.

Important information as to the time of absorption is shown by the distribution of poisons in the various tissues. The unabsorbed residue is found in the stomach and intestines, plus whatever may have been excreted by the intestines. Poisons in both stomach and liver indicate a short interval between the taking and the death. Poison in the liver and organs, with none in the stomach, indicates a greater interval if the poison was taken by mouth. Most poisons remain in the liver after disappearance from the stomach, and remain longer in the muscles and bones than in any other tissue. Poisons are found in their greatest purity in the kidneys and urine. When chronic poisoning is suspected during life, a sample of urine may be quietly secured for analysis without arousing suspicion. Apart from the analysis, the stomach contents give valuable information as to the time and composition of the last meal, which may have a very important and circumstantial bearing.

In corrosive poisoning, the best results are obtained by removing the mouth, esophagus, stomach, and duodenum together. The fauces and pharynx, besides corrosion, may show foreign substances, and any particle between the teeth should be carefully examined. The crucial point of the autopsy is the opening and examination of the stomach, which should be done over a vessel suitable for receiving the contents, the mucous membrane being spread out and examined with a hand lens for lesions and suspicious substances. The cooperation and presence of the chemist at this stage is specially valuable, but the examination of the stomach by the chemist alone may lead to statements very extraordinary from a pathologic point of view.

For analysis of contained gases in blood, the bottles should be completely filled and tightly stoppered.

It must be remembered that besides the examination for poisons and their lesions, every organ must be thoroughly examined and all natural causes of death, in particular the causes of sudden death, rigidly excluded. Particular attention must be paid, therefore, to the cerebral, pulmonary, and coronary arteries, the veins and other

sources of embolism, the heart-muscle, brain, and the air-passage.

In addition no examination should be neglected which will forestall subsequent hypothetic objections, the spinal cord being best examined as part of the routine. It is most necessary that microscopic and bacteriologic studies be made when these will yield any information. Small bits of tissue preserved in formalin for microscopic examination will often give decisive information in organs too decomposed to be trustworthy to the naked eye.

Sources of Error.—The principal are: (1) Failure to recognize the existing appearances of poisoning; (2) supposed detection of characteristic appearances not really present; (3) misinterpreting, an effects of poison, lesions due to disease or to agonal or postmortem changes. In acute cases the possibility of remedial measures employed in modifying appearances must be borne in mind. The inflamed and reddened conditions of the stomach recorded for many poisons, are probably largely mistakes of observation.

The stomach in full digestion is found intensely reddened postmortem. Softening of the mucosa after death may resemble erosion, and passive or hypostatic congestion may lead to suffusion of blood in the mucous membrane, with the appearances strongly resembling those in inflammation. Due allowance must be made for the attitude of the mind when certain changes are expected. To pathologists, reddening or congestion of the stomach mucosa in itself indicates nothing important.

Anatomic Distribution of Lesions.—The following are some of the more common changes:

Surface.—Pinkish lividity, from carbon monoxid or cyanid of potassium.

Fauces, Esophagus, and Stomach.—Foreign substances, corrosion effects, odors, inflammatory exudates, ulcers, and perforation; brittleness from acids; soapiness from alkalies. The microscopic examination of sloughs shows hemorrhagic infiltration at the base, and may show crystals, as arsenic or oxalates. Diluted corrosives cause more inflammation, but less necrosis, than concentrated ones. The stomach lesions lie mostly at the greater curvature and along the rugæ. Among foreign substances, may be found matchheads, indicating phosphorus; cantharides scales, Paris-green particles, etc. Fatty change following cloudy swelling may occur secondarily in arsenic and phosphorus-poisoning.

Intestines.—Diffuse pinkish congestion, with rice-water contents in arsenic poisoning, and membranous colitis in sublimate poisoning, are highly characteristic.

Blood.—Carmin colored in poisoning by carbon monoxid and potassium cyanid; dark in prussic acid poisoning; chocolate brown, with destruction of red cells, from potassium chlorate and other reducing agents; dark, and free from clots in alcoholic or narcotic poisoning, and all conditions causing death by asphyxia. Distinctive odors may be present.

Heart.—Fatty in subacute arsenic and phosphorus-poisoning; ecchymoses of walls with phosphorus-, and subendocardial ecchymoses with arsenic, poisoning.

Lungs.—Congestion and bronchopneumonia from narcotics; carmin colored and edematous in carbon monoxid; fat emboli with phosphorus.

Kidneys.—Cyanosed in alcoholism, with the hog-back shape; cloudy swelling and fatty change in arsenic and phosphorus; congestion and glomerular and papillary hemorrhages in cantharides; methemoglobin infarcts with potassium chlorate, etc.

Liver.—Fatty with arsenic and phosphorus-jaundice in phosphorus.

Lesions Characteristic of the More Important Poisons. Concentrated Sulphuric Acid.—Blackening from carbonization in esophagus, stomach, and duodenum; perforation and charring of adjacent organs; erosion of skin.

Dilute Sulphuric Acid.—Severe gastroenteritis, with sloughing and ulceration.

Hydrochloric Acid.—Concentrated: corrosion, with gray color of the stomach; no corrosion of skin. Dilute: same as dilute sulphuric.

Nitric Acid.—Intense yellow tint from the formation of picric acid, tissues becoming very brittle.

Caustic Alkalies.—Mucosa of mouth, esophagus, and stomach swollen, translucent, and brown, soapy to the touch, and with odor of lye. In later stages intense inflammation of stomach and esophagus (croupous in the case of ammonia), followed by ulceration. Stricture of esophagus frequently follows.

Nitrous Acid Fumes.—Intense capillary bronchitis, with edema of lungs.

Corrosive Sublimate.—Severe gastroenteric with diphtheritic colitis and very marked cloudy swelling of the kidney.

Arsenous Acid.—Intense congestion and hemorrhage of stomach; diffuse pinkish congestion of small intestines, with rice-water contents, free from fetor. Subendocardial ecchymoses. In later stages, necrosis and fatty change in stomach, cloudy swelling and fatty change of kidneys, skin eruptions, and neuritis in chronic cases.

Antimony Tartrate.—In acute cases general appearances similar to arsenic; in addition sometimes pustular eruption where tissues are in contact with the solid particles, as in esophagus; greater tendency to engorgement of lungs with pulmonary apoplexy.

Silver Nitrate.—Whitish coagulum, blackening on exposure to light; blackening of skin and internal organs in chronic poisoning (very rare).

Copper Salts.—Blue discoloration and tan appearance of tissues.

Lead.—In chronic cases blue line of gums, with fibrosis of the organs and nerves (changes not constant).

Carbolic Acid.—Corrosion, with drying, hardening, and whitening of tissues; characteristic odor; stomach pinkish-gray; blood, in contact, brick-red; lungs engorged.

Oxalic Acid.—Whitish coagulation of mucosa at point of contact; severe inflammation and hemorrhage about corroded areas, if death is not im-

mediate; infiltration of tissues by octahedral oxalate crystals.

Phosphorus.—Sometimes luminosity of stomach contents; presence of match-heads, onion odor, intense jaundice, fatty degeneration of liver, kidneys, and heart; ecchymoses throughout entire body; fat embolism. In chronic forms necrosis of jaw.

Carbon Monoxid.—Bright red lividity of surface. Carmin color of blood, with persistent fluidity and characteristic spectrum. Pinkish appearance of organ from alteration in blood tint. Edema of lungs; asphyctic state, with engorgement of organs. Delayed decomposition. Color of blood unaltered on adding alkalies, tannic acid, etc.

Hydrocyanic Acid.—Asphyctic state; characteristic odor (masked in presence of ammoniacal decomposition). Blood becomes bright red on adding reducing agent.

Cyanid of Potassium.—Asphyctic state; odor as in prussic acid; blood lake-colored. Mucosa of esophagus and stomach brownish-red, swollen, thrown into folds, translucent, and slippery.

Nitrobenzol.—Intense cyanosis; odor of bitter almonds.

Potassium Chlorate.—Cyanosis and asphyxia; chocolate-brown color of blood and organs, with methemoglobin spectrum; acute hemorrhagic glomerulonephritis, with methemoglobin in kidneys, spleen, bone-marrow, and urine.

Potassium Bichromate.—Changes similar to those from potassium chlorate; decomposition delayed.

Hydrogen Sulphid.—Characteristic odor; greenish tint of blood (only found in animal experiments).

Alcohol.—Characteristic odor, specially marked in brain and liver; odor may be that of aldehyd, ether, or mercaptan. Asphyxia, engorgement of organs with blood, edema of glottis, lungs, and pia. The organs usually present stigmata of chronic alcoholism—viz., cyanotic (hog-back) kidneys, with diffuse cirrhosis; fatty or cirrhotic liver, milky opacity of pia, and chronic or acute gastritis.

Cantharides.—Inflammation of stomach and intestine, with presence of scales in the stomach; acute hemorrhagic glomerulonephritis, hemorrhagic pyelitis, and hematuria.

The following poisons have appearances which, while fairly constant and uniform, are not in themselves characteristic:

Morphin, Laudanum, Chloral, and Narcotics.—Intense cyanosis and congestion of organs, frequently bronchitis and commencing hypostatic pneumonia.

In poisoning from **strychnin, belladonna, and other alkaloids, and in most glucosids,** the postmortem conditions indicate death by asphyxia. It must be mentioned, also, that this condition is found in poisons which produce syncopal effects, such as aconite, etc., the anatomic condition described as characteristic of syncope being only a figment of medicolegal imagination. With poisoning from digitalin and ptomains diarrhea is often a prominent symptom, without inflammatory changes in the intestines.

Anesthetics.—In deaths during anesthesia the appearances are usually negative; accidental causes of suffocation should be carefully looked for, as well as evidences of organic disease. Suffocation by inhalation of vomited matters is very frequently the immediate cause of death in alcoholism and carbon monoxid poisons, and occasionally is so in other poisons.

The recent work showing that ricin, abrin, and other substances produce cell-necrosis in the liver and kidney, indicates a field in which investigation is needed, and might give valuable diagnostic results. The leukocytosis in arsenic and other poisons may prove of importance in the future. The swelling and hemorrhagic condition characteristic of snake-venom, and the cell changes produced by the bacterial toxins, have important bearings on toxicology. So also has the rôle which secondary bacterial infection plays in poisoning cases, though as yet data on this are too meager to permit of generalization.

In the foregoing article prominence has not been given to the minor technic details of autopsy routine. Those who are not thoroughly familiar with autopsy methods will probably serve best their own interests and those of the public by not attempting work of this kind. When such a person cannot avoid the responsibility, his best plan would be to remove all the organs with as little dissection as possible, and bring them, untouched and uncontaminated, into the hands of some more competent person.

POLIENCEPHALITIS.—See Brain (Inflammation).

POLIOMYELITIS, ACUTE ANTERIOR.—See Paralysis (Infantile).

POLIOMYELITIS, ACUTE IN ADULTS (*Acute Atrophic Spinal Paralysis of Adults*).—Very rarely in adults under 30 occurs a disease almost identical with the infantile form, though mistakes in diagnosis have been made, the disease being in reality multiple neuritis.

POLIOMYELITIS, SUBACUTE AND CHRONIC (*General Anterior Spinal Paralysis, Subacute of Duchenne, Subacute and Atrophic Spinal Paralysis*).—Cases have occurred, though rarely, characterized by paralysis and atrophy of all extremities without sensory disturbance, and without the severe onset of the acute form. It has often been mistaken for multiple neuritis.

POLITZERIZATION.—See Ear (Examination).

POLLANTIN (Dunbar's Serum).—An antitoxic serum from horses treated with pollen toxin derived from ragweed. It is used in the prophylaxis and treatment of hay fever. See Hay Fever.

POLYCYTHEMIA.—Marked increase in the red blood cells is generally indicative merely of concentrated blood or stasis. It occurs in health after bathing, massage, violent exercise. It is observed in high altitudes and follows the administration of certain drugs. It may occur during digestion, in blood regeneration, vomiting, profuse sweating, the removal of exudates, profuse diarrheas and, it is said, with myxedema and acute yellow atrophy. It is found in circulatory derangements, such as

organic heart disease, emphysema, stenotic dyspnea. See Blood.

POLYDIPSIA.—Excessive thirst. It is usually present in fevers and in diabetes. See Thirst.

POLYNEURITIS.—See Neuritis (Multiple).

POLYPUS.—A pedunculated tumor arising from mucous membranes. The nose is a frequent seat of polypi. Uterine polypi are of three kinds—cystic, derived from the ovules of Naboth; mucous or soft, resembling rectal polypi; and hard or fibrous, the so-called fibrous polypus of the uterus. Polypi of the ear resemble nasal polypi, springing from the tympanic membrane and from the interior of the tympanum. Intestinal polypi are of more frequent occurrence in the rectum than in any other portion of the intestinal tract. They are composed of tissue resembling that of the mucous membrane of the part, and are mostly described as adenomata. Polypi are also found in the bladder, larynx, on the gums, and sometimes in sinuses communicating with the nose. See Nose, Uterus.

POLYURIA.—Excessive secretion of urine. The causes of temporary polyuria are: excessive ingestion of fluids, cold, suppression of perspiration, the use of diuretics; it occurs in the crisis of fevers, and in certain neurotic conditions, as hysteria, and in nervous excitement. A permanent polyuria is met in diabetes mellitus, diabetes insipidus, chronic interstitial nephritis, and in amyloid disease of the kidneys. See Diabetes, Nephritis, Urine (Examination).

POMEGRANATE.—See Granatum.

POMPHOLYX.—A rare inflammation of the hands and feet generally of the palmar and plantar surface, resulting in the formation of vesicles and blebs, occurring in adults. The majority of cases are met with in neurotic women. The vesicles are deep-seated and resemble boiled sago grains; they may disappear by absorption or become purulent or coalesce to form large, flat blebs. The disease is usually symmetric and lasts from a few weeks to several months. It must not be confounded with eczema or rhus poisoning. Treatment consists in improving the general health by tonics and good food and keeping the bowels open. Soothing applications are indicated locally.

PONS, DISEASES.—**Tumors** of the pons produce symptoms chiefly of pressure. Of 52 cases, 13 had cerebral nerves involved, in 13 the limbs were affected, and in 26 hemiplegia and nerve involvement existed. Twenty-two of the latter had alternate paralysis. In 4 no motor symptoms presented.

Hemorrhage into the pons and medulla oblongata is rarer than cerebral hemorrhage and more frequent than hemorrhage into the spinal cord. Atheroma or miliary aneurysm and other factors productive of increased arterial tension are usually coincident, while cardiac hypertrophy, nephritis, excessive bodily exertion, and alcoholism may be traced.

Lesions involving the pyramidal tract cause crossed paralyses. A lesion in the lower part of the pons will cause a lower segment paralysis of the face on the same side, and a spastic paralysis of the arm and leg on the opposite side. The abducens, the motor part of the trigeminal, and the hypoglossal nerves may likewise be paralyzed. When the central fibers to the nucleus of the hypoglossus are involved, a peculiar form of anarthria follows. Swallowing is interfered with if the nucleus itself is involved. A paralysis of the external rectus muscle of one eye and of the internal rectus of the other eye, in the absence of a "forced position" of the eye-balls, is highly characteristic of certain lesions of the pons. The internal rectus may still be capable of convergence. This conjugate paralysis may be complicated by other disturbances of eye-muscle movements, and the facial nerve is often involved in these paralyses.

In lesions of the pons the patient has a tendency to fall to the side on which the lesion is situated. Still more frequent is the simple motor hemiataxia consequent upon lesion of the medial lemniscus and possibly the longitudinal bundles in the formatio reticularis. Only when the lesions are very extensive are there disturbances of hearing.

Treatment should conform to that of cerebral hemorrhage. Electricity is indicated for the paralysis.

POPLITEAL ANEURYSM.—The popliteal artery is the most common seat of aneurysm, except the aorta itself. It is peculiarly liable to atheroma; it is not supported by the structures around; it is compressed more or less in flexion of the knee, stretched out in overextension, sometimes even ruptured; and immediately below it breaks up into a number of branches, so that an embolus, if it comes down the vessel, is almost certain to lodge there. That constitutional causes are of very great importance is shown by the fact that it sometimes occurs on both sides, and that it may even develop upon the second while the patient is lying in bed being treated for the first. Fusiform dilatation occasionally occurs, but sacculated aneurysm is much more common. In some cases it springs from the anterior surface of the artery and grows forward against the bone or the posterior ligament of the knee-joint, and then it is usually slow in its course, rarely attaining a large size. In others it extends backward, and, meeting with little to oppose it, becomes immense, forming a thin-walled sac within a comparatively short space of time.

Symptoms.—Occasionally the onset is sudden, dating from some exertion; more frequently, the patient suffers from obscure rheumatic pain down the leg, with stiffness of the joint and sense of weakness, and then suddenly discovers, or has discovered for him, the presence of a pulsating swelling. Usually the expansive pulsation, the bruit conducted down the leg, and the way in which the sac empties upon compression and fills again on relaxation of the vessel are distinctive. Occasionally the tumor is harder and cannot be emptied, the pulsation is that of an artery only, and the bruit is indistinct and faint; and in some very rare instances there is no pulsation at all. Probably, in the former case, the sac is already partly filled with fibrin, and possibly in the latter it is completely solid; but as pulsation sometimes makes its appearance later, this explanation is hardly satisfactory. If the sac grows forward, synovitis of

the knee-joint sets in, the pain is very severe, and movement greatly restricted. If it takes a direction backward, the popliteal vein may be compressed and congestion and edema follow; or the internal popliteal nerve may be stretched so that there is severe neuralgia extending down the side of the limb into the sole of the foot. Sometimes a distinct difference can be made out in the two tibial pulses.

Left to itself it occasionally undergoes spontaneous cure. Much more frequently it grows larger and larger, leaks, and ruptures either into the knee-joint, or more usually into the cellular tissue of the leg. In either case the patient is conscious of something having given way, and becomes sick and faint with the pain and loss of blood. If the rupture takes place through the posterior ligament, the knee becomes immensely distended at once, but the bruit and pulsation do not cease altogether, and the pulse can still be felt, though feebly, in the posterior tibial. If it is into the cellular tissue, a tense swelling forms rapidly in the popliteal space, filling it completely and causing the most severe pain; the limb below becomes cold and livid, the tibials cannot be felt, and in a very short time gangrene sets in. Occasionally inflammation breaks out round the sac, the skin becomes red, edematous, and exceedingly painful, and sometimes this is followed by suppuration.

The differential diagnosis must be made from sarcoma growing either from the bones, the posterior ligament of the knee-joint, or the lymphatic glands; abscess; bursal cyst, or diverticulum from the knee-joint; and solid tumors resting upon the artery. Arterial hematoma from perforation of the popliteal artery gives rise to the same symptoms as a leaking or a ruptured aneurysm, according to the size of the opening. Sometimes there is a distinct bruit with faint pulsation along the course of the vessel.

Treatment.—Rest and diet are employed only as adjuncts, but they should never be neglected, and unless the sac is enlarging rapidly, so that there is fear of rupture, it is always advisable to submit the patient to a few days' preparation before employing any active treatment. If the aneurysm is of moderate size only, and there is no fear of immediate rupture, Reid's method with Esmarch's bandage, or digital compression, is the best, preference being given to the latter if there is much evidence of atheroma or of heart-disease; to the former if, other things being suitable, there are enlarged glands in the groin. Flexion succeeds well with aneurysms that are small or already partially solidified. If these measures fail, or if the sac is enlarging rapidly and perhaps leaking, or if inflammation has set in, or if there is any edema of the foot from pressure upon the popliteal vein, surgical treatment should be resorted to. Matas' operation of aneurysmorrhaphy has been practised with success in popliteal aneurysm, and is to be preferred to ligation of the femoral artery. See Aneurysm.

POPPY.—See Opium.

POSITIONS.—See Fetus (Positions and Presentations.)

POSTMORTEM EXAMINATION.—**The general technic** of a postmortem is as follows: First, the appearance of the body is described, including sex, height, apparent age, discoloration of the skin, rigor mortis, state of nutrition, injuries, deformities, and any peculiarities that may be observed.

An incision is then made from the top of the sternum to the pubic symphysis, the abdomen being the cavity first opened. Then the position of the viscera, their condition, the presence of hernia, if it exists, the state of the peritoneum, and the quantity of fluid are noted, but all without disturbing the relation of the contents. The thorax is now opened. In order to do this, the ribs are divided at the costochondral junction, and the sternum and clavicles disarticulated. The relation of the structures exposed on lifting up the separated portion of sternum and ribs is noted—the presence of fluid in the pleural cavity, pleural adhesions, the extent to which the lung covers the pericardium. The pericardial sac is next opened, and its condition and the quantity of fluid recorded.

The opening of the heart is the next step. This may be done in several ways; one of the best is Virchow's method. The heart is opened *in situ*. The first incision is made in the right ventricle (many open the right auricle first), along the ventricular ridge, from near the auriculoventricular groove to near the apex. The second incision opens the right auricle midway between the entrances of the venæ cavæ. In the left auricle the incision is carried from the left superior pulmonary vein to near the auriculoventricular ring. The incision through the left ventricle begins just behind the base and ends just short of the apex. It must be carried deeply through the wall of the heart. The heart is now removed. To do this the organ is grasped with the index-finger of the left hand in the left ventricle and the thumb in the right; the heart is then raised by the apex and the venæ cavæ, the pulmonary veins, and the pulmonary artery, and the aorta divided, taking care that the incisions are not too close to the heart. The next step is to open the ventricles. For this purpose the heart is placed exactly in the position it occupied in the body. One blade of the scissors is then introduced near the lower end of the incision in the right ventricle, and carried outward in the direction of the pulmonary artery. The incision for the left ventricle commences at the apex of the heart and divides the anterior wall of the ventricle close to the septum, and is continued outward.

The lungs are next removed, usually the left first. Section of these organs is made by a long sweep of the knife—in the case of the left preferably from the apex to the base; in the case of the right, from the base to the apex. Attention is now directed to the abdomen, the **spleen** being the first organ removed.

Next come the **suprarenals** and the **kidneys**. In order to gain access to these it is wise to dissect off, by a few quick cuts, the entire colon from the sigmoid flexure to the ileocecal valve. A double ligature is placed around the sigmoid, and the gut

divided between the ligatures. The removal of the kidneys is further facilitated by cutting the diaphragm loose from its costal attachments and throwing it upward, with the liver, into the thoracic cavity. The adrenals and kidneys are then exposed; the course and condition of the ureters are noted. The suprarenals may now be removed separately, or taken out with the kidneys; in either case it is best to remove the organs on the left side first. Section is made of the adrenals; also of the kidneys. In the latter the capsule is stripped off, and a note is made of the extent, if at all, to which it is adherent; also whether the renal substance is torn on removing the capsule.

The next step consists in the **removal of the intestines**. These are cut closely to their mesenteric attachment, care being taken to leave as little of the mesentery attached to the gut as possible. The fecal contents are then washed out by a running stream of water through the bowel, which is opened at the attachment of the mesentery and examined. In removing the intestines the rectum and the first and second portions of the duodenum are left *in situ*. The next step is usually the **opening of the stomach** and remaining portion of the duodenum. This is accomplished, like the opening of the intestines, by means of the enterotome. After the duodenum is opened, the **gall-bladder** is pressed until bile is made to flow from the mouth of the common duct in the duodenum. If this is impossible, obstruction exists. The gastric contents are described, and the condition of the walls noted. The **pancreas** is now examined, the condition of its duct, and the presence of cysts or stones being noted. It is then removed and incised longitudinally.

The liver is next taken out, the condition of the vessels entering the portal fissure having been noted before they were divided. The liver is weighed and measured transversely, longitudinally, and vertically, the width of the two large lobes being taken separately. A long incision is now made into the substance of the organ and the conditions noted, especially the relation of the connective tissue to the hepatic substance proper.

The pelvic organs are next removed. This is best accomplished by first making a cut into the **bladder**; into the opening a finger is inserted, while the other fingers grasp the rectum. By making the tissues tense, their separation from the bony wall of the pelvis is facilitated. After removal they are cut open; in the case of a female subject the **uterus** is opened by a longitudinal cut through the anterior wall. A fine probe is passed into the oviducts to ascertain their patulousness; they may also be opened by a delicate pair of scissors.

Nothing of importance remains now in the abdomen except the vessels and the semilunar ganglia. The latter should be examined *in situ* and also after removal. The **aorta** should be opened by a longitudinal incision extending from the beginning of the arch down to its bifurcation, thence prolonged out into the iliac arteries. The **thoracic duct** should be looked for at the side of the aorta. The **trachea**, larynx, thyroid gland, pharynx, and tongue can be removed either through a median incision in the front of the neck or from the base of the neck.

For the **removal of the brain** it is necessary to saw out a portion of the cranial vault. It is customary to divide the scalp about on a line with the coronal suture. The vault is sawed through in front and behind, a large, wedge-shaped piece being removed. The dura is then divided on a line with the sawed edge of the bone, and also separated from the attachment to the crista galli in front. The brain is then carefully lifted from its bed, the nerves passing from it divided, and the attachment of the dura to the petrous portion of the temporal bone cut loose. If possible, the pituitary body should be kept attached to the brain.

A long knife is now introduced into the spinal canal, and the cord cut as low down as possible. The brain is then lifted out and placed on a board or plate. After a careful survey of its external appearances, the organ is dissected. A number of methods are in vogue. One of the best is that known as Edinger's method; only its general features can be indicated here. The lateral ventricles are first opened; then the cerebral hemispheres are cut away from the basal ganglia. Longitudinal and transverse cuts are made into the cerebral mantle, observing always to make the incisions as near as possible at right angles to the course of the convolutions. The basal ganglia are examined by making multiple incisions into them; the cerebellum is similarly treated.

The spinal cord is generally removed from the back; special saws have been devised to cut the pedicles of the vertebræ. The cord itself is removed in its membranes from below upward, the most important point being the avoidance of traction. The membranes are opened, and the cord substance divided at short intervals by transverse cuts. The eyes, if it is necessary, can be removed without difficulty. The removal of the organ of hearing requires considerable labor. All organs should, if possible, be weighed.

POSTPARTUM HEMORRHAGE.—Hemorrhage during and after the third stage of labor. Should it occur after the first 24 hours of the puerperium, it is called puerperal hemorrhage.

Postpartum hemorrhage may be divided into: (1) Hemorrhage from relaxation of the uterus; (2) hemorrhage from rupture of the uterus; (3) hemorrhage from inversion of the uterus; (4) hemorrhage from lacerations of the lower birth canal, and (5) hemorrhage into the perivaginal tissues (hematoma).

Hemorrhage from Relaxation of the Uterus.—This is one of the most common forms of postpartum hemorrhage, and is what is meant when the simple term "postpartum hemorrhage" is used.

Causes.—Any condition which interferes with firm contraction of the uterus after the expulsion of the child might be mentioned as a cause of postpartum hemorrhage. Of these conditions may be mentioned weakness of the uterine muscle from overdistention; general disease; faulty develop-

ment; mental anxiety; retained placenta, membranes, or blood-clots; old adhesions; tumors, and distended bladder and rectum.

Symptoms.—The important symptom is hemorrhage, which may appear before or after the expulsion of the placenta. There may be sudden gush of blood, profuse enough to destroy the patient in a few moments; or there may be a succession of gushes a few ounces of blood being lost every few seconds. Not infrequently there is a steady flow of blood from the uterus, which will only end with the death of the patient or with the most active treatment. Palpation shows a large relaxed uterus, and there are marked constitutional signs of hemorrhage, such as extreme pallor, vertigo, sighing respiration, and, possibly, syncope. The pulse is extremely weak and rapid, or it may be entirely absent at the wrist.

Treatment.—The proper management of the third stage of labor, followed by the application of an abdominal pad and binder, is the best preventive treatment of postpartum hemorrhage. When one has special cause to fear hemorrhage, as in case of multiple pregnancy, hydramnios, and the like, a good precautionary measure is the hypodermic injection of 3 to 5 grains of ergotin as soon as the child's head is born.

In the majority of instances a postpartum hemorrhage may be quickly controlled by **external stimulation of the uterus.** The fundus is grasped by the hand through the abdominal wall, and is pinched, kneaded, and irritated until, in favorable cases, it becomes firm and hard and the bleeding ceases. If the placenta is not yet expelled, it should be expressed by the Credé method. If the foregoing procedure fails to control the bleeding, the disengaged hand should be passed into the uterine cavity and all placenta, membranes, and blood-clots should quickly be removed. This **internal stimulation of the uterus** will usually prove most effective. Should this fail and should the hemorrhage be rather slight in amount, **hot douching** may next be tried. A fountain syringe is filled with plain boiled water at a temperature of 120° F., and this thrown well up into the uterine cavity by means of a large two-way metal catheter. Should the bleeding be alarming in quantity or should this latter method fail, the last and most effective method of treatment is the use of the **intrauterine tampon.** The best material for plugging the uterus is 5 percent iodoform gauze. The patient is brought across the bed with the buttocks extending well over the edge; the anterior and posterior lips of the uterus are each grasped with a double tenaculum and drawn well down toward the vulvar orifice. The end of the gauze is seized with dressing forceps and, guided by two fingers of the left hand, introduced into the cervix and pushed well up to the fundus; the dressing forceps are now removed and successive portions of the gauze are carried up until the uterine cavity is firmly packed from above downward. If the packing is done properly, from 3 to 5 yards of gauze will be required. This is followed by packing the vagina, either loosely or tightly as may be indicated. In exceptional cases when the uterus is entirely atonic, it may be necessary to reinforce the vaginal tampon by a large perineal pad and binder, the two ends of the binder being firmly attached to the abdominal binder.

The subsequent treatment will depend upon the amount of blood the patient has lost, and upon her general condition. After a moderately severe hemorrhage it will be sufficient to remove the pillow from under the patient's head and raise the foot of the bed; to give some rapidly acting cardiac stimulant; hypodermic injections of ether, brandy, or carbonate of ammonium; to give frequently repeated teaspoonful doses of strong hot coffee, hot water and brandy, hot milk, red wine, or champagne; and to surround the patient with hot bottles, and cover her with warm blankets.

When the anemia is extreme, it is necessary, in addition to the preceding, to replace the lost fluid as quickly as possible. This is done most readily by the injection of a normal salt solution—about 40 grains of NaCl to the pint of warm water—into the large intestine. Two or 3 pints of this solution, if retained, will cause a very marked and rapid improvement in the pulse. If the bowel will not retain this solution, it should be given subcutaneously. A cannula about the size of a rye-straw is attached to the rubber tube of a fountain syringe; the syringe, placed about 6 feet above the patient, is filled with a sterile salt solution; the cannula is plunged directly into the cellular tissue underneath the mammary gland, starting at the outer periphery of the gland; the fluid is allowed to drain into the tissues until a pint or more has been absorbed. Both breasts may be filled with this solution, or the loose tissue in the axilla or between the scapulæ may be selected for this purpose. Autotransfusion (bandaging the extremities and thus forcing the blood into the vital organs) will be found a useful adjunct. After the patient has reacted, a hypodermic injection of morphin (1/6 grain) will quiet her, and probably induce a much-needed sleep.

Hemorrhage from Rupture of the Uterus.—Rupture of the uterus is one of the rarest accidents of labor, occurring once in about 4000 cases. The position of the rent is most frequently in the lower uterine segment. Occasionally, the rupture is an incomplete one, involving the mucous and muscular coats only.

Causes.—The most frequent cause is some serious obstruction to labor, such as grave degrees of contracted pelvis, malposition of the child, and tumors obstructing the pelvic canal. Any condition weakening the uterine wall, such as fatty degeneration of the muscle, or a previous cesarean section, predisposes toward rupture. External traumatism may be mentioned as a rare cause.

Symptoms.—Rupture of the uterus may occur at any time during labor, but it occurs most frequently during the second stage. A prolonged second stage of labor, with frequent severe pains, thinning of the lower uterine segment, and rise of the contraction ring, should be looked upon with apprehension, as they are premonitory signs of rupture. At the time of rupture there are usu-

ally violent pain and a sensation as though something had "given away." There are pronounced shock, rapid weak pulse, pallid, leaking skin, fall of temperature, and sighing respirations.

Physical Signs.—The os is widely dilated; the membranes are ruptured; the presenting part, unless it has been firmly engaged, recedes; the uterine contractions cease, and the child may plainly be felt in the abdominal cavity. It may be possible to feel the rent in the uterus, with perhaps loops of intestines projecting through it. Rupture of the uterus may occur, rarely, without any of these symptoms—the rent being discovered during efforts at the removal of the placenta. In rare instances the uterus may rupture during the puerperium as a result of pressure necrosis, septic ulceration, or malignant degeneration of the deciduæ. The symptoms and treatment are those of septic infection.

Prognosis.—This depends largely upon the extent of rupture, the amount of hemorrhage, the cleanliness with which labor has been conducted, and the treatment. The mortality is variously given at from 55 to 90 percent. The two chief dangers are hemorrhage and sepsis.

Treatment.—This will depend upon the conditions present. Rupture of the uterus can be prevented, usually, by the proper treatment of labor complicated by contracted pelves, by correction of malpositions, and the like.

If the child is delivered before the rent is diagnosed, the treatment will depend upon the amount of hemorrhage. The placenta should be delivered immediately and a hypodermic injection of ergotin administered. If the hemorrhage is slight, a strip of iodoform gauze may be introduced into the rent to secure drainage. No further treatment is necessary except the removal of the gauze at the end of 24 hours. If the child is not delivered and is still in the uterine cavity, it must be extracted immediately by forceps, version, or craniotomy. If it has been extruded into the abdominal cavity, laparotomy must be performed immediately. In all cases when the rent is large, when the hemorrhage is great, and when it is believed that septic material has escaped into the peritoneal cavity, the abdomen must be opened, the peritoneal cavity cleansed, and the uterus amputated, or the rent closed, as may be indicated. When a conservative plan of treatment is at first pursued, it may be necessary to open the abdomen later on account of the occurrence of septic infection.

Hemorrhage from Inversion of the Uterus.—This is an extremely rare accident. It may occur before or after the expulsion of the placenta.

Causes.—Effort to secure delivery of the placenta by traction on the cord is probably the most important cause. Precipitate labor and paralysis of the placental site have also been mentioned as causes.

Symptoms.—The important symptoms are shock and hemorrhage. The former is most marked, the latter is variable. Pain may be present, although it is not a constant symptom.

Physical Signs.—A soft, round, tumor protrudes from the vulva. To it may be attached all or portions of the placenta. The orifices of the fallopian tubes may be seen on either side. The finger passed along the side of the tumor at its apparent attachment feels the symmetrically reflected cervix surrounding it. Abdominal palpation shows an absence of the fundus, a cup-shaped depression, containing, perhaps, the tubes and ovaries, being felt instead.

Prognosis.—This is very grave unless the uterus can be quickly replaced. Shock, hemorrhage, and sepsis may be causes of death.

Treatment.—This consists in immediate reposition. The uterus is grasped in such a manner that the fundus rests upon the palm of the hand, the fingers and thumb surrounding the reflected portion of the cervix. The vaginal part of the cervix is gradually dilated with the tips of the fingers, and the body of the uterus is passed steadily upward and forward until reduction is complete. If the placenta is adherent, it should be removed before attempting replacement.

Hemorrhage from Lacerations of the Lower Birth Canal.—Lacerations of the lower birth canal resulting in profuse hemorrhage are situated in the cervix, anterior vaginal wall, near the urethra, or about the clitoris. Inspection of the cervix, vagina, and vulva will speedily make the diagnosis.

Treatment.—If of the cervix, a tampon of iodoform gauze packed closely around the vaginal aspect will quickly control it. In very rare cases it may be necessary to suture it. If of the anterior vaginal wall or about the clitoris, a provisional tampon may be introduced, which is subsequently removed and the tear closely sutured.

Hemorrhage into the Perivaginal Tissues.—This is a rather infrequent complication of labor. It may occur in the labia, underneath the vaginal wall, or in the broad ligament.

Causes.—A varicose condition of the veins, which is so constant an accompaniment of pregnancy, is the predisposing cause. The exciting cause is the traumatism inflicted by the passage of the child; or it may be due to the use of forceps or other manipulations in securing delivery.

Symptoms.—Sharp pain is felt at the time of rupture, and, in exceptional cases, there may be signs of internal bleeding.

Physical Signs.—A bluish tumor, varying in size from a walnut to a fetal head, may be seen at the vulva, or may be felt in the vagina. It gradually increases in size, and is elastic or fluctuating. Very rarely it may rupture externally, causing profuse hemorrhage.

Prognosis.—If properly treated, the prognosis is favorable. The most serious complication is infection of the blood-clot.

Treatment.—If the bleeding does not subside spontaneously, it should be controlled by pressure and the application of ice. Subsequently, absorption should be encouraged by absolute quiet, cleanliness, and protection. If suppuration should occur, free incisions, with irrigation and drainage, must be resorted to. In exceptional cases it may be necessary to incise the tumor, turn out the clot, and ligate the bleeding point.

POSTURE.—See Gynecologic Examination.

POTASSIUM.—K = 39; quantivalence 1; specific gravity 0.865. A metallic element, of silvery luster, and characterized by intense affinity for oxygen. Its peculiar reactions are its precipitation when converted into the acid tartrate, its precipitation by platinum perchlorid, and the violet color it imparts to the flame. Physiologically, salts of potassium are protoplasmic poisons when applied locally in sufficient concentration. They dialyze more readily than sodium salts. In the body they occur especially in the solid structures, while sodium salts predominate in the fluids. In large doses by the mouth, potassium salts act as irritants to the gastrointestinal tract. The circulation is generally depressed by potassium salts—after small doses the primary depression of the pulse-rate and arterial pressure is followed by a rise of both; large doses cause a rapid fall of pressure and pulse-rate. Injected into a vein, salts of potassium cause paralysis of the heart. Potassium salts are obtained from the ash of plants, from saltpeter, from the potassium bitartrate deposited from urine in the process of fermentation, and from the washings of sheep's wool. The action of the various salts is given under their proper headings.

Preparations.—**P. Acetas,** $KC_2H_3O_2$, an easily soluble salt having marked diuretic properties. Dose, 5 grains to 1 dram. Purgative doses, 2 to 4 drams. **P. Arsenitis, Liquor,** Fowler's solution. See Arsenic. **P. Bicarbonas,** $KHCO_3$, a salt with properties like the carbonate, to which it is preferable. Dose, 5 to 45 grains. **P. Bitartras,** $KHC_4H_4O_6$. See P. Tartras. Dose, 20 to 60 grains as a diuretic; 1/2 to 1 ounce as a purgative. **P. Bromid,** KBr, a colorless, crystalline, bitter salt, readily soluble in water. It is extensively employed as a sedative in nervous excitement, and is one of the best drugs in epilepsy. Its prolonged use causes the condition known as Bromism (*q. v.*). **P. Carbonas,** K_2CO_3, used locally in acne and acute eczema, internally in rheumatism, in the uric acid diathesis, and in jaundice. Dose, 2 to 20 grains. **P., Caustic,** potassium hydroxid. **P. Chloras,** $KClO_3$, a crystalline compound, with a saline, cooling taste. It is soluble in 15 or 16 parts of cold, and readily soluble in boiling, water. It is used as a gargle in diseases of the mouth and throat, in mercurial stomatitis, etc. Dose, 1 to 10 grains. In toxic doses it causes disorganization of the blood (converting the hemoglobin into methemoglobin) and intense irritation of the kidneys, with hematuria and blood casts. Sir James Y. Simpson recommended it in doses of 20 grains thrice daily, in threatened abortion from fatty degeneration of the placenta. **P. Chloratis, Troch.,** each containing 2 1/2 grains of the salt. Dose, 1 to 3. **P. Citras,** $K_3C_6H_5O_7.H_2O$, is used in solution as a febrifuge, a diuretic, and to alkalinize the urine. Dose, 10 to 30 grains. **P. Citratis, Liq.,** citric acid 6, potassium bicarbonate 8; filter and add enough distilled water to make 50 parts. Dose, 1/2 to 1 ounce. **P. Citras Effervescens** consists of the citrate 20, sodium bicarbonate 47, tartaric acid 25, and citric acid 16. Dose, 1 to 2 drams in a glass of water as an effervescing drink. **P. Cyanid.,** KCN, made from potassium ferrocyanid by the action of heat, sometimes with (also without) the addition of potassium carbonate and charcoal. It is very soluble in water, has active reducing powers, and is very poisonous. It has the sedative and antispasmodic action of hydrocyanic acid, and, like it, is used in gastric irritability and cough. Dose, 1/20 grain. **P. Dichromas.** Synonym of P. Bichromas. An antiseptic and escharotic milder than chromic trioxid. Internally it has been efficient in chronic nasal, gastric, or intestinal catarrh, chronic ulcers of the mouth and pharynx, chronic bronchitis, laryngitis, rheumatism, locomotor ataxia, sometimes in diphtheria. Dose, 1/10 to 1/2 grain in trituration. Locally it is used in aqueous solution (5 grains to 1 dram to the ounce). **P. et Sodii Tartras,** $KNaC_4H_4O_6.4H_2O$, "Rochelle salt," laxative. Dose, 1 to 4 drams. **P. Ferrocyanid,** $K_4FeC_6N_6+3H_2O$, yellow prussiate of potash, prepared from blood, and by heating together animal charcoal, iron, and pearl ash. It occurs in yellow crystals, soluble in water. It has many uses in chemic analysis. **P. Hydroxidum,** KHO, potassa, "caustic potash," deliquescent and very alkaline. A powerful escharotic. **P. Hydroxidi Liquor,** an aqueous solution of about 5 percent of **P. Hydroxid.** Dose, 5 to 30 minims, well diluted with water. **P. Hypophosphis.** See Phosphorus. **P. Iodid.,** KI, used in syphilis, metallic poisoning, and as an antirheumatic. Dose, 2 to 20 grains. See Iodin. **P. Nitras,** KNO_3, saltpeter, niter, crystallizing in long white prisms. Commercially, it is prepared by double decomposition of potassium chlorid and Chili saltpeter, sodium nitrate. Dose, 5 to 20 grains, well diluted **P. Permanganas.** See Manganese. **P. Sulphas,** K_2SO_4, a hepatic stimulant and laxative; soluble in 10 parts of water at ordinary temperature. Dose, 10 to 45 grains. **Pulvis Efferves. Comp.,** compound effervescing powder, "Seidlitz powder," contains in the blue paper potassium bitartrate, 120 grains, mixed with sodium bicarbonate, 40 grains; and in the white paper, tartaric acid, 35 grains.

POTT'S DISEASE.—See Spine (Caries).

POTT'S FRACTURE.—See Ankle (Fracture).

POULTICE (Cataplasm).—Generally employed as a means of applying heat and moisture to a certain portion of the body, but is sometimes medicated with anodyne, counterirritant or disinfectant agents. An excellent method of preparing poultices is to make several bags of various sizes, of either of the fabrics known as *Swiss* and *cheese-cloth*, filling each bag half full with the linseed meal or other agent used, then sewing up the open end. When wanted for use one of these bags is submerged in boiling water for a few minutes, and on taking it out the meal is found to have swelled so as to fill the bag, which should then be squeezed to rid of superfluous water, laid on the part and covered with oiled silk and a bandage.

The ordinary filthy poultice of flaxseed, slippery elm, bread and milk, has no place among the resources of the aseptic surgeon. The common poultice is a hot-bed for bacteria, and as such, it

should be discarded. In the treatment of an ordinary furuncle with poultices, almost every surgeon must have seen occasionally the development of innumerable minute daughter-furuncles in the surface covered by the poultice. In phlegmonous inflammation of the fingers or hand, the prolonged use of the poultice is followed by maceration of the skin, extensive edema of the superficial structures, a flabby condition of the granulation—in fact all the evidences which point to the poultice as a means of favoring the extension of the infectious process (Senn).

A *sinapism* is a poultice or plaster containing mustard (sinapis), used for the purpose of counter-irritation. If applied too hot and kept on too long the skin will become inflamed and ulcerated, and extensive gangrenous sores may result.

The only poultice official in the U. S. P. is the **catapalsma kaolini,** in which glycerin is the active agent. It consists of kaolin, 577 gm.; boric acid, 45 gm.; thymol, 0.5 gm.; methyl salicylate, 2 gm.; oil of peppermint, 0.5 gm.; glycerin, 375 gm.; to make 1000 gm.

Fomentations.—Flannel may be wrung very dry out of boiling water, applied, and covered with oiled silk. Spongiopiline, a fabric composed of sponge and wool, coated with india-rubber, is an excellent vehicle for the application of warmth and moisture. The inner surface is moistened with hot water, and its utility may be increased by sprinkling the moistened surface with charcoal or yeast or by saturating it with any desired lotion or liniment.

POWDER (Pulvis).—In pharmacy one or more medicinal substances reduced to a state of very fine division. Powders are usually prepared extemporaneously, but a few compound ones have been made official, the ingredients being simply rubbed together until reduced to a fine powder and thoroughly mixed. Special directions are given in a few instances. Powders are usually mixed on a slab with a spatula, but, except in the case of explosives, a much better method is trituration in a mortar.

There are 9 official powders:

Title.	Constituents.	Properties and Dose.
Pulvis:		
Acetanilidi Compositus (Antikamnia?).	Acetanilid, 70 gm.; caffein, 10 gm.; sodium bicarb., 20 gm.	Relieves pain, 8 gr.
Aromaticus.....	P. cinnamon, 35 gm.; p. ginger, 35 gm.; p. cardamon, 15 gm.; p. nutmeg, 15 gm.	Aromatic, 15 gr.
Cretæ Compositus.	Prep. chalk, 30 gm.; acacia, 20 gm.; sugar, 50 gm.	For chalk mixture, 30 gr.
Effervescens Compositus (Seidlitz powder).	Sodium bicarb., 31gm.; Rochelle salt, 93 gm.; tartaric acid, 27 gm.; mix the sod. bicarb. and Roch. salt, and divide into 12 pts. (blue papers). Divide the t. acid into 12 pts. (white papers).	Laxative, 1 set of 2 powders.
Glycyrrhizæ Compositus (licorice powder).	P. senna, 180 gm.; p. licorice, 236 gm.; washed sulphur, 80 gm.; oil fennel, 4 gm.; sugar, 500 gm.	Laxative, 60 gr.
Ipecacuanhæ et Opii (Dover's powder).	P. ipecac, 10 gm.; p. opium, 10 gm.; sugar of milk, 80 gm. Ten grains contain a grain each of the active constituents.	Diaphoretic, 8 gr.
Jalapæ Compositus.	P. jalap, 35 gm.; potass. bitart., 65 gm.	Cathartic, 30 gr.
Morphinæ Compositus (Tully's powder).	Morph. sulph., 1.5 gm.; p. camphor, 32 gm.; p. licorice, 33 gm.; precip. calc. carb., 33.5 gm.	Diaphoretic, 8 gr.
Rhei Compositus...	P. rhubard, 25 gm.; magnesia, 65 gm.; p. ginger, 10 gm.	Laxative, antacid, 30 gr.

POX.—See Syphilis.

PREDIGESTED FOOD.—See Peptonized Food.

PREGNANCY.—The state of the female corresponding to the presence within her body of the product of conception; the period from conception to delivery. When delivery is protracted far beyond the normal time and the ovum is dead, the condition of pregnancy cannot be said to exist. The normal duration of pregnancy in woman is 280 days, or 10 lunar months of 28 days each, or 9 calendar months. Various methods have been devised to estimate the probable termination of pregnancy, one of which, Ely's table, is introduced under Confinement.

PREGNANCY, DIAGNOSIS.—The signs of pregnancy may be divided into *subjective* and *objective*.

The subjective signs are those which are appreciated by the mother. Arranged in the order of their importance, they are: (1) Cessation of menstruation; (2) nausea and vomiting; (3) change in the size and shape of the abdomen; (4) change in the genitalia and breasts; (5) quickening; and (6) change in the nervous system. These signs, taken alone, are of slight importance, but when they are considered in connection with the objective signs, they become of considerable value.

The objective signs are those which are ascertained by employing the senses of sight, touch, and hearing.

Inspection shows splotches of pigmentation on the face and dark circles under the eyes. The breasts are enlarged, the nipples are prominent, the areola is widened and darkened, a secondary areola is developed, the glands of Montgomery are enlarged, and pressure on the breast from the periphery toward the nipple will cause the appearance of a drop or two of turbid fluid—colostrum. The abdomen is symmetrically enlarged, striæ are present, the umbilicus is pigmented, and after the sixth month of gestation projects from the surface of the abdomen, and fetal movements can be seen. The mucous membrane of the vulva and vagina is dark purple in color.

Palpation ascertains the size and shape of the uterus; the intermittent uterine contractions; and

in advanced cases the position of the fetal back, head, and extremities. Vaginal examination shows softening of the cervix and lower uterine segment; change in the shape, size, and consistency of the uterus; and ballottement. See BALLOTTEMENT.

Auscultation reveals the fetal heart-sounds, the uterine souffle, and at times the funic souffle.

For convenience of clinical diagnosis it is best to divide the signs of pregnancy into three groups:

1. Those manifesting themselves during the *first three months* are: Cessation of menstruation, nausea and vomiting, enlargement of the breasts, soft cervix and lower uterine segment, and change in the size, shape, and consistency of the uterus.

2. During the *second three months* there are, in addition to the foregoing, intermittent uterine contractions, ballottement, fetal movements and heart-sounds, and purple discoloration of the vaginal mucous membrane.

3. During the *last three months*, in addition it is possible to ascertain the position of the back, head, and extremities, and to determine the presenting part.

Of these signs, ballottement, fetal heart-sounds, and fetal movements are considered absolutely diagnostic.

PREGNANCY, DISEASES.—These are considered under their appropriate headings. See AMNION, CHORION, ECLAMPSIA, COLON BACILLUS INFECTION, NEPHRITIS OF PREGNANCY, etc.

PREGNANCY, DURATION.—See CONFINEMENT.

PREGNANCY, EXTRAUTERINE OR ECTOPIC.—See EXTRAUTERINE PREGNANCY.

PREGNANCY, FALSE.—See PSEUDOCYESIS.

PREGNANCY, MULTIPLE.—Two or more fecundated ova or fetuses occupying the uterus at the same time. Twin births occur once in about 100 cases, triplets occur once in about 8000, and quadruplets once in about 400,000 cases. Twin pregnancy occurs when 2 ova are fecundated at or near the same time; or two fetuses may develop from a single ovum. If the twins are developed from 2 ova, each twin has its own amnion, chorion, and placenta; if from 1 ovum, there is but one chorion and placenta.

The diagnosis of multiple pregnancy is difficult, and is usually not made until birth. Irregularity in the shape and excessive size of the abdomen would be suggestive. Edema of the lower part of the abdominal wall and lower extremities is a common sign, while the presence of an abnormal number of extremities would be almost diagnostic. The only positive signs are: The existence of 2 fetal heart-sounds, of different rates, heard with greatest intensity at different points on the abdomen; and the palpation of two heads, two breeches, or multiple extremities.

The prognosis for both mother and child is somewhat graver than in single pregnancy. The dangers to the mother are albuminuria and eclampsia, postpartum hemorrhage, and a long, tedious, and complicated labor. The children are likely to be ill developed from lack of room; monsters, from anastomoses between fetal and placental vessels, frequently occur, and usually there are serious complications at birth.

The treatment of labor in multiple pregnancy is the same as in ordinary pregnancy until the first child is born. After this has occurred the cord should be ligated and the position and presentation of the second child determined. If this is faulty, as it frequently is on account of the roominess of the uterus, it should be corrected immediately, and a dram of the fluidextract of ergot administered. The second child is usually born within an hour after the first; a longer delay than this demands some artificial interference.

PREGNANCY, PERNICIOUS VOMITING.—The variety of vomiting occasionally seen in pregnancy that becomes so excessive as to threaten the patient's life.

Causes.—The causes of pernicious vomiting are extremely varied. The most common are: (1) Reflex disturbance, caused by the rapid growth and distention of the uterus, with irritation of its contained nerve endings; (2) some pathologic condition of the uterus or its adnexa, such as endometritis or inflammation of the tubes and ovaries; (3) some pathologic condition of the gastrointestinal tract, such as gastritis or gastric ulcer; (4) excessive sexual intercourse; (5) kidney insufficiency.

Symptoms.—The ordinary physiologic vomiting of pregnancy becomes exaggerated until the patient vomits almost continuously. Anything taken into the stomach is immediately vomited, and with it bile-stained mucus. Blood is not infrequently mixed with the vomited material. The mere sight or thought of food is enough to provoke an attack of vomiting. There is intense thirst; the patient becomes extremely weak and emaciated; the temperature is usually subnormal; the respirations are rapid; the pulse becomes rapid and feeble; coma supervenes, and death occurs from profound exhaustion.

Diagnosis.—The diagnosis of the condition is easy, while that of the cause of the condition is difficult. From the fact that it occurs early in pregnancy, usually from the second to the fourth month, the existence of pregnancy may be overlooked. Should the vomiting occur late in pregnancy, kidney disturbance should be suspected.

Prognosis.—The prognosis is grave. In general practice the mortality ranges from 25 to 50 percent.

Treatment.—The patient should be confined to bed in a quiet, darkened room. The bowels should be kept freely open, and a suitable diet given. This should consist of easily digestible foods, such as milk, broths, eggs, and the like. Sexual intercourse must be prohibited. Should any local exciting cause be found, it should, if possible, be removed. Thus, a displaced uterus should be replaced; erosion of the cervix or inflammation of the cervical canal should be treated by the application of a solution of silver nitrate (20 grains to the ounce); inflammation of the tubes and ovaries may be treated by the careful use of tampons and douches. Drugs that allay nervousness are sometimes beneficial; grain doses of the aqueous extract of opium by suppository, or 10-grain doses of sodium bromid in a dessertspoonful of camphor

water may be given 3 or 4 times daily. Other drugs that have been found useful at times are: Cocain (1/4 of a grain), silver nitrate (1/4 of a grain), oxalate of cerium (10 grains), hydrobromid of hyoscin (1/120 of a grain), antipyrin (8 grains), tincture of aconite (6 minims), tincture of iodin (2 minims), tincture of nux vomica (10 minims), and creosote (1 minim).

If the patient cannot retain any food by the mouth, all efforts in this direction should cease and she should be fed by the rectum. If this is properly done, life may be sustained for days or even weeks. The following rules should be observed in rectal alimentation: (1) The enema must consist of predigested food. A very good one is the following: Three ounces of peptonized milk, 2 ounces of liquid peptonoids, 1/2 of an ounce of whisky, and 15 drops of tincture of opium. (2) The enema should not exceed 6 ounces in quantity. (3) It should be given regularly at intervals of 4 or 5 hours. (4) It should be preceded by irrigation of the lower bowel with a normal salt solution.

If the patient fails to improve under this course of treatment, the induction of abortion is indicated. This final step in the treatment of pernicious vomiting must not be delayed too long or the exhaustion will become so great that it will fail. If vomiting continues after 6 or 8 days of rectal feeding; if her temperature rises or remains subnormal; if her pulse becomes rapid and weak; if, in short, she presents the picture of pronounced exhaustion, abortion should be induced immediately in the manner already described. Dilatation of the cervical canal and internal os with the finger has been tried with benefit in a certain proportion of cases. It should be given a trial just previous to the induction of abortion.

PREMATURE LABOR.—See Labor (Premature).

PRESBYOPIA (Old-age Sight).—A condition of the eye in which the power of accommodation is either partially or wholly lost by age. Properly speaking, presbyopia implies diminution of the accommodative power in adults past middle life to such an extent as to interfere with near vision. Presbyopia usually occurs between 40 and 50 years of age. As a hyperopic eye is obliged to exert a portion of its power of accommodation to overcome its refractive error, it necessarily has less accommodative power in reserve, and consequently becomes presbyopic sooner than an emmetropic or myopic eye. An uncorrected myope may never exhibit the signs of presbyopia, as he can read at his far-point, but if he wears a distant correction, he will have the same need for a reading glass about the presbyopic age as the enmetrope or hyperope. See Ametropia.

Cause.—The direct cause of presbyopia is the diminishing elasticity of the lens, simultaneously with the solidification and sclerosing conditions which take place elsewhere in the body with advancing age. As a consequence of the changes in the lens-structure, it gradually loses its power to become convex, and hence to refract diverging rays from a near-point so that they will meet directly on the retina and give a clear image. This diminution in the refractive power of the lens is physiologic, and when it has advanced to such a point that rays at the average reading distance—about 13 inches—are no longer refracted exactly on the retina, presbyopia is said to have commenced.

Notwithstanding the fact that each patient should be studied individually, and no arbitrary rules can be constructed by which we can estimate the relative range of accommodation to age, for convenience it is desirable to have the following tables in the mind in refracting presbyopes:

Age in Years.	Accommodation in Diopters.	Age in Years.	Accommodation in Diopters.
10,	14	45	3.5
15,	12	50	2.5
20,	10	55,	1.75
25,	8.5	60,	1
30,	7	65,	0.75
35,	5.5	70,	0.25
40,	4.5	75,	0.

	Additional Glass Required to Produce a Comfortable Working Point.
45,	+1 D.
50,	+1.75 D.
55,	+2.50 D.
60,	+3 D.
65, or over,	+3.50 D.

Symptoms.—The chief symptom of recession of the near-point beyond the ordinary working distance is dimness of vision for near-work, the patient particularly complaining of inability to read, write, or sew, without holding the work at an uncomfortably increased distance. The ordinary symptoms of accommodative asthenopia are very often present, and it is quite likely that the headaches, dyspepsia, and neurotic conditions in women about 45 years of age, so often attributed to the menopause, are really directly due to eye-strain. The gradual progress of presbyopia, together with the attempt of nature to remedy the defect by narrowing the pupil, somewhat delays the marked symptoms, and, unfortunately, most presbyopes unconsciously undergo considerable eye-strain before seeking the oculist.

Diagnosis rests on the age of the person, the history of failing near vision, the recession of the near-point as tested with the Jaeger types, and the acceptance of a convex lens at close range. A loss of accommodation disproportionate with the age is indicative of ciliary palsy or insufficiency.

Treatment.—In every case it is necessary to detect and properly correct the hyperopia, myopia, or astigmatism that may exist; and for this purpose, in strong, vigorous persons under 50 the administration of a mydriatic is necessary. Following the ordinary method of prescribing lenses for distance in the kind and degree of ametropia detected, we correct the presbyopia by adding to the distant correction a convex spheric lens that gives the best vision at an ordinary working distance. If allowed to choose the glass and distance, the presbyope will usually select a strong glass at a close reading point, and thus lead the

examiner into error. Always try the test-lenses with the reading card at least 13 inches from the eye. Again, it must be constantly borne in mind that the patient's occupation is an important factor to be considered in prescribing presbyopic glasses; the engraver needs stronger glasses than the seamstress, and, conversely, persons working at a comparatively long distance, such as musicians, artists, ministers in the pulpit, etc., need weaker glasses in the pursuit of their occupations than they do for ordinary reading.

PRESCRIPTION-WRITING.—Although prescriptions in good English are preferable to those written in incorrect or badly abbreviated Latin, the classic formulas of prescription-writing, taken from Potter, are given below:

A prescription should begin with the name of the person for whom it is designed, and the date on which it is written. Then follows the Latin word *Recipe*, usually abbreviated to the sign ℞, and signifying "Take," or "Take thou;" next the names and quantities of the ingredients to be used, which are also expressed in Latin; then the directions to the compounder, followed by the directions to the patient, the last being now usually expressed in English; and, finally, the signature and address of the prescriber.

A prescription then has four component parts —viz.:

Superscription—consisting of the name of the party for whom it is designed, the date, and the sign ℞, signifying "Take thou."

Inscription—the body of the prescription, consisting of one or more of the following subdivisions —viz.:

Basis—or chief active ingredient.

Adjuvant—to assist the action of the basis.

Corrective—to correct some injurious quality of the other ingredients.

Vehicle or excipient—giving the prescription a suitable form.

Subscription—the directions for the compounder, usually expressed in contracted Latin.

Signature—the instructions for the guidance of the one administering the medicine, in English, followed by the signature of the prescriber.

A prescription may, however, contain the base alone, or the base with the adjuvant, or the base with a simple vehicle or diluent. A single ingredient may serve a double or treble office, as the syrupus rhei aromaticus with quinin, in which case the syrup serves as an adjuvant to increase the action of the quinin, as an excipient to cover the taste, and as a vehicle to facilitate the administration of the dose directed. Again, the basis may need no aid in doing its work, and may require no corrective of its action, nor any special vehicle. On the other hand, there is no limit to the number of ingredients which may be used, provided that the prescriber has a clear idea of something to be accomplished by each one, and also provided that there is no chemic or medical incompatibility between them. The tendency of the present age is toward monopharmacy, rather than polypharmacy. However, proper combinations of medicines will often produce effects for the patient's good which could not be obtained from the use of any one remedy.

Procedure in Writing a Prescription.—In writing an extemporaneous prescription, the first step is to write the patient's name and address, the date, and the sign ℞. The physician's registration number is also necessary if the prescription contains opium or cocain, or any salt or derivative of opium or cocain. (See HARRISON LAW). Then the title of each ingredient should be written in Latin and in the genitive case, except that when a certain number only of an ingredient is ordered, the name of the ingredient should be in the accusative case: for example, *Vitellum unum*, "one yolk of egg." Next, the quantity of each ingredient sufficient for one dose should be mentally determined and multiplied by the number of doses which the mixture is to contain, and the result set down in signs and Roman numerals. The directions to the pharmacist and patient being added, and the prescriber's name or initials affixed, the prescription is completed; but when very active agents are used, it is a good plan to go over the calculations a second time before letting it leave the hands of the person most responsible for its action. For pills or powders the same process should be employed, slightly varied according to the requirements of each case. Frequently, the ingredients and quantities for but one pill, powder, or suppository are named, with instructions to make a certain number after the formula. When an unusually large dose of any poisonous drug is prescribed, it is customary to underline the quantity.

An example will perhaps make the foregoing more comprehensible, and at the same time serve to indicate the style of Latin writing formerly employed. The following formula is that ordered in the U. S. P. for the preparation known as Black draft, but officially styled the compound infusion of senna, approximate weights and measures being substituted for the pharmacopeial metric weights:

For Mrs. John Black. *January* 1, 1911. *Recipe*, Take,—		Superscription.
(Basis.)	*Sennæ, semiunciam,* Of senna, half an ounce. *Magnesii sulphatis,* Of magnesium sulphate.	Inscription.
(Adjuvant.)	*Mannæ, ana unciam unam,* Of manna, of each an ounce.	
(Corrective.)	*Fœniculi, drachmam,* Of fennel, 1 dram.	
(Vehicle.)	*Aquæ bullientis, fluiduncias octo,* Of boiling water, 8 fluidounces.	
Macera per horam in vase clauso, deinde cola. Macerate for an hour in a closed vessel, then strain.		Subscription.
Signetur, Let it be entitled—*A wineglassful every 4 hours until it operates.* *Charles White, M. D.*		Signature.

The above prescription abbreviated would read.

For Mrs. John Black. *January* 1, 1911.

℞. Sennæ, ℥ ss
Magnesii sulphat.,
Mannæ, āā ℥ j
Fœniculi, ℥ j
Aquæ bull., ℥ viij.

Mac. per hor. in vase clauso, deinde cola.

Sig.—A wineglassful every 4 hours, until it operates. *C. White, M. D.*

TABLE OF PRESCRIPTION DOSES AND QUANTITIES (Potter)

Grains in Entire Mixture.	Grains in Each ℥ Dose in a Mixture of								Grains in Entire Mixture.	Grains in Each ℥ Dose in a Mixture of							
	℥j	℥ij	℥iij	℥iv	℥vj	℥viij	℥xij	℥xvj		℥j	℥ij	℥iij	℥iv	℥vj	℥viij	℥xij	℥xvj
1/10	1/960	1/480	2 1/40	3 1/20					XXXJ	3 3/8	1 13/16	1 7/8	1 7/8	7/11	9/17	9/16	1/4
1/8	1/64	1/28	1/92	2 1/56	3 1/4				XXXIJ	4	2	1 1/8	1	3/8	1/2	1/3	1/4
1/6	1/48	1/96	1/44	1/32	2 1/8	2 1/84			XXXIIJ	4 1/8	2 1/18	1 3/8	1 1/18	11/16	1/2	1/3	3/11
1/4	1/32	1/64	1/96	1/28	1/12	2/56			XXXIV	4 1/4	2 1/8	1 5/8	1 1/16	7/10	6/11	4/11	3/11
1/3	1/24	1/48	1/72	1/96	1 1/14	1 1/92	2/88		XXXV	4 3/8	2 3/16	1 4/9	1 1/11	5/7	5/6	4/11	2/7
1/2	1/16	1/32	1/48	1/64	1/96	1/28	1/92		XXXVJ	4 1/2	2 1/4	1 1/2	1 1/8	1/2	9/16	3/8	2/7
2/3	1/12	1/24	1/36	1/48	1/72	1/96	1 1/44	1/92	XXXVIIJ	4 3/4	2 3/8	1 4/7	1 3/16	4/5	3/5	2/5	3/10
3/4	1/11	1/22	1/32	1/43	1/64	1/96	1/28	1/72	XXXIX	4 7/8	2 7/16	1 5/8	1 3/8	9/11	3/5	2/5	5/16
I	1/8	1/16	2 1/4	1/32	1/48	1/64	1/96	1/128	XL	5	2 1/2	1 3/4	1 1/2	5/8	3/4	1/2	5/16
ISS	2/11	1/11	1/16	2 1/22	3/32	1/43	3/64	4/86	XLJ	5 1/8	2 5/16	1 7/10	1 3/7	9/7	7/11	3/7	1/3
IJ	1/4	1/8	1 1/2	1/16	2 1/4	3/32	1/48	3/64	XLIJ	5 1/4	2 1/8	1 3/4	1 5/16	1/8	3/8	6/16	1/6
IISS	1/3	1/6	1/9	1 1/12	2/9	2 1/4	1/40	1/48	XLIIJ	5 3/8	2 11/16	1 4/5	1 1/8	8/9	3/8	1/8	1/3
IIJ	3/8	1/8	1/8	1 1/11	1/16	2/9	1/32	1/40	XLIV	5 1/2	2 3/4	1 6/7	1 1/8	11/12	11/16	7/11	6/11
IIISS	3/7	2/9	1/7	1/9	1 1/14	1 1/8	2/88	3/86	XLV	5 5/8	2 1/8	1 2/7	1 1/8	13/14	7/16	7/15	6/14
IV	1/2	1/4	1/8	1/8	1 1/12	1/16	2/44	3/32	XLVIJ	5 3/4	2 9/10	1 9/10	1 1/11	1 7/8	9/7	9/19	4/11
IVSS	1/7	2/7	2/11	1/7	1/11	1/14	1/22	2/88	XLIX	6 1/8	3	2	1 1/2	1	7/6	1/2	3/8
V	5/8	5/16	1/5	1/8	1/10	1/12	2/20	3/24	L	6 1/4	3 1/8	2	1 5/8	1	4/5	1/2	3/8
VJ	3/4	3/8	3/4	1/8	1/8	1/10	1/16	2/20	LIJ	6 1/2	3 1/4	2 1/8	1 3/8	1 1/12	5/6	5/8	2/5
VIJ	7/8	3/7	2/7	2/8	1/7	1/9	1/14	1/18	LIV	6 3/4	3 3/8	2 1/4	1 7/10	1 1/8	9/7	9/7	3/7
VIIJ	1	1/2	1/3	1/4	1/8	1/8	1/12	1/16	LVJ	7	3 1/2	2 1/3	1 1/4	1 1/8	5/8	7/12	4/9
IX	1 1/8	4/7	3/8	2/7	2/11	1/7	1/11	1/14	LVIIJ	7 1/4	3 5/8	2 2/5	1 5/8	1 1/8	10/11	5/8	8/13
X	1 1/4	5/8	2/5	3/10	1/5	1/8	1/10	1/12	LX(℥J)	7 1/2	3 3/4	2 1/2	1 7/8	1 1/4	14/16	5/8	7/15
XJ	1 3/8	11/16	4/6	1 1/11	2/9	2/11	1/8	1/11	℥ISS	11 1/4	5 5/8	3 3/4	2 2/11	1 7/8	1 3/8	1 5/8	7/10
XIJ	1 1/2	3/4	1/2	3/8	1/4	1/8	1/8	1/10	℥IJ	15	7 1/2	5	3 3/4	2 1/2	1 7/8	1 1/4	1 5/8
XIIJ	1 5/8	4/5	2/11	2/8	3/11	1/8	1/8	1/10	℥IJSS	18 3/4	9 3/8	6 1/4	4 2/13	3 1/8	2 1/3	1 5/8	1 1/8
XIV	1 3/4	7/8	4/7	3/7	2/7	2/8	1/7	1/8	℥IIJ	22 1/2	11 1/4	7 1/2	5 5/8	3 3/4	2 4/5	1 7/8	1 2/5
XV	1 7/8	1 5/16	5/8	2/11	5/16	2/8	1/7	1/8	℥IIJSS	26 1/4	13 1/8	8 3/4	6 2/5	4 3/8	3 2/7	2 1/8	1 5/8
XVJ	2	1	3/4	1/2	1/3	1/4	1/8	1/8	℥IV	30	15	10	7 1/2	5	3 3/4	2 1/2	1 1/4
XVIJ	2 1/8	1 1/16	7/8	1 1/11	1 1/11	3/11	1/8	1/8	℥V	27 1/2	18 3/4	12 1/2	9 3/8	6 1/4	4 4/5	3 1/8	2 1/4
XVIIJ	2 1/4	1 1/8	1/4	1 6/16	3/8	2/7	3/16	1/7	℥VJ	45	22 1/2	15	11 1/4	7 1/2	5 5/8	3 3/4	2 5/8
XIX	2 3/8	1 3/16	1/5	3/8	2/5	3/10	1/8	1/7	℥VIJ	52 1/2	26 1/4	17 1/2	13 1/8	8 3/4	6 5/8	4 3/8	3 2/7
XX	2 1/2	1 1/4	5/8	5/8	1/2	1/16	1/8	1/8	℥VIIJ (℥J)	60	30	20	15	10	7 1/2	5	3 1/4
XXJ	2 5/8	1 5/16	9/7	2/8	3/7	1/8	1/8	1/8	℥VIIISS	63 3/4	31 1/8	21 1/4	16	10 5/8	8	5 1/4	4
XXIJ	2 3/4	1 3/8	11/12	11/16	4/6	1/8	2/8	1/8	℥IX	67 1/2	33 3/4	22 1/2	16 7/8	11 1/4	8 7/16	5 3/8	4 2/3
XXIV	3	1 1/2	1	3/4	1/2	3/8	1/4	1/8	℥X	75	37 1/2	25	18 3/4	12 1/2	9 3/8	6 1/4	4 11/16
XXVJ	3 1/4	1 5/8	1 1/12	9/11	6/11	2/8	3/11	1/8	℥XJ	82 1/2	41 1/4	27 1/2	20 5/8	13 3/4	10 3/16	6 7/8	5 1/2
XXVIIJ	3 1/2	1 3/4	1 1/8	7/8	4/7	3/7	3/7	2/8	℥XI (℥ISS)	90	45	30	22 1/2	15	11 1/4	7 1/2	5 5/8
XXIX	3 5/8	1 9/11	1 1/8	1/12	3/8	4/9	3/10	2/9	℥XIV	105	52 1/2	35	26 1/4	17 1/2	13 1/8	8 3/4	6 4/7
XXX(℥SS)	3 3/4	1 7/8	1 1/4	15/16	5/8	5/11	5/16	1/4	℥XVJ (℥IJ)	120	60	40	30	20	15	10	7 1/2

Explanation.—*In writing a prescription* look for the dose of the ingredient (say 1/20 grain) in the column headed by the size of your mixture (6 ounces); then on that line, in the left marginal column, is the quantity (2 1/2 grains) you must put into the entire mixture to get your dose in each dram thereof. *In reading a prescription* find the quantity of any ingredient called for in the left marginal column (say 3/4 grain), and on the same line, in the column headed by the number of ounces in the mixture (3 ounces), you will find the quantity (1/32 grain) in each dram dose. Of course, when the dose is more or less than 1 dram, the result must be proportionately multiplied or divided accordingly.

As the result of the above is nearly identical with the official preparation, we might write the same prescription more simply, as follows:

℞. Infusi Sennæ Compos., ℥ viij.

with the proper superscription and signature; this being the manner of prescribing the official preparations.

A rule for writing a prescription in metric terms by one who is not practised in the use of the system is the following, by Potter:

Write as though prescribing but one dose of each ingredient in grains or minims and decimals thereof; then substitute the term "grams" or "cubic centimeters" for grains or minims, and the prescription is correct for 15 doses in metric terms.

Of course, when writing for a mixture or solution, the proper quantity of vehicle must be added to complete the one dose, and must also be expressed first in grains or minims. For example:

	One Dose.	15 Doses Metric.
℞. Quininæ sulphatis,	gr. j,	1
Strychninæ sulphatis,	gr. $\frac{1}{64}$ or 0.016,	016
Fluidextr. glycyrrhizæ,	♏ iv,	4
Syrupi,	♏ lx,	60

This gives a two-ounce mixture approximately, of which the dose would be a teaspoonful.

	One Dose.	15 Doses Metric.
℞. Quininæ sulphatis,	gr. j,	1
Massæ ferri carb.,	gr. ij,	2
Extr. nucis vomicæ,	gr. $\frac{1}{4}$ or 0.25,	25

Ft. pil. no. xv.

Sig.—One pill thrice daily after meals.

See Dosage; Latin (Medical); Incompatibility.

PRESENTATIONS, FETAL.—See Fetus (Position and Presentation).

PRESSURE.—Pressure is a less ambiguous term than compress or compression. Illustrations of the mechanic uses of pressure are: Coaptation of divided parts, crushing and dispersion of a ganglion on the wrist, truss retention of hernia, dilatation of strictures by bougies, and injections of air or oil by the rectum in cases of intussusception. The therapeutic uses of pressure, in combination with immobility and rest, antiseptics, and styptics are hemostatic, antispasmodic, and antiphlogistic in nature. In arresting hemorrhage, by most methods, in preventing and in treating acute inflammation when from a bruise or injury to a joint, gentle, equable, and elastic pressure conduces powerfully to the balance of innervation and circulation. In chronic inflammation pressure is a powerful agent. The patient's comfort is the usual measure of the degree of pressure in each case. When pressure causes pain, it must at once be lessened. Well-adjusted and elastic pressure is of service in the treatment of simple flesh wounds, complicated fractures, ingrowing toe-nail, in burns, bubo, carbuncle, whitlow, and arthritis. Bandaging is the most usual form of applying pressure, with or without padding, while elastic bandages, india-rubber strapping, air-cushions and water-cushions, and bags filled with sand or shot are other means. Digital pressure may sometimes be useful in compressing an artery. Successive layers of collodion make considerable pressure.

PRESSURE SYMPTOMS.—1. Nervous symptoms due to pressure upon the brain or spinal cord. In general if the pressure is light, the symptoms are those of irritation of the area pressed upon, manifesting themselves as spasmodic movements, tonicity of the muscles, pain, hyperesthesia, etc.; if the pressure is great, there results paralysis—motor or sensory or both—of the parts innervated by the areas pressed upon. See Brain, Spinal Cord. 2. The symptoms produced by an aneurysm or a tumor, as of the pelvis, adjacent organs being impinged upon.

PRIAPISM.—See Penis, Spine (Injuries).

PRICKLY HEAT.—See Sweat Glands.

PRISMS.—See Eye-muscles.

PROCTITIS.—See Rectum (Inflammation).

PROCTOCLYSIS.—Continuous rectal irrigation, popularized by Murphy, has proved of inestimable value in the treatment of peritonitis, hemorrhage, and shock. It is also recommended in typhoid, scarlatina, eclampsia, and the first stage of pneumonia. The nozzle of the apparatus is bent in order that it may be inserted without pressure against the posterior rectal wall as the patient sits up in bed. An adhesive strip fastens the tube to the thigh. The tube may remain in position several days. Murphy introduces a pint and a half of the solution (1 dram each of sodium chlorid and calcium chlorid to the pint of water) into the rectum in about an hour, then after an interval of an hour, a similar quantity is introduced. A modified form of irrigator has an electric heater attached to the douche so that the water entering the rectum can be kept at a constant temperature of 100° F. Saline solution may be administered by the drop method by means of a special instrument, containing a glass sight tube and a hard rubber regulator, designed to eliminate the disadvantages of the continuous flow method (back flow of fluid, regurgitation of feces, difficult retention of fluid in some cases). Through this contrivance, too, gases can readily escape. The Elbrecht apparatus, recommended by Dr. Murphy as fulfilling all indications, is adapted for either the continuous or the drop method. See Peritonitis.

PROFESSIONAL NEUROSIS.—A neurosis caused by continuous exercise of one set of muscles. See Occupation Neuroses.

PROGRESSIVE MUSCULAR ATROPHY.—Chronic anterior poliomyelitis in which the large ganglion cells of the anterior horns, the motor and trophic cells of the muscles, are gradually destroyed. See Muscles (Atrophy).

PROLAPSE.—See Anus, Ovary, Rectum, Umbilical Cord, Uterus, etc.

PROSTATE GLAND, HYPERTROPHY.—The term hypertrophy of the prostate is applied to that form of enlargement of the gland which takes place after middle life, rarely before the fiftieth year, and more frequently after the age of 60, developing

slowly and without inflammatory symptoms. The enlargement may be general, affecting the entire organ equally, or it may take the form of a circumscribed growth involving only one portion of the gland. Thus, the so-called middle lobe alone may be involved. Overgrowth in this situation may take the form of a pedunculated tumor or of a sessile hypertrophy. In other cases there is a hyperplasia of the lateral lobes without any involvement whatever of the median portion. Sometimes one lateral mass is much more affected than the other.

In one form of this affection there is a marked overgrowth in a transverse direction, just at the vesical orifice, which gives rise to an upward projection that offers a great impediment to the emptying of the bladder. To this particular condition the term "collar" has been applied. There are two distinct types of prostatic hypertrophy. In one the overgrowth affects chiefly or entirely the glandular elements, forming a tumor of the type of the adenomata. In the other form the increase affects the stroma, which results in the formation of a fibroma-like tumor. Between these two types there is every gradation of simultaneous involvement of both gland and stroma.

Etiology.—The etiology of this form of prostatic enlargement has not been definitely determined. Many theories have been advanced, but, so far, none of them is susceptible of complete demonstration. Thus Launois advanced the hypothesis that the condition is merely a part of a universal arteriosclerosis, or local sclerosis affecting the urinary organs, and Ciechanowski endeavored to prove that it is the terminal result of chronic gonorrheal inflammation. Neither of these theories, however, has been generally accepted, and in fact good evidence has been adduced to show that they are wrong. Other supposed causes such as chronic constipation, sexual excesses, gout, rheumatism, the abuse of alcohol, etc., are so fanciful as to require no consideration whatever.

Symptoms.—The symptoms of enlargement of the prostate are not referred to the organ itself, but to the function of urination. In a certain percentage of cases with a moderate degree of hypertrophy there will be no symptoms to direct the patient's attention to the presence of this condition. As the overgrowth is of slow and gradual formation, so the symptoms are usually so insidious that the patient does not notice the change until the condition is well advanced. Usually, the earliest symptom is an increase in the frequency of urination. The difference in the beginning is very slight, but as the condition goes from bad to worse, the patient may be called upon to empty the bladder as often as every hour, half-hour, or even 15 minutes. In some cases this increased frequency is more particularly noted during the hours of sleep. There is also more or less hesitation in the beginning of micturition and absence of the usual force, which results in the loss of the usual parabolic curve, and, finally, an incomplete stoppage. Pain is a marked symptom in some instances, and is absent in others. It is particularly marked in the cases complicated with acute inflammation of the bladder. Some forms of prostatic hypertrophy obstruct the outflow of urine to a marked degree, while others seem to offer no obstacle to this function. In the former class the patient is unable entirely to empty the bladder. The urine that remains after the patient passes as much as possible is termed "residual." In some instances the patient is unable to void any urine voluntarily; in other cases it collects until the bladder is filled to its utmost capacity, after which there is an involuntary "dribbling," which flows as fast as the secretion is discharged from the kidneys. If cystitis is superadded, the urine will contain pus and mucus proportionate in amount to the grade of the inflammation, and blood will very frequently be present also. In a few cases the very first symptom will be absolute retention, which is the result of cold or some other condition, producing an acute congestion of a gland already the seat of a marked hypertrophy.

Diagnosis.—The diagnosis of hypertrophy of the prostate is usually to be made by digital palpation through the rectum. This examination reveals enlargement of the lateral lobes only, but will not always detect with certainty an overgrowth of the median portion. It is necessary, however, to exclude other sources of obstruction and other disturbances of the function of urination. Among the conditions from which prostatic enlargement is to be distinguished are: Stricture of the urethra, atony and paralysis of the bladder, tumor of the bladder, calculus, and cystitis. Stricture of the urethra will be detected readily by the usual examination for this condition. Atony of the bladder results from prolonged overdistention or from profound depression of the general health. Paralysis of the bladder would be accompanied by other evidences of degenerative changes in the spinal cord. Tumors of the bladder and tuberculosis are more difficult to distinguish from hypertrophy of the prostate. A careful study of the history and the symptoms is necessary, and, finally, the usual examination for the latter condition will generally enable one to determine its presence or absence. Vesical calculus will be detected by careful examination with the proper instrument. It should not be forgotten, however, that vesical calculus and prostatic hypertrophy frequently coexist, the latter condition predisposing to the formation of stone. The differentiation from simple cystitis must be made again by excluding enlargement of the prostate.

The positive evidence of prostatic enlargement is determined, as already indicated, by digital examination through the rectum, and, in addition, by careful instrumental examination of the urethra. In making the latter examination the following points should be noted: (1) The distance the catheter passes before urine begins to flow; (2) whether the point of the catheter deviates to either side or is otherwise obstructed as it reaches the prostatic portion of the urethra; and (3) whether it is necessary to depress the shaft more than usual between the thighs before the point of the instrument enters the bladder.

This exploration is in most instances best made

with a full-sized metal catheter (24 to 28 of the French scale) that has been properly sterilized and lubricated. It is also necessary to pass a catheter immediately after the patient has voided as much urine as possible voluntarily, in order to determine whether there is any residual urine. If the catheter passes freely and if urine is withdrawn when the instrument has been passed 7 1/2 inches, it is to be presumed that marked enlargement does not exist. If it is necessary to introduce a catheter 8 or 9 inches, or even further, before urine flows, and if, in addition, it is necessary to depress the shaft forcibly, prostatic enlargement is probably present. In certain cases it will be found impossible to introduce the ordinary form of metal catheter. In these cases it will be necessary to employ the metal "prostatic" catheter, which has a larger curve and a longer shaft than the ordinary instrument. In other instances, on account of the irregular overgrowth and consequent tortuosity of the urethra, some of the forms of flexible catheters must be employed. The information obtained by the foregoing examination will be confirmed or disproved by digital examination through the rectum. In making this examination the patient should lie in the dorsal position. The middle finger is the most suitable for this exploration. The physician should, of course, be familiar with the size of a normal prostate—which is usually described as being about that of the common horse-chestnut —in order to detect the presence of any enlargement. It is well, at the same time, to determine as far as possible the character of the growth, whether uniform or affecting principally one lateral lobe; and also whether it is hard or soft, hardness indicating fibrous overgrowth and softness glandular hypertrophy. Every grade of hypertrophy exists, from a degree scarcely to be detected, to the size of an orange or even larger. A gland that is twice the normal size must be considered the seat of distinct enlargement. It is to be remembered that the degree of obstruction and the urgency of the other symptoms do not depend entirely upon the extent of the enlargement.

The cystoscope, if skilfully used, will impart much information concerning the condition of the prostate. The projection of the enlarged gland into the bladder can be plainly seen, as can also the narrow channel formed by the convergence of the right and left lobes toward the median line; in lesser degrees of hypertrophy the irregular margin of the sphincter is shown. The so-called third lobe may also be distinctly seen, jutting out into the bladder. In addition the state of the bladder may be ascertained.

Treatment.—The treatment of these cases is to be determined by the symptoms and not by the degree of the enlargement of the prostate. As in the treatment of every other condition, no rules can be given that will be of universal applicability. Particular indications must always receive due consideration. Casper has truly stated that great knowledge and much patience is required of the surgeon who assumes the responsibility of treating prostatic cases. Attention to hygiene is of great importance. The diet should be plain but nutritious, a moderate amount of exercise taken, the bowels kept regular, and everything known to predispose to congestion and engorgement of the prostate avoided. Consequently exposure to cold and dampness must be guarded against as it often precipitates an attack of acute retention. Many prostatics get along excellently by following this regimen of living. If in course of time occasional attacks of pain, strangury and difficulty in urinating occur, relief will often be afforded by rest in bed, the use of hot applications to the hypogastrium, together with hot sitz-baths and the internal administration of anodynes and urinary antiseptics. In these attacks of incomplete retention recourse to the catheter is frequently necessary, but there are cases, as already stated, in which the trouble subsides promptly under the treatment above indicated.

In cases of complete retention regular catheterization must of course be practised. Great care is necessary in this procedure, which must be carried out under the strictest aseptic precautions, with the greatest gentleness, and by means of properly selected instruments. As a rule soft catheters should be used, and of these the French silk-web ones are an excellent type. The preliminary injection of a weak cocain and adrenalin solution, followed by an injection of warm sterilized olive oil or 20 percent gomenol oil, just before the catheter is inserted into the urethra, will facilitate the passage of the instrument and also lessen the pain incident to the procedure. In exceptional cases other instruments such as Mercier's, Guyon's, Brodie's, or an ordinary English catheter bent to a certain curve, will render good service, but it is advisable that they be used only by one who is well skilled in the manipulation of urethral instruments, lest a false passage be made. After the urine is withdrawn the bladder may be washed out with hot normal salt solution. A saturated solution of boric acid or weak permanganate solution, for instance 1 : 8,000. In cases in which there is an associated purulent cystitis, nitrate of silver solution is of value.

For those patients who are more or less dependent upon the catheter, the internal administration of such drugs as urotropin, arbutin, salol, opium and hyoscyamus or belladonna will prove helpful if they are selected in accordance with the indications present in the individual case. They are especially valuable during temporary retention in the comparatively early cases as they render the urine aseptic and relieve irritability and pain. Permanent catheterization is of decided value in certain cases, but no fixed rules can be laid down with regard to its employment. When the passage of an instrument is very painful to a patient suffering with prolonged complete retention, the permanent catheter may be tried. If it produces so much irritation that the patient cannot be made comfortable with a moderate amount of opium, it is well to discontinue its use. Patients vary greatly with reference to their toleration of this

instrument, and each case must be decided upon its own merits.

Acute complete retention may demand capillary puncture of the bladder if an instrument cannot be passed through the urethra after a reasonable effort has been made to get one through. This little operation is free from danger. The skin is incised above the symphysis and the trocar plunged quickly and forcibly downward and backward.

With regard to operative treatment suprapubic and perineal prostatectomy chiefly require consideration. They are to be welcomed as a decided advance in the therapy of prostatic hypertrophy, inasmuch as they afford relief in a class of cases not otherwise amenable to treatment. They are not without danger, however, and therefore should not be employed indiscriminately nor undertaken lightly, being reserved for those cases in which milder measures prove futile (Casper).

When catheterization fails or has to be frequently repeated owing to smallness of the bladder produced by thickening of its walls, when it is very painful or is followed by hemorrhage, and when severe cystitis is present or frequent attacks of retention occur, then one of these radical operations is to be considered (Casper). Although both operations have ardent advocates, it is probable that each has its own particular sphere of applicability. Thus it may be stated that the large, soft adenomatous prostate which projects up into the bladder can be better attacked and removed through the suprapubic incision, and that the small, hard, fibrous prostate which does not rise into the bladder for any distance can be better removed by the perineal route. Naturally those operators who have had unusual experience in the performance of one or the other operation can do it successfully under conditions which would make its performance very difficult to a surgeon of less experience. The suprapubic operation still has a higher death rate than the perineal, but it is claimed by many that the results obtained by it are better and more permanent than those which follow the perineal operation.

The Bottini operation, or galvanoprostatotomy, is rarely employed at present. Casper states that as a rule it is only palliative, although in a few specially selected cases it affords permanent relief. Castration for the purpose of producing atrophy of the enlarged prostate is a relic of the past, and division of the vasa deferentia is employed only in case of patients who suffer from prostatism or recurring epididymitis due to catheterization. When advanced arteriosclerosis, grave cachexia, bilateral renal disease, or other serious organic trouble is present so that a radical operation is not possible relief may be obtained by the establishment of a suprapubic fistula.

PROSTATE GLAND, INFLAMMATION.—Inflammation of the prostate may be either *acute* or *chronic*. Two forms of each are described—namely, *follicular* and *parenchymatous*. In the former the pathologic process affects the follicles chiefly or solely, while in the latter all the structures of the organ are involved.

Acute Prostatitis

Etiology.—Acute prostatitis probably does not occur as an "idiopathic" affection. Among the causes assigned are such external influences as exposure to cold and wet, and traumatism of the perineum; such local factors as injury from instrumentation, calculus, or foreign body; and such general conditions as gout and the acute infectious diseases. It is probable that all the cases are due to infection, and that the factors mentioned act chiefly by establishing a focus of diminished resistance. The majority of cases of inflammation of the prostate are secondary to extension backward of a specific urethritis. The prostate is also involved in some cases of cystitis, the condition being known as "prostatocystitis." Acute prostatitis may develop during the course of smallpox, scarlet fever, typhoid fever, typhus, etc., or it may occur as a sequel to one of these diseases. Prostatitis of tubercular origin is occasionally met with. There appears to be no evidence that horseback riding and bicycle riding, under proper conditions, have ever caused inflammation of the prostate. The cases that have been reported as originating from these causes may have depended upon other factors that were not manifest. This expression is not intended to convey the idea that the use of a saddle constructed upon principles that are grossly wrong anatomically and injudicious riding may not exert some unfavorable influence upon structures adjacent to the perineum. These are factors, however, that may be eliminated, and should not be allowed to weigh against the many advantages to be derived from judicious riding. It has seemed well to speak emphatically upon this point, inasmuch as the question is so frequently asked, and because some difference of opinion exists.

Symptoms.—The symptoms of acute prostatitis are: A sensation of heat and of weight in the perineum or in the rectum; micturition is more frequent than normal and may be attended with tenesmus; if there is great swelling of the gland, retention may result; pain soon becomes a prominent symptom and is frequently very severe—it may be throbbing in character, it is worse on motion, and the usual sitting position is uncomfortable if not impossible; a constipated stool is attended with very acute suffering; pressure on the perineum causes pain; digital examination of the prostate, per rectum, shows the gland to be somewhat enlarged and tense, and pressure causes very acute pain. There is always some constitutional disturbance in these cases; the temperature ranges from 100° to 103° F., and the pulse is proportionately accelerated.

In the higher grade of inflammation pus is likely to form. The occurrence of suppuration is often announced by a chill, and digital examination at this stage will sometimes reveal an area of softening at some point of the gland or distinct fluctuation may be felt. The abscess may remain localized until it is evacuated, it may discharge spontaneously, or the whole gland may break down rapidly. In connection with the last termi-

nation the constitutional disturbance is usually pronounced. Septicemia and pyemia are rare terminations of acute prostatitis, and are especially liable to occur in the cases in which the periprostatic tissues are involved with secondary thrombosis of the prostatic plexus of veins.

Diagnosis.—Acute prostatitis must be distinguished from acute posterior urethritis; from acute cystitis, especially that form affecting chiefly the vesical neck; from cowperitis, and from stricture of the urethra and hypertrophy of the prostate Acute posterior urethritis may present all the urinary symptoms observed in acute prostatitis; the constitutional symptoms, which are usually marked in the latter, will, however, be absent, or nearly so, in the former; swelling and tenderness of the prostate, as determined by rectal palpation, will be absent in urethritis. Acute cystitis would likewise cause no change in the prostate gland; the condition of the prostate is the chief distinguishing feature between these two diseases. Cowperitis would be detected by the presence of a slight, very tender swelling on one side of the perineum (unless the disease were bilateral); the absence of change in the prostate would exclude inflammation of this structure.

Stricture of the urethra would not be accompanied by the local evidences of inflammation of the prostate gland or the accompanying febrile symptoms. Hypertrophy of the prostate almost never occurs before the age of 50, and is not usually observed until the sixtieth year or later. The absence of acute inflammatory symptoms would exclude acute prostatitis.

Treatment.—In common with all other acute inflammatory processes the treatment of acute prostatitis should include absolute rest and a position that will favor emptying the part of blood as much as possible. Therefore, rest in bed—with the hips elevated upon pillows to a higher level than the shoulders—is to be insisted upon. In the more acute cases the local abstraction of blood by means of leeches applied to the perineum and around the margin of the anus will be followed by marked amelioration of the pain. Hot sitz-baths or hot compresses applied to the hypogastrium and perineum act beneficially by withdrawing the blood from the deeper parts to the surface. Hot-water clysters are likewise useful.

If there is marked fever, a prescription similar to the following should be used:

℞. Boric acid, Potassium bromid, } each, ʒ j
Potassium citrate, ʒ ij
Tincture of aconite, ♏ lxxij
Tincture of belladonna, ʒ ss
Sweet spirit of niter, ℥ ss
Water, add enough to make, ℥ vj.

One tablespoonful every 3 hours.

If pronounced vesical irritation is present, the administration of some such mixture as the following will give marked relief:

℞. Boric acid, Sodium bromid, } each, gr. clx
Tincture of belladonna, ss ʒ
Solution of citrate of potassium, add enough to make ℥ viij.

One tablespoonful to be taken every 3 hours.

If the pain is severe, 1 grain of morphin sulphate may be added to the foregoing mixture with advantage, or suppositories may be administered. A common and useful formula for the latter is:

℞. Extract of belladonna, gr. iij
Watery extract of opium, gr. vj
Cacao-butter, add enough to make 12 suppositories.

One of these may be introduced into the rectum 2 or 3 times a day, according to the severity of the pain.

Straining, either at stool or during micturition, should be avoided, as it increases the congestion in and about the prostate and aggravates the symptoms. If the patient is unable to pass his urine naturally, it should be drawn, preferably with a Nélaton catheter of medium size (14 to 18 of the French scale). The bowels should be kept acting rather freely by the use of salines or other laxatives. The diet should be restricted to milk as nearly as possible. Stimulants should not be given unless indicated by some other condition, and then in moderation only.

If abscess of the prostate forms, the pus should be evacuated as soon as detected. The incision should be made through the perineum, except in those rare instances in which the pus appears just beneath the mucous membrane of the rectum, when the incision may be made in this situation. To reach a collection in the prostate through the perineum, the index-finger of the left hand should be introduced into the rectum and the abscess located; then a straight bistoury, with the cutting-edge directed upward, is introduced into the perineal raphe, about 3/4 of an inch anterior to the anus, and carried forward toward the tip of the finger in the rectum until the abscess is reached. Neither the urethra nor the rectum should be wounded in this operation. The incision should be enlarged upward sufficiently to give free exit to the pus. It is always well to explore with the finger, to be certain that the drainage is free, and also to break up any partitions that may exist. Thorough irrigation with an antiseptic solution and moderate packing with iodoform gauze complete the operation. In the event of profuse hemorrhage following the operation, the packing should be firm. The gauze should first be removed on the second or third day, after thorough soaking with antiseptic solution. The dressings are to be repeated daily thereafter. Sometimes a urethroperineal or a urethrorectal fistula will persist; but with proper attention to the care of the wound this will be rare. A prostatic abscess will usually be evacuated through the urethra, either spontaneously or as the result of passing a catheter. This is to be considered a favorable termination, but in severe cases with marked local and con-

ritus ani), the vulva (*pruritus vulvæ*), and the scrotum (*pruritus scroti*).

Pruritus is far more common in advanced life (*pruritus senilis*).

The form of pruritus occurring during the cold months of the year is designated *pruritus hiemalis*.

Etiology.—Generalized pruritus may be caused by Bright's disease, diabetes, hepatic affections, digestive and intestinal disturbances, nervous disorders, pregnancy, uterine and ovarian disease, ingestion of certain medicaments, etc.

Pruritus vulvæ is not infrequently produced by irritating vaginal discharges. It is a common symptom in diabetes. Pruritus ani may be caused by hemorrhoids, fissures, seat-worms, etc., or may be due to digestional disorders, gout, or some other consitutional condition.

Diagnosis.—Pediculosis corporis may usually be differentiated from pruritus by the localization of the scratch marks and the presence of the parasites in the garments.

Prognosis.—Guarded. Depends upon the nature and removability of the cause.

Treatment.—The cause must be assiduously investigated and treated. In all patients who present themselves for the treatment of this disease, it is of the utmost importance that the urine be examined carefully for sugar as pruritus is frequently a symptom of diabetes. It is also at times associated with lymphatic disturbances and many other internal derangements. In many cases, it is absolutely impossible to attribute it to any known cause and certain symptoms make it seem as though it were the result of some mental disturbance. A very thorough examination of all the organs may elicit the cause of this troublesome condition and the treatment should be along this line, and internal medication and diet governed entirely by such findings. Alcohol in any form is usually contraindicated.

Internal Treatment.—Diet and hygiene should be carefully regulated. The various visceral diseases must receive appropriate treatment. In obscure cases the mineral acids, quinin, strychnin, atropin, gelsemium, pilocarpin, and arsenic may be variously tested.

Local treatment is designed to give merely temporary relief from the distressing itching.

The following are some of the best antipruritic lotions:

℞.	Phenol,	ʒ j to iij
	Glycerin,	ʒ ij
	Alcohol,	ʒ iv
	Water, add enough to make	O j.
℞.	Liquor carbonis detergens,	ʒ ss to ij
	Water,	O j.
℞.	Thymol,	ʒ ss to ij
	Solution of potassa,	ʒ ij
	Glycerin,	ʒ ss
	Water,	O j.

For pruritus vulvæ one may use: (1) Saturated solution of boric acid; (2) compound tincture of benzoin (painted on); (3) vaginal injections of alum zinc sulphate, etc.

For pruritus ani:

℞.	Phenol,	gr. x to xx
	Calomel,	gr. xx to xxx
	Zinc oxid ointment,	ʒ j.
℞.	Mercuric chlorid,	gr. viij to xvj
	Water,	ʒ viij.
℞.	Morphin sulphate,	gr. x
	Flexible collodion,	ʒ j.

See Anus, Vulva.

PRUSSIC ACID.—See Cyanids.

PSAMMOMA (Sand Tumor).—A fibrosarcoma, containing calcareous material, observed rarely in the meninges, pineal gland and choroid plexus.

PSEUDOCYESIS (False Pregnancy).—The belief in the existence of pregnancy on the part of a woman, accompanied, perhaps, by more or less vague subjective signs. This condition occurs in nervous, hysteric women as a rule. It is seen most frequently in unmarried girls who fear the results of illicit sexual connection, or in sterile married women who are approaching the menopause and who very much desire offspring.

It is accompanied usually by such common symptoms of pregnancy as nausea, enlargement of the abdomen, and sometimes cessation of menstruation. A careful vaginal examination (preferably with the aid of anesthesia), will reveal an absence of the characteristic signs of true pregnancy.

Treatment should be directed toward the general nervous condition. Sedatives, tonics, and change of food, air, and scene will be found most beneficial.

PSEUDOLALIA.—See Speech Defects.

PSEUDOLEUKEMIA.—See Lymphadenoma.

PSEUDOLEUKEMIA, SPLENIC.—See Splenic Anemia.

PSEUDOLEUKEMIC ANEMIA OF INFANCY.—A chronic anemia of infants and young children described by von Jaksch, characterized by marked leukocytosis and marked reduction in the red cells and hemoglobin, greatly enlarged spleen, sometimes moderately enlarged liver with sharp edges and at times enlarged lymphatic glands. The disease is not to be confounded with pseudoleukemia, in which there is no leukocytosis, nor with leukemia, in which there is not so marked a reduction of hemoglobin or in the number of red cells but a greater increase in the number of leukocytes. The leukocytes are characterized by their varied shape and unusual size. The red cells display a high degree of poikilocytosis, while white cells inclosing red cells and fragments of red cells are also found, together with occasional eosinophilic leukocytes and large multinuclear neutrophilic leukocytes and nucleated red cells. All of these modifications of the blood-corpuscles, however, may occur in leukemia. Prognosis is only guardedly favorable, for death often occurs from intercurrent disease.

PSILOSIS.—See Sprue.

PSOAS ABSCESS.—Chronic collections of tuberculous fluid, which form in the cellular substance of the loins, behind the peritoneum, and descend in

the course of the psoas muscle; if the disease forms on the side of the vertebræ, instead of the fore part, it is termed lumbar abscess.

Etiology.—This disease arises generally from cold, strains, or falls, and from general debility, and not infrequently from spinal affections.

Symptoms.—At the beginning there is little or no pain, no inflammation, nor is there febrile disturbance; but previous to the appearance of any other symptom the patient has an unaccountable feeling of weakness across the loins, accompained by pains, usually giving no indication of the seat of the disease, and likely to be regarded as rheumatic. The tuberculous fluid is formed slowly and imperceptibly, and occasions, at first, no manifest swelling or fluctuation. When the lower dorsal or upper lumbar vertebræ are diseased, the pus enters the sheath of the psoas, or the substance of the muscle, and is firmly bound down in front by the fascia covering this muscle and the iliacus. The abscess proceeds as far as the tendon of the muscle by Poupart's ligament, where its further progress will probably be arrested. When it has attained considerable magnitude, it passes under Poupart's ligament, between the femoral vein and the symphysis pubis.

The diagnosis is difficult when the abscess is unattended by an external tumor. The swelling takes place in various situations and assumes different aspects; it may appear beneath the femoral fascia, or it may descend as far as the knee and form a prominent swelling; sometimes it will make its way downward into the pelvis and occasion a swelling in the neighborhood of the anus, or it may appear in the vicinity of the vertebræ, or, again, it may make its way through the abdominal muscles.

Treatment.—A psoas abscess should be opened, if possible, before it leaves the abdomen, just about Poupart's ligament, external to the line of the vessels. If it points at the inner side of the thigh, an incision may be made in that situation, in addition to the one above Poupart's ligament. Under antiseptic precautions, the sooner the abscess is opened, the better, for the abscess cavity is then smaller than if the surgeon waits until the fluid has burrowed its way into the thigh. Free drainage should be established from the groin to the lumbar region. The same principal of treatment must be applied to lumbar abscesses. Antiseptic dressings must be continued as long as there is discharge. General tonic and alterative treatment is indicated. See also Spine (Caries).

PSORIASIS.—A common chronic inflammatory disease of the skin, characterized by variously sized lesions, having red bases, covered with white scales resembling mother-of-pearl. It affects by preference the extensor surfaces of the body. The lesions are infiltrated, elevated, clearly defined, covered with white, shining, easily detachable scales which, upon removal, reveal a red, punctate, bleeding surface. The eruption is absolutely dry, and itching is usually absent. The recognition of psoriasis depends upon a clear comprehension of the many manifestations exhibited by this cutaneous affection. The lesions observed in the early stages of an attack may not always be sufficiently distinct to the casual observer to obviate error. Those noted in the later periods of the condition are usually characteristic.

Symptoms.—Early in its inception psoriasis is observed to present lesions of a papular nature and of diminutive size. Scattered here and there over the body surface there are noted pinhead-sized or smaller lesions, each of which very early in its life becomes tipped with a minute scale of a pearly white color. They are slightly raised above the surrounding healthy skin, and while showing a pinkish-red coloration directly at the point of attack, the amount of inflammation is not of a high grade, and does not extend beyond the borders of the individual papule. Enlarging by gradual periphearl extension—either slowly or quickly—they soon become easily discernible and characteristic.

Later in their course they have been known to attain varying dimensions—from the diminutive lesion to those occupying areas one inch or more in diameter, or when two or more in close proximity have coalesced, forming patches the size of one's hand, or even covering the greater part of one limb, or occasionally the major part of the back or chest. The edges of these lesions are distinct and stand out prominently, being, with the entire patch, raised somewhat above the surrounding areas. They are always dry and covered with abundant, pearly white, shining scales, which are arranged one upon the other in an imbricated manner. The removal of the scale often presents some bleeding points upon the affected areas. The patches often assume grotesque outlines—being in some instances annular or circinate, and in still others semicircular or arranged in bands—to each of which descriptive names are applied. Although rarely giving sensitive impression of their existence, they occasionally give rise to intolerable itching in certain nervous constitutions.

Psoriasis may remain stationary at any stage of its process, but, generally seen, all stages may be depicted in any given case. While the affection may be observed at any point of the body surface, it usually accepts certain points, such as the scalp, elbows, and knees, as its most formidable positions. It may be observed at any age, although early adult life presents the greater number.

Diagnosis.—The special points of value in reference to diagnosis are: Lesions of variable dimensions, all being capped with the pearly white scales; borders severely outlined; tendency to coalescence, with the presentation of bleeding points upon removal of scale.

In differentiating psoriasis from **eczema** care should be exerted to observe the dry character of lesions which are scattered over the entire body surface; their tendency to coalescence, with the appearance of characteristic scale; the chornic course, with existence of but slight, if any, itching; the well-marked borders and regularly rounded outline of each lesion. In eczema there is always a history of moisture, with occasionally crusting and scaling; the patches always fade into surrounding areas, and are continually changing; itching is

usually severe, while the inflammation is more of an acute nature.

In contradistinction to syphilis, psoriasis gives no history of initial lesions; there is no enlargement of glandular structures; lesions are symmetric, present a tendency to uniformity and coalescence, with abundance of pearly white scaling. Itching is occasionally present, although of but slight degree. Syphilis presents a history of contamination, with enlargement of cervical, inguinal, and epitrochlear glands. The lesions are asymmetric and multiform, but retain their contour. Itching is not a usual accompaniment. The scale is of a grayish tint.

Erythematous lupus is more often limited to the face and neck. The lesions number but two or three, are paler in tint, and covered with a fine yellowish or grayish scale; the center is depressed beneath the surrounding edge of the patch, and is more whitish in appearance than surrounding healthy areas. Upon removal of the scale, small sebaceous plugs may be observed emerging from the follicles.

Tinea circinata rarely occurs over a great surface. It is an acute affection, and gives a history of contagion. Lesions are usually annular, and extend upon the periphery while the center is healing. Vesicles may often be noted upon their periphery. Psoriasis, while clearing in the center, presents a tendency to peripheral disappearance.

Treatment.—While internal and external measures may both be demanded in most of the cases of this affection, there are many in which either plan may prove curative, and therefore it is advisable to acquaint one's self with the therapeutic agents of both classes.

Internal Treatment.—By far the greatest benefit may be received from the use of arsenic in one of its many forms; and while it has been supposed to possess specific properties for the removal of this affection, this cannot be proved, on account of its many failures. In the choice of this remedy it is advisable to select those cases in which there is not decided inflammation, as is often encountered in its early history, or those more chronic, wherein the drug has not been used. Arsenic seems to lose its power over the affection when used continuously or when repeated attacks are placed under its influence. One of the following plans may often prove beneficial: In one set of cases the best results follow the administration of 4 or 5 drops of the solution of arsenite of potassium, given 3 times daily for an indefinite period (arsenous acid, in doses of 1/20 grain, possesses a similar property). In another set of cases it may be found advantageous to increase the dose by 1 drop daily until near a point of tolerance, but not reaching that point.

Cod-liver oil is efficacious in cases of lowered vitality, and is best administered in the maximum dose, according to the age of the affected individual. The oil of copaiba, in doses of from 5 to 30 drops, thrice daily, may be most judiciously advised in many cases of long standing or when the degree of inflammation is high. Potassium iodid, in 5-grain or 10-grain doses, given for indefinite period; the salicylates, in similar dosage, produce good effects. Iron and strong tonics are demanded in certain depressed constitutions. Numerous other drugs are omitted, owing to the many chances of failure following their use.

Sea-water injections are said to have been used with some success.

External Treatment.—The first essential point in the external treatment is the removal of the scales; and to accomplish this, recourse must be had to the use of either baths or emollients. The ordinary bicarbonate of sodium or, preferably, the carbonate of potassium may be used in strengths varying from 1 to 3 ounces to each bath of 30 gallons. Olive oil or liquid petrolatum may produce a similar effect, possibly without fear of irritation in injudicious subjects.

Ordinary soap and water, applied thoroughly by means of a coarse towel, may likewise remove the abundance of scales, and thus present a clear base upon which to apply the chosen unguent. It may be found advisable to apply one of these measures frequently during the treatment of a case, owing to the tendency to reaccumulation of scales.

Ointments or pigments may possibly be the preferable plan of using external drugs, although liquid applications may give as good results. Salicylic acid, in from 3 to 10 percent ointments, with petrolatum applied twice daily, may be satisfactorily borne by many patients, but care must be exerted not to produce too much irritation of the underlying skin or contiguous parts. Tar—in the form of the oil of cade, oil of birch, or ordinary liquid tar—in the proportion of 1 or 2 drams to the ounce of ointment, may be judiciously advised in many long-standing cases. Ichthyol proves beneficial in many instances, and may be used in strengths varying from 1 to 3 drams to the ounce, and applied once daily during the whole course of the disease. This class of remedies may also be used in watery solutions, in strengths similar to those mentioned.

Chrysarobin produces excellent results in ointment form, in the strength of from 10 to 60 grains to the ounce of petrolatum, in those cases wherein much thickening has been induced by the process. It may also produce good effects when applied dissolved in the strength of from 10 to 60 grains to the ounce of either traumaticin or chloroform. Either of these plans will demand careful attention, owing to the inflammation that may be induced; and if applied near the eye, violent iritis may follow.

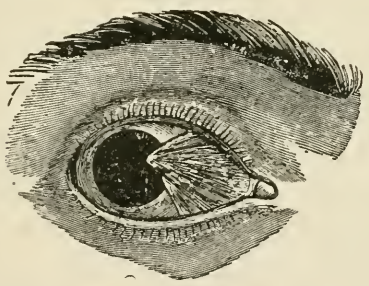
Pyrogallic acid may be used advantageously in a manner similar to the foregoing, and with less likelihood of producing ill effects. When psoriasis is observed upon the face or upon other visible parts of the body surface, it should be treated by some form of inunction, such as by ammoniated mercury, that does not give evidence of its presence. This remedy, used in the strength of from 10 to 40 grains to the ounce of petrolatum, will usually suffice.

PSOROSPERMIASIS.—Psorosperms (sporozoa cytozoa) belong to the lowest forms of the pro-

tozoa. The most important psorosperms are the *coccidium cuniculi* and the *coccidium hominis*. The latter is reported to have caused a few cases of intestinal disease in man. The former has been found in man usually in the liver. Its presence gives rise to inflammation of the ducts followed by the formation of tumor-like nodules with a cheesy center containing pus, débris, coccidia and shed epithelial cells. These nodules with the massing of epithelial cells have led to the opinion that they are associated with cancer formations. The cutaneous lesions that sometimes occur simulate verrucose tuberculosis, mycosis fungoides or carcinoma.

PSYCHOSIS POLYNEURITICA (Korsakow's Psychosis, Polyneuritis).—See MULTIPLE NEURITIS.

PTERYGIUM.—A triangular patch of thickened conjunctiva, most common on the nasal side; the apex of the growth points toward the pupil, and the fan-shaped base radiates toward the canthus. As it continues to grow it resembles a mass of flesh; and as years go on it partly atrophies, becomes pale, and appears tendinous. It is loosely attached at the limbus, and in this position a probe can be passed under its edges. On the cornea the growth is firmly adherent and must be torn or dissected away. If the pterygium grows over the cornea, it may drag the conjunctiva and caruncle with it to such a degree as to interfere with the movements of the eyeball, besides becoming unsightly. This affection is frequently found in elderly persons who have endured exposure in years of outdoor occupation. It is common in sailors. One eye is usually affected, although the growth has been seen simultaneously in both eyes, and in rare instances has developed from the outer canthus.



PTERYGIUM.

Treatment.—If the growth has not extended upon the cornea and shows no sign of progression, it may be left undisturbed. A flat, stringy head indicates a cessation of growth, and excision need not be resorted to. A vascular head means active progression. The operation of removal is as follows: Grasp the neck of the pterygium with fixation forceps, making traction perpendicular to the surface; dissect up the head, and make two converging incisions into the body with a pair of scissors. The parts between these incisions are dissected away and the lozenge-shaped wound closed by a suture applied about the middle of the wound. Another method of removal is by *transplantation*. The growth is split longitudinally and is fixed in an upper and a lower conjunctival pocket with a suture. *Ligation* has also been recommended; a large part of the pterygium between the sclerocorneal margin and the base of the growth is strangulated by sutures in the manner shown in the illustration. It has been suggested that the whole trouble in pterygium lies in the apex, and curetting the affected cornea or the application of the galvanocautery has produced good results. Under the old operations pterygium was liable to occur, and sometimes repeated operations caused limitation of the ocular movements. Electrolysis is the most recent treatment proposed.

PTOMAIN.—A basic nitrogenous compound, resembling the alkaloids, and produced by the action of bacteria on organic matter. As they are usually formed in putrefactive processes, ptomains have also been termed *putrefactive alkaloids*. The name *cadaveric alkaloids* has also been given to them, but applies properly only to those obtained from the dead animal body. Some of the ptomains are poisonous; many are not. As a rule, each distinctive ptomain is produced by a different microorganism, but there are instances of several bacteria producing the same ptomain. The dependence of a ptomain upon microorganisms may be indirect and complicated by or dependent upon purely chemic changes. The kind of ptomain produced depends somewhat upon the stage of putrefaction, as ptomains are "transition products in the process of putrefaction." Their production is also influenced by the media in which the bacteria grow. A ptomain that is formed by a certain bacterium in one medium may not be produced by the same bacterium in another medium. Ptomains have been found in foods, as in mussels, oysters, eels, sausage, ham, canned meats, cheese, milk, ice cream, etc. The pathogenic action of certain bacteria may be due to their production of ptomains. In addition to the well-known ptomains, a number of unnamed substances have been studied that possess reactions and physiologic effects similar to or identical with those of well-known vegetable alkaloids. These at present can only be called after analogs —*e. g.*, **coniin-like substances**; others are called **atropin-like, delphinin-like, digitalin-like, morphin-like, nicotin-like; strychnin-like, veratrin-like**, etc. See LEUKOMAIN, PTOMAIN-POISONING.

PTOMAIN-POISONING.—Infection of the organism through the medium of the gastrointestinal tract.

Etiology. Exciting Causes.—Certain varieties of food which have partially undergone putrefaction, such as oysters, ice-cream (made of milk containing tyrotoxicon), sausage, meat, mussels, fish, and cheese. Sausage poisoning is not uncommon in Germany. Ham poisoning not due to trichina has been reported, and many cases of poisoning from canned meats are recorded, though these may be due to the chlorids of lead or tin. Milk, cheese, and ice-cream poisonings are not rare, although

tyrotoxicon is not always the active cause. The mussel furnishes the most frequent source of poisoning from the shell-fish. See PTOMAIN.

These foods contain a variety of poisonous ptomains after decomposition, such as tyrotoxicon (in milk), neurin, mydatoxin, methyl-guanidin (in meats), mytilotoxin (in mussels), and a poisonous base in fish isomeric with ethylidene diamin ($C_2H_4(NH_2)_2$).

Predisposing Causes.—(1) A catarrhal condition of the stomach and intestines; (2) dilatation of the stomach; (3) certain diseases, as typhoid fever, enteritis, peritonitis; (4) idiosyncrasy toward certain kinds of food.

Pathology.—In a case of ptomain-poisoning from milk observed by Vaughan and Prescott, the following lesions were found 15 hours after death: "The mucous membrane of stomach and intestines normal (bile-stained); the small intestine distended with gas; the jejunum ashy green in color; the ileum purplish green; the cecum, ascending, transverse, and descending colon empty; the circular fibers tightly constricted; the salivary glands distinct but not inflamed; Peyer's patches normal; the liver and spleen normal." Rigor mortis is usually quite marked.

In other cases of ptomain-poisoning the mucous membrane of the stomach and intestines has been found red and swollen, presenting the picture of acute inflammation; the large vessels filled with dark blood; the kidneys congested; spleen enlarged; the heart either empty or filled with dark blood.

It would seem, therefore, that the *materies morbi*, while primarily acting as a gastrointestinal irritant, after being absorbed spends its force chiefly upon the nervous system.

Symptoms and Clinical Course.—The symptoms of ptomain-poisoning usually manifest themselves in from 2 to 24 hours after the food has been taken.

Nervous Symptoms.—Sense of chilliness, coldness of extremities, headache, vertigo, dryness of mouth, extreme thirst, constriction of the throat, difficult deglutition, intense pains in the abdominal region and calves of legs, muscular weakness, twitching of eyelids and muscles of face, shoulders, and hands, tingling sensations, hallucinations, mental anxiety, imperfect vision, dilatation of pupils, strabismus, dyspnea, convulsions, and coma.

Gastrointestinal Symptoms.—Abdomen retracted, sense of heat in stomach, excessive nausea, persistent vomiting, usually watery diarrhea. Constipation is present in some instances.

Cutaneous Symptoms.—Scarlatinal rash, urticaria.

Circulatory Symptoms.—Heart feeble and quick, often 140 to a minute; violent throbbing of abdominal aorta.

Temperature.—In many cases there is a subnormal temperature (95° F.), but if the case is protracted, the temperature is somewhat elevated (100° to 102° F.).

Respirations are hurried (dyspnea), 35 to 40 a minute.

Diagnosis.—

Acute Gastrointestinal Autointoxication.	Cholera Morbus.	Mineral Poison.
1. Onset often from 2 to 24 hours.	1. Onset usually at night or early morning hours.	1. Onset within half an hour.
2. Results from eating animal (nitrogenous) food.	2. Results from eating fruits or vegetable food.	2. History negative.
3. Nervous symptoms marked (twitching of facial muscles, tingling sensations, dilated pupils, convulsions).	3. Nervous phenomena, as seen in autointoxication, absent.	3. Nervous phenomena, as seen in autointoxication, absent.
4. Early dyspnea, cyanosis.	4. Respirations normal.	4. Dyspnea comes on late in mineral poisoning.
5. Temperature often subnormal.	5. Temperature often elevated a degree or two.	5. Temperature often elevated a degree or two.
6. Dryness of mouth and fauces, often bitter taste.	6. Bitter or sour taste in mouth.	6. Metallic taste in mouth.
7. Vomitus contains mucus, contents of stomach, or bile.	7. Vomitus has a sour or bitter taste without blood.	7. Vomitus variable, often tinged with blood, and containing trace of poison.
8. Generally watery diarrhea, sometimes constipation.	8. Diarrhea and tenesmus; feces greenish in color.	8. Feces may contain blood and trace of poison.
9. Various cutaneous eruptions (scarlatinal eruptions, urticaria).	9. Cutaneous eruptions absent.	9. Cutaneous eruptions absent.

Prognosis is guardedly favorable.

Treatment.—After the diagnosis has been fully determined, the first attempt should be directed toward the removal of the cause of the evil by aid of the stomach-tube, emetics (if needed), irrigation of the bowel with long rectal tube attached to a fountain syringe; and, subsequently, remedies to control the pain, to combat the symptoms of shock, and intestinal antiseptics to keep down intestinal putrefaction.

The stomach-tube may be introduced at once, and 1 1/2 pints of lukewarm water allowed to run in; the funnel of the tube should then be lowered and the fluid drained away. The process may be repeated until the stomach is thoroughly cleansed. See LAVAGE.

The rectal tube is then inserted into the bowel its full length and attached to a fountain syringe, and from 1 to 2 quarts of lukewarm water introduced. After the fluid has been expelled, the operation may again be repeated.

If emesis is not sufficient to expel the gastric contents and time is lost in procuring a stomach-tube, apomorphin (1/4 of a grain) may be given hypodermically. Should the bowels be constipated and the stomach retentive, magnesium sulphate (6 drams), Rochelle salt (6 drams), or solution of citrate of magnesia (10 ounces) may be given at once. Pain is best relieved by morphin (1/4 of a grain) hypodermically.

If collapse threatens, it must be combated with hypodermics of atropin (1/100 grain), strychnin

(1/30 grain), nitroglycerin (1/75 grain), whisky, inhalations of ammonia, nitrite of amyl, and hot applications to abdomen and extremities. After the stomach and bowels have been thoroughly cleansed by means of irrigation and purgatives, the following prescription may be given:

℞. Codein, gr. iij
Naphthalin, } each, ʒ j.
Bismuth subnitrate, }

Divide into 8 powders. One powder every 2 hours.

Naphthalin (10 grains) or naphthol (4 grains) may be given every 4 hours for 2 or 3 days. Salol (5 grains) may be substituted for the other intestinal antiseptics.

PTOSIS.—Drooping of the upper eyelid. It may result from any effusion or inflammation weighing down the upper lid. Excessive deposits of fat in the lid may cause it to droop. Ptosis also results from injury to or paralysis of the levator palpebræ muscle. It is one of the symptoms of palsy of the third nerve.

The treatment of ptosis consists in removing the cause if possible. In paralysis of the levator muscle strychnin and the galvanic current are useful. Several ingenious lid elevators have been devised for the relief of this condition. Operative interference has for its object the removal of a piece of the skin of the upper lid, or the insertion of silver wire to hold the lid up. The tendon of the levator muscle may be advanced, or the tarsus may be sutured to the temporal muscle. The patient can often relieve ptosis by learning to use the temporal muscle, or by throwing the head backward in order to see better.

A simple and effective operation for ptosis consists in passing a stout silk ligature vertically under the skin from the eyebrows to the margin of the lids, and firmly tying the ends. The noose formed in this manner is tightened every day, until it has cut its way through the confined tissues; the resultant cicatrix draws the lid to its normal position.

PTYALAGOGS.—See Sialagogs.

PTYALISM.—See Mercury (Salivation).

PUBERTY.—1. The period at which the generative organs of the male or the female become capable of exercising the function of reproduction. 2. The changes in the generative organs and in the general system that accompany the inauguration of this period.

Puberty occurs earlier in warm climates, in sanguine temperaments, and in highly cultivated and luxurious states of society. It cannot be estimated by age alone, and it is modified by family or hereditary peculiarities and the influence of various diseases. In the male the voice becomes bass, while about the same time hair grows on the face, pubes, and other parts of the body. Before this the male genital organs develop; the testes enlarge, as do other parts of the sexual apparatus; seminal and other accessory fluids are secreted, and there is an out-burst of sexual feelings and instincts. The changes are so slowly proceeding that they are not completed until full age has been passed.

In the female the individual passes from childhood to womanhood. The external genital organs enlarge, the uterus, ovaries, and breasts develop, and the commencement of the periodic menstrual discharge is marked. This time is usually, in this climate, between 13 and 15 years. The nonappearance of menstruation may be due to some constitutional disease or some general condition, the rational treatment of which rather than any uteroovarian stimulation should receive the physician's attention. Many of the ailments common about the period of puberty are but forerunners and accompaniments of the functional and organic changes about to commence, especially in the female sex. The influence of excessive mental stimulation during puberty is a subject deserving attention. The mind should not be goaded or overstrained at this time. See Adolescence, Anatomic Age.

PUERPERAL CONVULSIONS.—See Eclampsia.

PUERPERAL FEVER.—Fever occurring in women during the first few days after childbirth. It is of two varieties—(1) infectious and (2) noninfectious.

Noninfectious puerperal fever may be due to a variety of causes. The most common are emotion, constipation, exposure to cold, and reflex irritation.

PUERPERAL INFECTION.—Infectious puerperal fever may be divided into—

A. That class in which the infecting agent—bacteria or ptomains—gains entrance to some part of the genital tract or its vicinity.

B. That class in which the infection enters the body at some point distant from the genital tract, as the infectious fevers, erysipelas, and malaria.

Class A

Etiology.—The varieties of microorganisms capable of producing infection are the streptococci, which are the infecting agents in 80 to 95 percent of the cases; the staphylococci, the colon bacilli (see Colon Bacillus Infection), the gonococci, and, in short, any of the germs capable of causing local inflammation or general disease. In addition to these the saprophytes of decomposition, by the manufacture of ptomains, play an important rôle in the commonest form of puerperal sepsis—sapremia. These germs gain entrance to the genital canal by the hands of the physician, nurse, or other attendant; by instruments used in or about the parturient tract; by the water used to wash and douche the patient; by the bed-clothing, personal clothing, vulvar pads, and material used to cleanse the vulva; and by the atmosphere, laden with dust or vitiated by bad hygienic conditions. Putrescible material contained within the genital tract, such as decidua, pieces of placenta, and blood-clots, forms a suitable area for their multiplication, growth, and dissemination. Finally, a certain small proportion of cases may be traced to autoinfection—*i. e.*, to the action of germs resident in the body and not introduced from without

during or after labor. Such cases may arise from the rupture, during labor, of an old pyosalpinx or a suppurating cyst.

It should be remembered that while a large proportion of vaginal secretions contain pathogenic bacteria, these bacteria are frequently incapable of producing disease, since they are in a condition of diminished or absent virulence. It should also be remembered that the vagina possesses certain natural resisting powers against pathogenic invasion. These powers depend upon a special bacillus (Doederlein's) which, by the production of lactic acid, is antagonistic to pathogenic bacteria; the leukocytosis which is always present, due to chemotactic action; the anatomic structure of the mucous membrane of the vagina, resembling skin; the plug of cervical mucus; and the bloody discharge during the first few days of the puerperium.

Classification and Pathology.—The most convenient classification is that one which is dependent upon the part of the genital tract or its vicinity which is most extensively involved. Thus, we have the following:

1. **Endocolpitis, endometritis, and salpingitis**—inflammation of the mucous membrane of the vagina, uterus, and tubes. This is most frequently of the superficial or suppurative variety; it may, however, be ulcerative or phlegmonous.

2. **Metritis and cellulitis**—inflammation of the uterine walls and pelvic connective tissue. The former is the result of septic endometritis, the inflammation having extended beyond the mucous membrane and attacked the muscular wall. Cellulitis is usually the result of direct extension from the uterus; it not infrequently terminates in abscess formation.

3. **Peritonitis.**—This is the result, usually, of an extension through the tubes or a pelvic cellulitis. As a rule, the inflammatory process is limited to the pelvis; occasionally, diffuse peritonitis is seen.

4. **Uterine and Parauterine Phlebitis.**—This is caused by infection of blood-clots at the placental site. These may be disintegrated and swept into the circulation, producing pyemia. Rarely, phlebitis may occur from infection of the wall of the vein as it passes through a septic area.

5. **Sapremia.**—This is due to absorption of ptomains. The ptomains are generated by the putrefaction, in the uterus or vagina, of blood-clots, decidua, membranes, or placenta. It is the most common cause of fever after childbirth.

6. **Septic Cystitis, Ureteritis, and Pyelitis.**—This is frequently caused by infection from a dirty catheter. The condition becomes exceedingly grave when the kidney is involved. The inflammation may be suppurative or ulcerative in character.

7. **Septic Proctitis.**—This is a rare form of infection. It may be suppurative or ulcerative.

Symptoms.—The symptoms may be divided into local and general.

The local symptoms are (1) Putrid discharge; this is not invariably present, but it is seen in the majority of instances. (2) Diphtheritic patches; these ulcerated areas about the cervix, vagina, and vulva are seen in the severer class of cases. (3) Edema of the vulva; usually present in more or less marked degree. (4) Localized pain and tenderness. (5) Abdominal distention. (6) Inflamed tubes and ovaries. (7) Subinvoluted uterus. (8) Pelvic exudates and, later, perhaps, signs of pelvic abscess.

The general symptoms are: (1) Rigors or chill, followed by rise of temperature. The temperature usually ranges between 101° and 104° F.; the chill is not infrequently absent. (2) Rapid pulse; this is an almost constant symptom. (3) Prostration, delirium, and usually constipation.

All of these symptoms are not to be expected in every case of septic infection. Rise of temperature and rapid pulse may be only evidences of the condition.

Differential Diagnosis.—It is desirable to differentiate the various forms of sepsis. Unfortunately, this is not always possible; indeed, two or more of them not infrequently occur together. There are, however, certain distinctive signs which are of value:

1. **Endocolpitis, Endometritis, and Salpingitis.**—In the former speculum examination will reveal a red, swollen mucous membrane, and probably patches of ulceration about the vulva, vaginal vaults, and cervix.

2. **Metritis and Cellulitis.**—The uterus is large, boggy, and tender; the discharge is foul and copious; exudate may be felt through the vaginal vaults; the uterus is firmly adherent.

3. **Peritonitis.**—There is a very rapid, running pulse; the abdomen is greatly distended and very tender; constipation is a marked symptom.

4. **Phlebitis.**—The symptoms usually occur late in the puerperium; there is high and very irregular fever, with marked remissions, sometimes lasting 4 or 5 days; prostration is profound; phlegmasia alba dolens is commonly present; there are no severe local symptoms.

5. **Sapremia.**—This variety of sepsis should be expected if there are moderate fever, rapid pulse, and no other well-defined symptoms. A thorough disinfection of the birth canal will cause a rapid disappearance of these symptoms.

6. **Septic Cystitis, Ureteritis, and Pyelitis.**—There are pain and tenderness in the lumbar and hypogastric regions; urination is frequent and painful; blood and pus may be found in the urine.

7. **Septic Proctitis.**—There are pain in the rectum, diarrhea, and bloody stools; examination will reveal areas of ulceration on the mucous membrane of the bowel.

Treatment.—The treatment naturally divides itself into the (1) preventive and (2) curative.

1. **Preventive treatment** comprises care to avoid all sources of puerperal infection. It is considered under the management of labor. Careful attentions should be paid to the hygiene during pregnancy and to the sanitary condition of the lying-in chamber. Asepsis of patient, physician and accessories is imperative. No more internal examinations should be made than are absolutely necessary. See LABOR.

2. **Curative treatment** may be subdivided into constitutional, local, and special treatment.

Constitutional Treatment.—Give (1) calomel (1/2 grain) every hour until 4 grains have been taken. Follow this with Rochelle salt (1 dram) every half-hour until free catharsis is produced. (2) Milk (4 to 6 ounces) with lime water (1 fluid-ounce) and whisky (1/2 ounce) every 4 hours. Broths and beef-tea may be given during intervals if the patient can assimilate them. (3) Tincture of digitalis (10 drops) and sulphate of strychnin (1/20 grain) 4 times daily as long as the pulse is above 120 a minute. (4) Suppositories of quinin (5 grains) and pyrophosphate of iron (3 grains) twice daily. (5) Ergot is indicated to promote involution, thereby reducing the absorbent power of the uterus. (6) Inhalations of oxygen are of great value.

In addition to the foregoing, certain drugs that produce hyperleukocytosis, such as nuclein, may be tried. Nuclein, in some cases, has appeared to give very satisfactory results. Unguentum Credé, (a harmless remedy) may be used. Various results have been obtained from the intravenous infusion of formaldehyd solution. Pryor had excellent results with iodoform gauze packing subsequent to operation.

For reduction of the temperature hydrotherapy is valuable especially in the form of the wet pack or cold sponge. The ice-bag or coil applied intermittently is advocated for local tenderness.

The subcutaneous injection of a normal salt solution, a pint or more 2 or 3 times daily, has given good results. It probably acts by causing a hyperleukocytosis. Saline enteroclysis may be of service.

Serum Therapy.—Injections of antistreptococcic serum have given varied clinical results. If the streptococcus be present it may be used, but in conjunction with other treatment, as previously mentioned. The method of administration is as follows: 20 c.c. of reliable serum are injected deeply into the tissues as an initial dose. The daily dose in a desperate case should be 60 c.c. The serum may be tried as a last resort even in the absence of a microscopic examination of the lochia.

Local Treatment.—This consists in thorough disinfection of the parturient tract as follows: (1) Bring the patient in the lithotomy position across the bed, with the buttocks projecting well over the edge. (2) Sterilize vulva, vagina, instruments, and hands. (3) Seize the anterior lip of the cervix with a double tenaculum, and draw it well down to the vulva. (4) Curette thoroughly, using only the force of thumb and forefinger. (5) Remove any tabs of decidua or placenta digitally if possible —if not, by means of placental forceps. (6) Curette again carefully. (7) Irrigate with warm sterile water. (8) If the discharge has been very offensive, inject into the uterine cavity an emulsion of sweet oil (2 ounces) and iodoform (2 drams). (9) If the uterus does not contract firmly or if it is displaced, insert a light drain of iodoform gauze.

This constitutional and local treatment should be instituted in every case of puerperal sepsis. In addition it may be necessary to resort to the following:

Special Treatment. 1. **Endocolpitis, Endometritis, and Salpingitis.**—For the first two, repeated douches of sterile water or a 50 percent solution of alcohol should be given. If ulcerated areas of mucous membrane are present, they should be touched with nitrate of silver solution (1 dram to 1 ounce). In suppurative salpingitis laparotomy will be required.

2. **Metritis and Cellulitis.**—For the former, frequent intrauterine douches are required; in grave cases hysterectomy will be necessary. Cellulitis will yield in most cases to free purgation, counter-irritation, poultices, and douches; if abscess should occur, laparotomy must be performed and the abscess cavity evacuated and drained. If after the abdomen is opened it is found that the inflammation is confined to the pelvic connective tissue, the wound should be closed and the infected area opened and drained through the vaginal vault or above Poupart's ligament.

3. **Peritonitis.**—Salines, stupes, and free stimulation will be sufficient in mild cases. If active symptoms persist far beyond 48 hours, it is probable that suppuration has occurred. In such a case the abdomen should be opened, abscesses evacuated and drained, and diseased tubes and ovaries removed. It may also be necessary to perform hysterectomy.

4. **Phlebitis.**—Prolonged rest in bed, free stimulation, and an abundance of good nutritious food is required. If complications occur, such as septic pneumonia or arthritis or phlegmasia alba dolens, they must be appropriately treated. If one is certain that he has to deal with a pure phlebitis, local treatment is unnecessary or even harmful.

5. **Sapremia.**—Though disinfection of the parturient tract will cause a disappearance of symptoms in from 24 to 48 hours.

6. **Septic Cystitis, Ureteritis, and Pyelitis.**—Irrigate the bladder every 4 hours with boric acid solution (15 grains to 1 ounce). Use hot stupes, salines, and stimulation. Urotropin should be given. Abscess of the kidney may necessitate evacuation and drainage.

7. **Septic Proctitis.**—Irrigate the rectum with sterile water, and apply nitrate of silver solution (1 dram to 1 ounce) to ulcerated areas.

Class B

The most common varieties of infectious puerperal fever, in which the infecting agent enters the body at some point distant from the genital tract, are malaria, typhoid, and erysipelas. To eliminate the first as the cause of fever, give blue mass (8 grains) followed by quinin (15 grains); next morning give a brisk saline purge and repeat the quinin.

PUERPERAL INSANITY.—This is a somewhat rare complication of childbirth, occurring once in about 400 cases. It commonly manifests itself as mania, melancholia, or dementia—the former being the most frequent. It usually makes its appearance during or just after labor, less frequently during lactation, and rarely during pregnancy.

Causes.—The reduction in physical and mental power caused by the strain of gestation might be

considered the predisposing cause. Exciting causes are profound emotion, dystocia, anemia, albuminuria, and septicemia.

Diagnosis.—The diagnosis is not difficult, although it is important to distinguish it from the temporary delirium of labor, the delirium of fever, and delirium tremens.

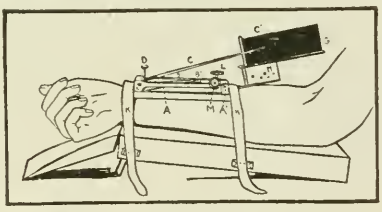
Prognosis.—With appropriate treatment about 66 2/3 percent recover their reason in the course of a few months. Of the remainder, a small proportion die from infection or exhaustion, and the rest remain permanently insane.

Treatment.—This consists in the administration of tonics and nutritious food; a change of scene, open-air exercise, and general hygienic precautions are most beneficial. The patient must be constantly watched, lest she attempt some injury to herself or child.

PULMOTOR.—A recent appliance for producing artificial respiration in cases of asphyxia. By appropriate mechanism, which acts automatically, and alternately by pressure and suction, oxygen is pumped into the lungs, and then by negative pressure an outflow from the lungs is caused. The apparatus has already achieved great results and is most valuable. See NEW-BORN INFANT (Asphyxia Neonatorum).

PULSE.—Much information of the action of the heart, of the blood, and of the artery itself may be gained by a simple examination of the radial pulse.

The physicians in olden times gave much careful attention to the pulse, and the amount of information to be gained from its study is astounding. By the introduction of percussion, and auscultation, the interest in the study of the pulse was decidedly lessened. This interest was further diminished by the introduction of the *sphygmograph;* and the clinical thermometer dealt a deathblow to the painstaking study of the pulse.



MAREY'S SPHYGMOGRAPH.—(*Greene.*)

A. Steel spring. *B.* First lever. *C.* Writing lever. *C'.* Its free writing end. *D.* Screw for bringing *B* in contact with *C*. *G.* Slide with smoked paper. *H.* Clockwork. *L.* Screw for increasing the pressure. *M.* Dial, indicating the pressure. *K, K.* Straps for fixing the instrument to the arm and the arm to the double inclined plane or support.

To take the pulse, the physician should be seated by the side of the patient, who should be in a sitting or recumbent posture, with arm extended and resting on some support. The physician should lightly place the 4 fingers of his right hand over the left radial artery of the patient, with his index-finger nearest patient's hand; the little finger will thus be the first to receive the stroke. The pulse should always be taken at each wrist, for reasons to be given later. By so doing the presence of aneurysms may often be suspected and frequently verified. Pressure should be made and relaxed alternately. Points to be noticed are: (1) The size of the artery; (2) pulse rate or frequency; (3) regularity of rhythm; (4) uniformity of strength; (5) synchronism and equality of the right and left radial pulses; (6) the force required to obliterate them (tension); (7) abnormal thickening of the artery (arteriosclerosis). A strong pulse is characterized by volume and vigor; a weak one by the reverse conditions. The number of pulsations to the minute, which can generally be counted accurately by means of a watch, is the least important of all the points to the experienced clinician, who cares little whether the heart contracts 75 or 100 times a minute. He is mainly "interested in the dynamics of the viscus rather than in the derangement of its running-gear." Above all things should the family physician be familiar with the pulses of his patients in health, for, as is well known, some families have abnormally slow and others fast pulses.

The pulse may be modified (1) as to frequency, (2) rhythm, (3) volume, (4) tension.

Frequency.—The normal pulse-rate in the male adult may be said to be 76 a minute and 80 for the female; at birth it has been placed at 120 to 130, and 100 at the second year.

The frequency of the normal pulse may be increased by excitement—such as fright—emotion, by violent exercise, and by the use of drugs, such as stimulants. An increased frequency of the pulse is spoken of as **tachycardia,** (*q. v.*). It is often greatly increased (1) in fevers, as scarlet fever, and diphtheria; (2) shock from loss of blood; (3) exophthalmic goiter; (4) pressure on the base of the brain; (5) organic heart-disease, angina pectoris, etc.

Bradycardia, (*q. v.*), or a **slow pulse,** is seen in (1) jaundice; (2) atheroma; (3) lesions of the cerebral centers; (4) fatty degeneration; (5) often after the use of such drugs as aconite, digitalis, and opium; (6) Stokes-Adams syndrome. A slow pulse is often a physiologic phenomenon.

Rhythm.—Often the interval between the beats is disturbed, and there will be (1) an intermittent pulse or (2) an irregular pulse (arrhythmia).

Intermittent pulse is often seen in those who habitually use tobacco, or after hearty eating. It is commonly due to reflex causes, as constipation and diseases of the stomach, liver, or kidneys. The rheumatic or lithemic diathesis may give rise to a slow pulse.

Irregular pulse is often found in disease of the heart-muscle or in disease of its valves. It is very common in mitral regurgitation.

Dicrotic pulse is a condition of the pulse in which the first impulse as it strikes the finger is quickly followed by another impulse or a secondary wave. It is found often in conditions of marked exhaustion or toxemia as in typhoid fever, and in other febrile diseases.

Quick pulse (*pulsus celer*) or **water-hammer pulse** (*Corrigan's*) is a condition of the pulse characterized by a short, sharp, strong impulse, which seems to collapse under the finger. It is best detected by holding the arm erect. It is almost

diagnostic of aortic regurgitation under certain conditions. It also occurs in anemia and fevers when the arterioles are relaxed.

Pulsus paradoxus is a pulse in which the wave is small and imperceptible during full inspiration. It is seen sometimes in health and often in adherent pericardium.

Volume.—When the beat of the pulse is large or strong, it is known as a **full pulse,** such as is found in plethora or in the robust. If the beat is weak, it is known as a **small pulse,** such as is found in debility or exhaustion.

Strength.—A **strong pulse** is one in which there are little compressibility and a strong impulse, such as is found in hypertrophy of the heart. Its opposite is a **weak pulse,** as in adynamic states.

Tension or Resistance.—It may be either hard or soft. A **hard pulse** is one of high tension, or one in which there is great contractile power; it is often seen in hypertrophy of the left ventricle, interstitial nephritis, septicemia, angina pectoris, arteriosclerosis; certain intoxications like gout, lead poisoning, diabetes in elderly persons. It is observed in apoplexy and at times in anemia. A small, hard, **wiry pulse** is noted in the early stage of peritonitis. A **soft pulse** is of low tension and easily compressible, indicative of a loss of tone in the arterial coats. It is found in low fevers, such as typhoid, the later stages of pneumonia, and in adynamic conditions in general. It is sometimes hereditary and may be observed in obesity. See HEART-DISEASE (Functional).

PULVIS.—See POWDER.

PUMPKIN SEED.—See PEPO.

PUPIL, CHANGES IN MOTILITY.—Mydriasis, or extreme dilatation of the pupil, occurs under the effects of drugs possessing a mydriatic action, such as atropin, homatropin, hyoscyamin, etc.; in glaucoma; in optic nerve atrophy; in diseases of the orbit; after fright; in neurasthenia; after irritation of the cervical sympathetic, as by an aneurysmal tumor; and sometimes in idiots. Permanent mydriasis has occurred after the instillations of a mydriatic have been suspended. Mydriasis of distinctly cerebral origin is caused either by irritation due to some lesion in the brain or cervical portion of the spinal cord, or by paralysis of the oculomotor center due to hemorrhage, thrombosis, tumor, or abscess of the brain.

The treatment of mydriasis consists in remedying the cause, if possible; locally, pilocarpin or eserin is indicated, and the galvanic current is sometimes of use. Exercise of the eyes with convex lenses upon near objects may be of value.

Miosis, or permanent contraction of the pupil, occurs under drugs possessing miotic action, such as eserin, pilocarpin, etc.; in paralysis of the cervical portion of the spinal cord, particularly in locomotor ataxia; in paretic dementia; in cerebral syphilis; and in bulbar palsy, with progressive muscular atrophy. Persons who continually use their eyes on fine objects, such as watchmakers and engravers, sometimes suffer from miosis. In opium-poisoning the pupil is reduced to the size of a pinpoint, dilating just before death. Nicotin and alcohol in poisonous quantities may produce miosis. As contraction of the pupil may result from irritating cerebral lesions similar to those causing dilatation, it is important to have some means of differential diagnosis. Berthold mentions that miosis occurs in a sudden attack of paralysis due to embolism, and mydriasis in an attack due to ophthalmia. Idiopathic cases are said to result from syphilis, tuberculosis, rheumatism, and other systemic disorders.

Treatment is virtually the same as that for iritis, although atropin must be used with caution, as it is often very poorly borne. Plastic and purulent cyclitis must be treated rigorously with mercurial inunctions. For the reduction of tension, the local use of eserin, diaphoretics, and paracentesis are indicated. In purulent cyclitis, especially after operations, antiseptic douches are indicated. On account of the uncertain prognosis, the possibility of relapses, disorganization of the vitreous, and sympathetic ophthalmia, the patient may be carefully watched, and expectant treatment continued after the symptoms have subsided.

Anisocoria, or **inequality in size of the pupils,** may occur in perfect health. In fact, it is much more common than text-books indicate. It is sometimes seen in eyes of widely dissimilar refraction, diseases of the brain and nervous systems, and in insanity. It is not uncommon in tabes, disseminated sclerosis, and paretic dementia.

Wernicke's sign, or **hemiopic pupillary inaction,** is mentioned in the discussion of HEMIANOPSIA (*q. v.*). Light is carefully thrown on the blind side of the retina; if there is reflex contraction, the lesion is behind the pupillary centers; if there is no reflex obtained, the lesion is at or in front of the pupillary centers.

The Argyll Robertson pupil is a name given to a reflex pupillary rigidity producing loss of reaction to light stimulation, although the action to accommodation and convergence may still be present. It is a diagnostic sign of value in locomotor ataxia, but has been noticed in general paralysis of the insane, in cerebral syphilis, and is the result of poisoning by bisulphid of carbon.

The orbicularis pupillary reaction refers to contraction of the pupil when a forcible effort is made to close the lids.

Hippus is the name given to the oscillations occurring after contraction to light. It is exaggerated in hysteria, disseminated sclerosis, epilepsy, and in the early stages of acute meningitis.

Iridodonesis is a tremulous condition of the iris, due to lack of a normal support of the lens. It is seen in conditions in which the lens is dislocated posteriorly, in atrophy of the vitreous, in overripe cataract, and after cataract extraction.

PURGATIVES.—See CATHARTICS.

PURPURA (Peliosis Rheumatica).—A hemorrhagic disease characterized by the appearance on the skin of variously sized and shaped reddish-purple macules, not disappearing under pressure.

Varieties.—There are 3 chief varieties, distinguished by the premonitory and concomitant constitutional symptoms, by the extent of hemorrhagic extravasation, and by the cause: (1) Purpura simplex; (2) purpura rheumatica; (3) purpura hæmorrhagica.

Purpura Simplex

The eruption usually appears suddenly and consists of pinhead-sized to bean-sized, round, oval, irregular, claret-red or purplish spots. They are circumscribed, smooth, and nonelevated, and are symmetrically distributed, tending particularly to occur upon the lower extremities. Subjective symptoms are, as a rule, absent. There is commonly no systemic disturbance, and the disease tends to a favorable termination in the course of a few weeks.

Purpura Rheumatica (Peliosis Rheumatica)

This form is ushered in with fever, lassitude, anorexia, and severe rheumatoid pains, particularly in the lower extremities, the joints of which may be swollen. The eruption consists of well-defined, splitpea-sized to finger-nail-sized hemorrhagic patches which may be slightly elevated or level with the skin. At first of a pinkish, reddish, or purplish color, they later pass through the color transitions of all ecchymoses. The eruption is more or less generalized, but is most marked upon the extremities. The disease may last a few weeks or persist, in the form of relapses, for several months. It is sometimes associated with erythema multiforme.

Purpura Hæmorrhagica (Morbus Maculosus Werlhofii; Land Scurvy)

The onset of the hemorrhagic form is signalized by the occurrence of fever and symptoms of systemic depression. The eruption consists of hemorrhagic patches varying in size from that of a small coin to that of the palm of the hand, which come out suddenly and in considerable numbers. The trunk and extremities are the regions usually involved. At the same time, bleeding from the mouth, gums, nostrils, bowels, bladder, etc., may take place. The disease may terminate in a fortnight or may continue for weeks. In a certain number of cases it proves fatal.

Etiology.—The causes of purpura are obscure. The disease, especially the hemorrhagic type, occurs more often in debilitated individuals. Some look upon the vasomotor apparatus as the agency primarily at fault; others believe purpura to be an infectious disease. Such drugs as arsenic, potassium iodid, chloral, quinin, and the salicylates may produce hemorrhagic eruptions.

Pathology.—As a result of an alteration in the blood or blood-vessel walls an extravasation of blood takes place into the tissues. After a variable period of time this undergoes resorption, the changes in the blood pigment producing the varying colorations. The process is not attended with inflammation.

Diagnosis.—The evident hemorrhagic nature of the lesions and their failure to disappear upon pressure distinguish them as purpuric. Purpura hæmorrhagica may be confounded with scorbutus:

Scorbutus.	Purpura Hæmorrhagica.
1. Occurs in those subject to lack of vegetable food and to bad hygiene.	1. No such etiologic relationship.
2. Definite premonitory symptoms: weakness, impaired circulation, etc.	2. Premonitory signs slight or absent.
3. Onset slow.	3. Onset sudden.
4. Gums spongy, swollen, and bleeding; teeth loose.	4. Gums often bleeding but not swollen.
5. Severe muscular pains.	5. Less marked.
6. Brawny infiltration of lower extremities.	6. Not present.
7. Hemorrhages from mucous membranes not, as a rule, profuse.	7. Hemorrhages from mucous membranes often so severe as to prove fatal.

Prognosis.—In purpura simplex and rheumatica the prognosis is favorable, recovery taking place in several weeks or months. In purpura hæmorrhagica the prognosis is more guarded, a certain number of cases succumbing to internal hemorrhage.

Treatment.—The treatment of purpura must be adapted to the exigencies of the individual case. Ergot, tincture of the chlorid of iron, quinin, turpentine, and the mineral acids are useful in all forms of the disease. In purpura rheumatica and hæmorrhagica the patient should be confined to his bed and placed upon a nutritious and easily assimilable diet. Locally, astringent lotions and ice, if necessary, may be employed.

PUS.—See Suppuration.

PUSTULANT.—See Counterirritation.

PYELITIS (Pyelonephritis).—Inflammation of the mucous membrane of the pelvis of the kidney. Except in the mildest cases, the kidney proper becomes simultaneously involved. To the former condition the term pyelitis is applied; to the latter, pyelonephritis.

Etiology.—(1) Renal calculus; (2) secondary to urethritis or cystitis; (3) tuberculosis; (4) after infectious diseases, such as typhoid fever, scarlet fever, diphtheria, small-pox; (5) carcinoma.

Microorganisms may gain access to the kidney either through the blood stream or through the urinary tract. When infection occurs in the former way it is called hematogenous; when in the latter, urogenous. See Colon Bacillus Infection.

Pathology.—The mucous membrane of the pelvis of the kidney is swollen, turbid, and often shows minute extravasations. The epithelium has in certain areas undergone degeneration, forming mucus or pus. The suppurative process may finally extend into the kidney structure, giving

rise to pyelonephritis, and a large abscess may occupy the entire area of the kidney. In certain instances the fluid material may be entirely absorbed, leaving a putty-like material.

Symptoms and Clinical Course.—There is pain in the lumbar region and also anteriorly, detected on deep pressure. The fever is irregular, occasionally accompanied by hectic symptoms, with sweat and chill. In some cases the disease may simulate typhoid fever. The urine is clear at times, but generally has a turbid color, with a heavy precipitate containing a large amount of mucus, pus-cells, red blood-corpuscles, and pelvic epithelium. Blood-clots may be passed.

The purulent material renders the urine albuminous.

Diagnosis.—

Pyelitis.	Nephritis.	Cystitis.
1. History of case.	1. Increased micturition; sweat and chills rare.	1. Micturition accompanied by tenesmus; often burning pain.
2. No tube casts...	2. Albumin and various kinds of casts.	2. No tube casts.
3. Pus in urine....	3. Pus rare.....	3. Blood often at end of micturition.
4. Dropsy rare....	4. Dropsy common... 5. Urea diminished.	4. No dropsy.

Prognosis.—The prognosis is variable; simple pyelitis may exist for years without the substance of the kidney itself becoming involved. Pyelonephritis, as a rule, gradually leads to destruction of the kidney and therefore must be considered a serious disease.

Treatment.—The treatment of acute pyelitis consists in the employment of antiphlogistic measures and the administration of narcotics and urinary antiseptics. Of the latter urotropin is the most valuable. Regular evacuation of the bowels should be secured. If threatening symptoms persist, such as high fever and chills, and if an exact diagnosis can be made as to which kidney is diseased, or at least as to which one is the more diseased a brilliant curative effect can sometimes be secured by splitting the kidney. This applies to pyelitis as well as pyelonephritis, but is only of value in the ascending forms of the disease.

In chronic pyelitis, and pyelonephritis, the use of urinary antiseptics and the employment of hygienic measures are also indicated. For pyelitis due to infection with the gonococcus or colon bacillus Casper recommends irrigation of the renal pelvis with a solution of silver nitrate 1:1000. In chronic pyelonephritis nephrotomy often brings about a cure. See Kidney (Injuries, Surgery), Nephritis.

PYEMIA.—Phlebitic septicemia, with the presence of pyogenic microorganisms in the blood and with the formation, wherever they lodge, of secondary embolic or metastatic abscesses. It is characterized by intermittent fever, with recurrent rigors, profuse sweats, a sweetish odor to the breath, a dry, brown tongue, and rapid emaciation. Slight jaundice frequently develops; sometimes, also, a purpuric eruption; the temperature may be very high—105° F., or even more. It usually terminates in death. See Sepsis.

PYLORUS.—See Stomach.

PYOKTANIN.—See Methyl-violet.

PYOMETRA.—See Hematometra.

PYONEPHROSIS.—Pyonephrosis is the distention of the pelvis and calices of the kidney with pus, and the subsequent destruction, more or less complete, of the medullary and cortical substance, the whole kidney being at length converted into a large multilocular suppurating cyst. This cyst may rupture into the peritoneal cavity or colon, or into the surrounding tissue, causing a perinephritic abscess.

Etiology.—Infective nephritis with retention of pus is a very common cause, but some cases of pyonephrosis are due to infection of a hydronephrosis.

Symptoms.—In addition to a tumor in the abdomen with characters similar to those of hydronephrosis, there will be pain in the tumor, especially on pressure, and if the obstruction of the ureter is incomplete, pus in the urine, septic fever varying with the absorption.

Treatment.—Nephrotomy, with removal of any obstruction discovered in the pelvis of the kidney or ureter. If after nephrotomy, however, the cyst does not shrink and cease to suppurate, and the opposite kidney is sound and working well enough, nephrectomy may have to be done, as otherwise lardaceous disease may carry off the patient, or blood-poisoning may ensue from the discharge becoming septic, or, as sometimes happens when the obstruction of the ureter is relieved to some extent by the nephrotomy, the decomposing pus may make its way into the bladder, set up cystitis, and the other kidney become affected. When the disease is bilateral both kidneys are drained through the loins. See Pyelitis.

PYORRHŒA ALVEOLARIS.—Riggs' Disease, Phagedenic Pericementitis (Black), **Interstitial Gingivitis** (Talbot), **Phagedenic Pericemental Alveolitis** (Logan).

Definition.—A chronic destructive disease of the supporting structures of the human tooth.

Etiology.—The usual *systemic predisposing* causes are diseases of the heart and vessels, diabetes and Bright's disease. Chronic rheumatism and digestive disturbances are held to be the most serious predisposing factors. *Local predisposing causes:* Lack of maintenance of proper hygiene; absence of normal contacts and masticatory influences; excessive irregularities and malocclusion of the teeth. *Local exciting causes:* Presence upon the crown and root surfaces of teeth of inorganic and organic deposits of a fatty glue-like substance impregnated with pyogenic bacteria; lodgment of food in the interproximal spaces; the presence of pyogenic organisms that chronically involve the pericemental alveolar structures which normally support the teeth. The *entamœba buccalis* has been found in many cases.

Diagnosis.—This disease exists whenever serumal deposits are found upon the exposed cementum, and a septic chronic destructive inflam-

mation coexists in the pericemental and alveolar structures, providing this exposed cementum resulted from some disturbance that had its origin of irritation in the gums. This disease exists also when we find a chronic septic destructive process beginning at the gums and progressively involving the pericemental and alveolar tissues in such a manner as to create well defined pockets in the form of narrow routes at the expense of the pericemental tissues and the inner surface of the alveolar structures some distance in advance of the alveolar rim involvement. According to the above diagnostic findings phagedenic pericemental alveolitis exists without serumal deposits being found in the pockets as well as with them. However, in over 90 percent of the advanced cases serumal deposits are present.

Subjective Symptoms.—Patients as a rule not aware of the presence of the disease until it has progressed to a serious stage; then low, dull, gnawing pains are experienced in the part for a few days at a time, with variable periods of rest from discomfort. In advanced cases tenderness is felt when masticating food.

Objective Symptoms.—Deep dark red discoloration of the gums and adjacent soft tissues overlying the bone structure about the roots involved. Excessive hemorrhage from gums from the slight irritations caused by thorough examination, the usual brushing, and the mastication of food. Sufficiently pronounced hemorrhage occurs sometimes during sleep to saturate the pillow. In advanced cases pus can be forced up around the necks of the teeth involved from practically all of the pockets found. The teeth eventually become abnormally mobile and permanently shift from their normal positions causing characteristic deformities. The roots gradually become exposed as the supporting structures are progressively destroyed.

Treatment, operative, consists in the removal of all deposits found upon the exposed cementum in the pockets. Smooth the roughened cementum with sharp instruments and polish with pumice and orangewood point all exposed tooth surfaces. **Surgical,** remove all degenerating pericemental fibers from the tissues forming the borders of the pockets, carefully examining remaining alveolar process and if carious areas are found, these areas are to be curetted. **Medicinal,** irrigate pockets during operative and surgical treatment with a physiological salt solution, which is to be made fresh for every patient. Senn's solution should be employed for the final medicinal treatment in the pocket. Tincture of iodin for local application to be applied upon the gums and overlying structures is sometimes beneficial in causing the acute inflammation to subside. The constant use of astringent mouth washes acts against rather than in favor of gaining and maintaining control of this disease. Tooth powders and mouth washes should never be relied upon to cure this condition; still proper oral and dental cleanliness is necessary for the prevention of the beginnings of excessive dental caries and diseased conditions of the gums. The use of emetin has been recommended but it is impossible to say, as yet, whether it will always give the good results which have been claimed for it. Dilute sulphuric acid (in 20 to 30 minim doses, has also been advocated.

Prosthetic Treatment.—A reestablishment of all lost contacts and the fixation of the abnormally loose teeth is to be brought about by the constructing of metal splints that are to be cemented into place.

Prognosis for *single rooted teeth* when only the gingival third is involved, is good; when the middle third is extensively involved prognosis is only fair; when the apical third is extensively involved the tooth should be immediately extracted. **Prognosis** of *multiple rooted teeth* when gingival third is involved is good; but when middle third is extensively involved the tooth should be extracted or one of the roots excised.

PYOSALPINX.—See Fallopian Tubes.

PYOTHORAX.—See Pleurisy (Purulent).

PYRAMIDON.—A derivative of antipyrin in which an H-atom of the pyrazolon group is replaced by a dimethylamido group. It forms a yellowish-white, tasteless, crystalline powder, soluble in water (1:10). This solution gives a violet fugitive color with Fe_2Cl_6. Nitrous acid gives an evanescent violet. In the urine pyramidon is best detected by the ferric chlorid test. The action of pyramidon upon the nervous system is analogous to that of antipyrin, but it is active in much smaller doses. It is much milder, more gradual and lasting in its influence than antipyrin. Dose, 2 to 8 grains. For consumptives and in hectic fever the minimum dose should not be exceeded. *P. Acid Camphorate* and *P. Neutral Camphorate.* The acid and neutral salts combine the antipyretic action of pyramidon with the antihidrotic action of camphoric acid, the former action predominating in the neutral salt, the latter in the acid salt. It is said that the tonicity of pyramidon is thereby reduced, while the camphoric acid has greater antihidrotic power. They are especially efficacious in the night-sweats of phthisis. Dose of the neutral salt, 8 to 12 grains; of the acid salt, 12 to 15 grains.

P. Salicylate is antipyretic, analgesic and antiseptic, combining the activity of its components, pyramidon and salicylic acid. It is recommended in rheumatic and gouty affections, neuralgia, pleuritis, etc. Dose, 8 to 12 grains.

PYRETHRUM (Pellitory).—The root of *Anacyclus pyrethrum.* It contains an alkaloid *pyrethrin,* also inulin, tannin, mucilage, etc., with a brown *resin* and two fixed oils. When taken into the mouth, it increases the flow of saliva, and is used as a masticatory in dry conditions of the mouth, in relaxed states of the throat, and in aphonia; also in headache and facial neuralgia. It is valuable mainly as a masticatory and sialagog. Dose, 10 to 45 grains. **P., Tinct.,** 20 percent; used externally. *P. roseum,* Persian pellitory. The powdered flower-heads are used as an insecticide.

PYROGALLOL. $C_6H_3(OH)_3$.—A triatomic phenol obtained chiefly by dry distillation of gallic acid, occurring in light, white, shining laminæ or fine needles; of bitter taste, but soluble in water,

alcohol, and ether. Dose, 1 to 2 grains. It is a powerful reducing agent, and is used as a disinfectant in 1 to 2.5 percent solutions. As an ointment (1 dram to 1 ounce) it ranks next to chrysarobin, for use in psoriasis, while in lupus and epithelioma it is supposed to attack only the diseased nodules, leaving uninjured the adjacent skin. By the mouth, for internal hemorrhage, it has been used in 20-grain doses. Large doses may produce hemoglobinuria and general disorganization of the blood-corpuscles.

PYROPLASMOSIS HOMINIS.—A peculiar fatal disease of certain parts of Idaho, Wyoming, Montana, Nevada, occurring during the spring and early summer, apparently only in persons who have been bitten by ticks. Certain observers believe it to be due to the *pyroplasma hominis*, which is closely related to the pyrosoma bigeminum, the cause of Texas cattle fever, and is believed to be transmitted by means of the bite of a tick (though the latter may be overlooked by reason of its presence at times only in the hair above the genitals). This organism is found in the patient's blood.

Symptoms.—After an incubation period of from 3 to 10 days, headache, nausea, muscular soreness, and a chill or chilliness and nose-bleed are followed by a rapidly rising fever and unduly rapid pulse and respiration. On the third day a rash, macular, bright red, in severe cases petechial, appears first on the forehead and extremities, later on the chest, abdomen, and back. It is profuse except on the abdomen. Desquamation may follow. Albumin is present in the urine. In fatal cases rapid anemia appears with sustained high temperature and rapid weak pulse. About the twelfth day the temperature falls by lysis in favorable cases, but 70 to 90 percent terminate fatally.

Prophylaxis.—It is wise not to live in these districts during the spring and early summer. Tick bites should be guarded against, but if incurred, ammonia, kerosene or turpentine should be applied, followed by cauterization with pure phenol.

Treatment is stimulating and symptomatic.

PYROSIS (Heartburn).—An affection of the stomach characterized by a burning sensation, accompanied by eructations of an acrid, irritating fluid. See Gastric Neuroses, Gastritis.

PYROXYLIN (Soluble Gun-cotton).—Chiefly tetranitrate of cellulose, used for preparing collodions. Collodion rapidly dries on exposure to air by evaporation of its ether and leaves a transparent film of pyroxylin on the surface to which it has been applied. This film, if the flexible collodion be used, will not contract or crack on drying.

PYURIA.—See Cystitis, Pyelitis, Urine (Examination).

Q

QUARANTINE.—The time (formerly 40 days) during which a vessel from ports infected with contagious or epidemic diseases is required by law to remain outside the port of its destination, as a safeguard against the spreading of such disease. The necessity and means of quarantine in infectious diseases are discussed under the separate headings of the different diseases. The methods of disinfection are considered under the heading DISINFECTION (*q. v.*).

QUASSIA.—The wood of *Picrasma excelsa*, or of *Quassia amara;* the former is known commercially as Jamaica quassia, and the latter as Surinam quassia. The wood is turned into cups, which are sold under the name of quassia- or bitter-cups. It contains a bitter principle, *Quassin*, $C_{31}H_{42}O_9$, which is crystalline, soluble in hot alcohol and in chloroform, slowly in cold water, faster in alkaline or acidulated water. Dose of the powdered wood, 5 to 15 grains. Quassia is fatal to flies and fish, and makes an excellent anthelmintic enema against the thread worm. The lower bowel should be washed out with soap and water, and from 1/2 to 1 pint of an infusion, made by adding 1 or 2 ounces of quassia chips to a pint of water, should be injected and retained for some minutes. Several such injections will invariably kill seat-worms or thread-worms, but enough fluid should be injected to reach high up in the rectum, and the washing with soap and water should not be omitted. Quassia contains no tannin, and may be prescribed with salts of iron. In atonic dyspepsia, with pain after eating and regurgitation of food, and to promote appetite and digestion, it is much employed.

A bitter tonic:

℞. Extract of nux vomica, gr. iv
Extract of quassia, gr. xx
Sulphate of quinin, gr. xl.
Make into 20 pills. One pill 3 times daily after meals.

Preparations.—**Q.-cup,** a cup made of quassia wood, called also *bitter-cup,* from which water may be drunk, the bitter principles becoming dissolved in the water. **Q., Ext.,** its properties are due to a bitter principle, *quassin.* Dose, 1 to 3 grains. **Q. Fluidextract.** Dose, 5 to 15 minims. **Q., Infus.,** quassia chips, 1 dram; water, 10 ounces. Dose, 1 to 3 ounces. **Q., Tinct.,** 20 percent in strength. Dose 5 minims to 1 dram.

QUEEN'S-ROOT.—See STILLINGIA.

QUERCUS (White Oak).—The bark of the white oak tree. It is astringent and tonic, but seldom used internally, its action being that of tannic acid. A decoction or infusion is much used as a cheap astringent application in leukorrhea, vaginitis, gonorrhea, prolapsus ani, hemorrhoids, etc., and as a gargle in faucial inflammations and for prolapsed uvula. It stains the clothing very slightly. *Q. tinctoria* stains the clothing very badly, but it is equally efficient. As an astringent poultice, the powdered bark is used to check discharges of freely running sores. An infusion of 1 ounce to a pint of water is of sufficient strength. **Q. Fluidextract.** Dose, 5 to 20 minims.

QUICKENING.—The first sensation of the movements of the fetus in a pregnant woman. It usually occurs at about the twentieth week. Some women experience it earlier than this, and in some it appears to be entirely absent. It has been likened in character to the fluttering of a bird held in the partly closed hand. It is one of the important subjective signs of pregnancy. See PREGNANCY (Diagnosis).

QUICKSILVER.—See MERCURY.

QUILLAJA (Soap Bark).—The inner bark of *Quillaia saponaria.* Its properties are due to a glucosid, *saponin.* It is a sternutatory, irritant to the mucous membranes, and an expectorant having an agreeable taste. Dose of a 5 : 200 decoction, 1 to 2 drams, according to age.

QUINIDIN.—A cinchona alkaloid, isomeric with quinin, with which it corresponds in therapeutic effects; but it is thought to produce less unpleasant symptoms in the head. **Q. Sulph.,** readily soluble in acidulated water and alcohol; it is an excellent antipyretic and antiperiodic. Dose, 20 to 60 grains or more. **Q. Tannate,** used in diarrhea, nephritis, and malaria. Dose, 2 to 12 grains twice daily.

QUININ.—Quinin is a finely crystalline or amorphous white alkaloid obtained from various species of CINCHONA (*q. v.*). It is odorless, very bitter, alkaline in reaction, and soluble in 1600 parts of cold water or 0.6 parts of alcohol. It is a valuable tonic, antiseptic, antipyretic, and antiperiodic. Quinin and its salts are distinguished from all other alkaloids, excepting quinidin and quinicin, by the emerald-green color given to their solution by chlorin water followed by ammonia.

Therapeutics.—Quinin finds its principal field of action in the malarial diseases, over which its influence is specific, by reason of its power to prevent the development of the plasmodium to which malaria is due. In intermittent fevers a 10-grain dose of the sulphate should be given in the sweating stage, and again 5 hours before the expected time of the next paroxysm. In the intervals arsenic is better used, as quinin may cause a daily exacerbation of temperature if long continued. In remittent fevers 20- to 30-grain doses should be administered once or twice a day until the temperature is reduced to the normal point. In pernicious remittent fevers large doses (30 to 40 grains) are necessary to the safety of the patient.

In chronic malarial poisoning quinin has considerable power, but chinoidin is more effective. Quinin (5 to 10 grains daily) is efficient as a prophylactic against malaria. See MALARIAL FEVERS.

As an antipyretic, quinin is used with the best results, especially in septic fevers, typhus, typhoid, variola, pneumonia, and acute rheumatism. Inflammations may, at their inception, be aborted by 15- or 20-grain doses, combined with morphin, which in this respect is synergistic to quinin. Acute tonsillitis and acute catarrh may sometimes be aborted by a full dose. In surgical fevers, pyemia, and exhausting suppurative conditions, also in septicemia, hectic fever, and before surgical operations, quinin is much employed. Neuralgias of malarial origin are amenable to it, as also neuralgia of the ophthalmic division of the fifth nerve. In eruptive fevers—especially scarlet fever, erysipelas, and measles—it is advantageously administered throughout their course. In some skin-diseases—particularly erythema nodosum—it is quite efficient, also in whooping-cough and hay-fever. In the latter affection a solution of 6 grains to the ounce of the neutral hydrochlorid is a very useful local application. Of internal antipyretics, the safest and best is quinin, next in order being phenacetin. Quinin hydrobromid has recently been recommended for use in exophthalmic goiter.

Warburg's tincture has obtained a very high reputation in the hands of Indian army-surgeons in the treatment of remittent and other malarial fevers of the most malignant types, in malarial neuralgias, acute nervous exhaustion, and sudden collapse without organic disease.

Poisoning.—The heart and the arterial tension are somewhat stimulated by small doses, but depressed by large ones (40 to 80 grains), which slow and enfeeble the pulse by direct action on the cardiac ganglia. The brain is rendered hyperemic and exhilarated by small or moderate doses, but large ones produce a sense of fulness and constriction in the head, cerebral anemia, pallor, tinnitus aurium, vertigo, staggering gait, amaurosis and deafness, great headache, dilated pupils, delirium, coma, and, in animals, convulsions. The eyes and ears are very rarely injured permanently. These symptoms collectively are termed CINCHONISM (*q. v.*).

Preparations.—**Quinina,** a white, amorphous or minutely crystalline powder, of alkaline reaction and very bitter taste, soluble in 1670 of water and in 0.6 of alcohol at 59° F. and readily in dilute acids. Dose, 1 to 20 grains, or 40 grains in special cases. Is insoluble in saliva. **Q. Bisulphas,** clear, colorless efflorescent crystals or small needles, of very bitter taste and strongly acid reaction, soluble in 10 of water with blue efflorescence, and in 32 of alcohol at 59° F. Dose, 1 to 20 grains, or even 60 grains in special cases. **Q. Hydrobromidum,** colorless needles, of very bitter taste, soluble in 54 of water and in 0.6 of alcohol at 59° F., very soluble in boiling water and in boiling alcohol. Dose, 1 to 20 grains. **Q. Hydrochloridum,** white needles in tufts, of very bitter taste, soluble in 34 of water and in 3 of alcohol at 59° F., in 1 of boiling water or alcohol. Dose, 1 to 20 grains. An excellent salt which should be more generally used; 5 to 10 grain doses are antipyretic. **Q. Hydrochloridum Acidum** (B.P.) is soluble in less than its own weight of water, and may be used hypodermically. Dose, 1 to 10 grains. **Q. Salicylas** is soluble in 77 of water, in 11 of alcohol, in 37 of chloroform, and in 110 of ether, at 77° F. It contains 70 percent of quinin. Dose, 1 to 20 grains in pill or capsule. **Q. Sulphas,** very light, snow-white, fragile crystals, of bitter, persistent taste, soluble in 740 of water and in 65 of alcohol at 59° F., more soluble in acidulated water. Dose, 1 to 20 grains, or even 40 grains in special cases. **Tinctura Pyrexialis, Tinctura Antiperiodica,** or **Warburg's Tincture** (Unofficial) is a celebrated and formerly secret preparation. The formula, published by the originator, included over 60 ingredients, one of which (Confectio Damocratis) contained many drugs which are not now obtainable. The tincture contained quinin bisulphate, 2 percent, with aloes, rhubarb, camphor and several aromatic herbs. Dose, 1 ounce (about 9 1/2 grains of quinin bisulphate) in 2 doses given 3 hours apart. Hager's modification of the original formula is—quinin sulphate 1, Spt. camphoræ 2, Tinct. aloes et myrrhæ 22, alcohol 16. Dose, as above. Some of the preparations now sold under this name contain few, if any, of the original ingredients. The so-called *Warburg's Pill* is a most irrational form in which to administer this complex medicine, even if it contains the proper constituents. See CINCHONA, EUQUININ.

QUININ HYDROCHLORID AND UREA.—Quinin carbamid hydrochlorid or urea-quinin. Recently this drug has been highly recommended as a local anesthetic in operations on the nose and throat and in ano-rectal surgery. A 1 percent solution is injected locally or a 10 to 20 percent solution is applied locally to the mucous membranes. The resulting anesthesia is claimed to be considerably prolonged. As a palliative measure a 20 percent solution has been applied in tuberculous ulcers of the larynx with excellent results. Quinin hydrochlorid and urea has also been used with good effect in hydrophobia. An intravenous injection of 15 grains of the drug in 3 c.c. of normal saline solution is used. This is twice repeated at intervals of two hours. More injections may be used if necessary, but the intervals between injections must be greatly increased.

QUINSY.—See TONSILLITIS.

R

RABIES.—See Hydrophobia.

RACHITIS.—See Rickets.

RADIOTHERAPY.—See Radium.

RADIUM.—Radium is one of the newer elements. It is a radioactive substance, obtained from pitch blende, and discovered by Madame Curie and her husband in 1898. It is of high atomic weight; extremely rare and expensive, being almost unobtainable in the pure state. It is of interest because of its wonderful radioactive emanations. These are of three kinds, and are designated as the *Alpha*, *Beta*, and *Gamma* rays. The *Alpha rays* have very slight penetrating qualities and are chiefly or entirely absorbed by the container. The *Beta rays* are the most numerous and have only a moderately penetrating effect, being absorbed chiefly by the skin and subcutaneous tissue. The *Gamma rays*, on the other hand, correspond rather closely to the Roentgen rays, and are very penetrating, probably more so than the Roentgen rays.

Therapeutically its exact value has not yet been determined, but it has been used successfully in the treatment of various obstinate skin diseases, such as epithelioma, rodent ulcer, and nevus. It has also been used with some degree of success in the treatment of deep-seated malignant disease, particularly when located in the cavities, which are not easily reached by the Roentgen rays.

It is used as a paste for external applications or in tubes. These tubes are often introduced into cavities; or even, by surgical means, into the tumors themselves.

RADIUS.—See Forearm.

RAILWAY INJURIES.—These are of greatest interest from their medicolegal aspect. Trivial railway injuries might be immediately followed by loss of memory, defective sight, pain in the back, and the usual symptoms of nerve shock, and subsequently by the most formidable array of nervous symptoms. On the other hand, very severe injuries may be followed by prompt and complete recovery. The more serious results are dependent upon the great weight and impulse of the train, the sudden arrest of momentum, and direct traumatism. Serious spinal injuries and violent shock have occurred to persons sitting in a train not in motion that has been struck by a moving train from behind. It is the sudden and violent character of the occurrence, the alarm and fright, the general jar and commotion of the whole body, and possible local damage that make the main features of railway injuries.

Direct results of railway accidents are various, but ligamentous lesions are perhaps the most characteristic. Death has resulted from sheer fright. The indirect results are also numerous and varied. It must always be borne in mind that a chronic inflammation may be lighted up by an accident; syphilitic, gouty, tubercular, and even cancerous diseases may follow and complicate the symptoms arising from the injury. Chronic inflammatory conditions of the cord or its membranes may be induced. Certain indefinite phenomena constantly render the diagnosis and prognosis of railway injuries difficult. When no local lesion of importance exists, neurasthenic conditions are likely to occur which are doubtless expressions of an exhausted nervous system. The temperature in these cases is often subnormal and the pulse slow. Asthenopia, with difficulty in, or real loss of the power of, accommodation, may impair the vision. Physical changes in the retina and optic disc are extremely uncommon, and generally follow organic lesions of the spinal cord and membranes. Functional disturbances, probably of cerebral origin, are often added to this neurasthenic condition, and in such cases there are frequently medicolegal controversies. The common "railway spine" is considered under the head Spinal Cord (Injuries) (*q. v.*).

Every medical attendant, as well as medical officer of any railway, should familiarize himself with all the circumstances of an accident and its results. Apart from the accident itself, the approximate speed of the train, the position of patient in the carriage and of carriage in the train, the presence of other uninjured passengers, the condition from the time of the accident to the time of examination, and the symptoms complained of, should be noted fully and filed away for reference. The general condition of the patient, especially as to appetite, capacity for work or sleep, and previous habits, the possible existence of organic disease, and the condition of urine are to be investigated. Bruises or signs of local injury are to be noted, and when injury to the spine is alleged, the amount of mobility or rigidity noticed when undressing, the effects of digital pressure or percussion, and the application of hot or cold sponges should be noted. The circumference of limbs should be measured, the electric excitability of muscles tested, the existence of spasm or tremor and the condition of reflexes, superficial and deep, ascertained. Cutaneous sensibility should be investigated, and an ophthalmoscopic examination may be made to determine the existence of local lesions of the fundus.

The medical attendant should form an opinion on the following points: Has the patient been really injured? What is the nature of the injury? Is the injury a possible or probable result of the accident as described? Are the symptoms consistent with the history and objective signs?

Railroad surgeons are usually given sufficient directions by the corporation that employs them, according to the views of their chief officers or in compliance with the law prevailing in the district where such accidents may occur.

The treatment of railway accidents is mostly surgical, and differs in no way from the treatment of similar injuries received in other ways, and which are fully discussed in other portions of the book under their various headings. Immediate treatment, even by the train crew and passengers, is necessary. Hemorrhage should be prevented by the prompt application of pressure. A handkerchief, belt, or suspender tied around a limb or twisted tight by a stick, or direct pressure with the finger, will usually suffice.

Fractures should be placed in improvised splints from umbrellas, walking-sticks, cushions, newspapers, broken pieces of wood, etc., and fixed by straps or suspenders, handkerchiefs, etc.

Simple dislocations should be reduced as early as possible, and simple fractures prevented from becoming compound.

Shock, collapse, and fright require great caution to maintain the vital powers until reaction sets in. The temperature of the body, the strength and rate of the heart's action, together with the respiration, are to be maintained by external warmth and by internal stimulants. Overstimulation is also to be guarded against. See Collapse, Shock.

Exposure to cold and wet should be prevented and shelter provided as soon as possible, followed by early removal to a hospital or place of rest. Subsequent treatment of railway injuries requires absolute rest for a long time, especially if spinal lesions are suspected; change of scene and moderate exercise often are beneficial, especially when neurasthenic conditions supervene. See Abdomen (Injuries), Chest (Injuries), Fractures, Spinal Cord (Injuries), Spine (Injuries), etc.

RAILWAY SPINE.—See Spinal Cord (Injuries).

RÂLES.—The sounds caused by the breaking of air through impediments or passing over obstructions in the lungs and bronchi. They vary in character according to the consistency of the surrounding lung tissue. Sometimes a distinction is made between râles and rhonchi. The first word is applied to sounds generated by vibrations set up in fluids; the second, to sounds generated in the narrowed or obstructed lumen of tubes. See Chest (Examination).

RALES, TABLE OF

Variety.	When Heard.	How and Where Produced.	Size and Character.	Condition in Which Heard.
Amphoric.....	Inspiration and expiration.	By movement of air in a tense-walled cavity containing air and communicating with a bronchus.	Large, musical, and tinkling.	In tuberculous and abscess cavities.
Bubbling, large.	Inspiration and expiration.	By passage of air through frothy mucus in the trachea and larger bronchi.	Larger than the medium bubbling; moist.	Bronchitis and pulmonary engorgement.
Bubbling, medium.	Inspiration and expiration.	By passage of air through mucus in the larger tubes.	Larger than the small bubbling; moist.	In capillary bronchitis especially in children.
Bubbling, small.	Inspiration and expiration.	By passage of air through mucus in the bronchioles.	Small; moist; like the bursting of soft bubbles.	In capillary bronchitis, especially in children.
Cavernous....	Inspiration and expiration.	By passage of air through a small cavity with flaccid walls, which collapse with expiration.	Hollow and metallic....	In the third stage of pulmonary tuberculosis.
Clicking.....	Inspiration only....	By passage of air through softening material in smaller bronchi.	Small; sticky.....	The apex in pulmonary tuberculosis.
Consonating ..	Inspiration and expiration.	When bronchial tubes surrounded by consolidated tissue.	Bright, clear, ringing..	Tuberculous pneumonia.
Crackling, dry.	In inspiration.....	By the breaking down of lung tissue.	Sharp, short, and clicking.	In the second or softening stage of pulmonary tuberculosis and in pulmonary gangrene.
Crackling, large.	Inspiration and expiration.	By fluid in very small cavities....	Larger than the medium crackling; dry.	In pulmonary tuberculosis and pneumonia, after formation of small cavities.
Crackling, medium.	Chiefly in inspiration.	By fluid in the finer bronchi.....	Larger than the small crackling; dry.	Softening of tuberculous deposit or pneumonic exudation.
Crackling, small.	Chiefly in inspiration.	By fluid in the finer bronchi.....	Small; dry; like the breaking of small shells.	Softening of tuberculous deposit or pneumonic exudation.
Crepitant.....	End of inspiration only.	By passage of air into vesicles collapsed, or containing fibrinous exudation. Usually at the base of the lungs.	Small; like rubbing the hair between the fingers.	Pneumonia, early stage; edema of lungs; hypostatic pneumonia; localized in pulmonary tuberculosis.

RALES, TABLE OF

Variety.	When Heard.	How and Where Produced.	Size and Character.	Condition in Which Heard.
Dry.....	Inspiration and expiration.	By narrowing of the bronchial tubes, from thickening of the mucous lining, from spasmodic contraction of the muscular coat, viscid mucus within, or pressure from without.	Large and sonorous, or small and hissing, or whistling.	In bronchitis, asthma, and localized in beginning pulmonary tuberculosis.
Extrathoracic.		In the trachea or larynx.		
Friction.....	Inspiration and expiration; most distinct at the end of inspiration.	By the rubbing together of serous surfaces, roughened by inflammation or deprived of their natural secretion.	Grazing, rubbing, grating, creaking, or crackling.	In pleurisy and pericarditis.
Gurgling.....	Inspiration and expiration.	By the passage of air through fluid in cavities, on coughing.	Larger than the large bubbling; moist; like the bursting of large bubbles.	Pulmonary tuberculosis, after formation of cavities.
Guttural.....	.....	In the throat.		
Moist.....	.....	By the passage of air through bronchi containing fluid.		
Mucous (of Laennec).	Inspiration and expiration.	By viscid bubbles bursting in the bronchial tubes.	A modification of the subcrepitant.	Pulmonary emphysema.
Râle redux, râle de retour.	Inspiration and expiration.	By the passage of air through fluid in a bronchial tube.	Crackling and unequal..	In pneumonia in the stage of resolution.
Sibilant.....	Inspiration and expiration.	By narrowing of the smaller bronchi from viscid mucus adhering to the walls, from thickening of the lining membrane or spasmodic contraction.	High-pitched and even hissing or piping.	In bronchitis, asthma, and localized in beginning pulmonary tuberculosis.
Sonorous.....	Inspiration and expiration.	By lessened caliber of the larger bronchi, from spasm, tumefaction of mucous lining, or external pressure.	Low-pitched and snoring.	Most frequent in bronchitis and spasmodic asthma, but may occur in any pulmonary disease.
Subcrepitant..	Inspiration and expiration.	By passage of air through mucus in the capillary bronchial tubes.	Small; moist.....	Capillary bronchitis.
Subcrepitant (of Hirtz).	Inspiration and expiration.	By passage of air through mucus in the capillary bronchial tubes.	Moist; metallic.....	Tuberculous softening.

RANULA.—A cystic tumor beneath the tongue, connected with the duct of the sublingual salivary gland.

Varieties.—*True ranula*, found in the floor of the mouth, from the size of a walnut to a pigeon's egg, and containing glairy, tenacious contents.

Mylohyoid, found between the mylohyoid and buccal mucous membrane, often as large as an orange, and filled with cheesy contents.

Etiology.—The common form of ranula has thin walls, and contains a fluid somewhat resembling saliva, and hence formerly supposed to be a dilatation of the duct of the submaxillary gland. It may be that this is true in those instances in which the duct is occluded by a salivary calculus, but in the majority of cases the ranula appears to be a distinct cyst.

Symptoms.—If the ranula has attained some size before it is noticed, it may be large enough to crowd the tongue against the hard palate, so that swallowing is interfered with, and sometimes even breathing becomes difficult, especially if there is concomitant coryza; or there may be convulsive attacks of dyspnea, simulating croup.

Prognosis is favorable, though the disease is prone to recur; rarely spontaneous cures have been known to follow suppuration.

Treatment.—If complicated with croupy attacks, the following operation should be immediately performed: Open the sac sufficiently to cauterize thoroughly its inner walls, which must be repeated often enough to prevent union, except from the bottom of the sac. If this is not obtained, relapses will occur.

RAPE.—The carnal knowledge by a boy or man of a female forcibly and unlawfully and without her conscious and free consent. If a woman is incapable of giving consent, as in idiocy, imbecility, or any mental unsoundness, either temporary or permanent, sexual intercourse with her is rape. If at the time of the act the victim is unconscious of the nature of the act, and this fact is known to the defendant; if her resistance is forcibly overcome or prevented by fear of immediate and great bodily harm, which she has reason to believe will be inflicted upon her; or if she is prevented from resisting by stupor or mental weakness produced by intoxicating, narcotic, or

anesthetic agents administered by or with the privity of the person accused of the crime, the offense constitutes rape. It is immaterial whether the victim is a virgin or a common prostitute.

Age of consent is the age below which a female is incapable of giving legal consent to sexual connection, and such connection on the part of a man is rape, in spite of her consent or desire.

The age of consent in the various States is given in the following table (compiled by the New York Society for the Prevention of Cruelty to Children):—

State.	Age of Consent.				
	12	14	15	16	18
Alabama		14			
Arkansas				16	
California				16	
Colorado				16	
Connecticut				16	
Delaware					18
Florida					
Georgia		14			
Idaho					18
Illinois				16	
Indiana				16	
Iowa			15		
Kansas					18
Kentucky				16	
Louisiana					18
Maine				16	
Maryland				16	
Massachusetts				16	
Michigan				16	
Minnesota				16	
Mississippi		14			
Missouri					18
Montana					18
Nebraska					18
Nevada					18
New Hampshire				16	
New Jersey		14			
New York					18
N. Carolina		14			
N. Dakota				16	
Ohio				16	
Oklahoma				16	
Oregon				16	
Pennsylvania				16	
Rhode Island				16	
S. Carolina		14			
S. Dakota				16	
Tennessee					
Texas			15		
Utah					18
Vermont				16	
Virginia	12				
Washington				16	
W. Virginia					
Wisconsin					18
Wyoming					18

Indecent assault may include various factors of an attempt to commit rape, comprising, in the case of a child, putting the hands on the external genitals or even feeling the legs.

Legal rape may be committed only when there is physical capacity in the direct perpetrator. A boy under 14 cannot commit rape according to the law in some countries and States, and no evidence is admissible if he is under that age, even though the fact could be shown that he had capacity. The presumption of capacity is rebuttable in Ohio, Massachusetts, New York, and Tennessee.

A boy under 14 cannot be convicted of rape in California, but in North Carolina and Florida courts the English law is followed. In Louisiana there is no foundation for the presumption of incapacity. Here the law conforms to the medical knowledge. It is not essential to prove emissions, as mere touching of the vulva by the penis suffices to establish the fact of carnal knowledge.

If the victim is under years of discretion, her evidence, even when unsupported, if believed by the jury sufficient to leave no reasonable doubt of guilt, will justify a conviction.

It is a matter of doubt whether rape is possible upon a woman of fair size and strength when committed by an unaided man. If in the enjoyment of her faculties, she is capable of offering an amount of resistance well-nigh insuperable, and if she has offered a decent resistance, the person of the ravisher should bear evidence of it. Rape is most often committed on children of tender-years, but it is well to be on one's guard against error. Purulent discharges from the vagina are not uncommon in ill-fed, dirty, and scrofulous children.

The *medical evidence* is based on: (1) Marks of violence about the woman's genital organs; (2) wounds, bruises, or other marks of injury on the woman or on the accused; (3) blood stains and seminal stains on the person or clothing of either party; and (4) the presence of any venereal disease on either party.

For examination for spermatozoa, see Seminal Stains.

RASH.—See Exanthems, Skin-diseases.

RATION, EMERGENCY.—One with high force-value and with sufficient available nitrogen for the needs of hard labor, prepared in compact form and designed for occasions when the use of the regular ration is impracticable.

UNITED STATES ARMY EMERGENCY RATION

	Quantity (in Ounces).	Protein (Grams).	Fats (Grams).	Carbohydrates (Grams).	Full Value (Calories).
Hard bread,	16.	70.76	5.89	332.94	1.712
Bacon,	10.	24.94	218.14	.....	2.030
Pea meal,	4.	24.94	2.25	59.84	.368
Coffee, roasted and ground, with four grains of saccharin,	2.				
Or tea, with four grains of saccharin,	.5				
Salt,	.64				
Pepper,	.04				
Tobacco,	.5				
	33.68	126.64	226.28	392.78	4.110

RAY FUNGUS.—See Actinomyces.

RAYNAUD'S DISEASE (Symmetric Gangrene;

Sphaceloderma).—A rare disease, characterized by a local stagnation occurring at the periphery of the circulation, producing symmetrically distributed gangrenous spots on the body. The disease occurs in 3 well-defined grades, which are, in the order of severity, *local syncope*, *local asphyxia*, and *local gangrene*. The so-called "*dead finger*," frequently seen in females, is an example of the first grade.

Local syncope is observed most frequently in the extremities, and produces the condition known as dead fingers or dead toes; it is analogous to that induced by intense cold.

Local asphyxia, which usually follows local syncope, but may develop independently. Chilblains are the mildest manifestation of this condition. The fingers, toes, and ears are the parts usually affected. In the most extreme degree the parts are swollen, stiff, and livid, and the capillary circulation is almost stagnant.

Local or Symmetric Gangrene.—The mildest form follows local asphyxia. Small areas of necrosis appear on the pads of the fingers and of the toes, also at the edges of the ears and tip of the nose. Occasionally, symmetric patches appear on the limbs or trunk, and in severe cases terminate in extensive gangrene.

Raynaud suggested that the local syncope is produced by contraction of the vessels; the asphyxia is probably caused by dilatation of the capillaries and venules, with persistence of the spasm of the arterioles. The condition is probably due to some disturbance of the vasomotor nerve-center or in some instances to a peripheral neuritis. Two forms of congestion occur, which may be seen in adjacent fingers, one of which may be swollen, intensely red, and extremely hot; the other swollen, cyanotic, and icy cold (Osler).

Pain is the most prominent symptom of the disease, which usually attacks children or adults under 30 years of age. Women of the neurotic temperament are more liable to be affected, and especially does it occur after some sudden mental shock. The disease is frequently associated with hemoglobinuria. Scleroderma and edema, probably angioneurotic, may be observed. There may also be cerebral symptoms, impaired vision, arthritic swelling, tingling and formication due to peripheral neuritis.

Treatment.—When seen early, galvanism, with one electrode applied to the spine and the other immersed with the affected part in water, is the best treatment. Friction with stimulating liniments, as for frost-bite, is also of value. Nitroglycerin is highly recommended. See GANGRENE.

REACTION OF DEGENERATION.—See DEGENERATION (Reaction), NERVOUS DISEASES (Examination).

RECTOCELE.—Protrusion of the anterior wall of the rectum and posterior wall of the vagina into the vagina or through the vaginal ostium. The condition is due to injury of the perineum that takes away the support of the posterior vaginal wall. The bulging of the vaginal wall causes a distinct tumor, which is readily recognized on separation of the vulva. Straining or bearing-down efforts cause an increase in the size of the tumor. The patient feels during defecation as though the feces were about to pass through the vagina. Pressure on the rectocele will easily replace it.

The treatment of rectocele consists in repair of the perineum by Emmet's operation. See PERINEUM.

RECTOVAGINAL FISTULA.—See VAGINAL FISTULA.

RECTUM, ABNORMALITIES.—The only congenital malformation needing mention here is imperforate anus. The anus may be entirely absent; it may be present but separated from the rectum by a membrane; or the rectum may open into the bladder, prostatic urethra, or vagina.

Treatment.—When only a thin membrane intervenes, its division is all that is necessary. When there is no apparent outlet to the re tum, careful dissection is made upward to the bowel from a spot where the rectum is normally situated. Mayo Robson advises continuing the dissection in the perineum, opening the peritoneum, pulling the end of the gut down and fixing it to the skin. In some cases left inguinal colotomy is necessary. See ANUS (Preternatural).

RECTUM, ADMINISTRATION OF MEDICINE BY.—See MEDICINES (Administration).

RECTUM, EXAMINATION. Interrogation.—After the patient has concluded the description of the ailment, the following are the principal queries which may be asked with advantage (Adler):

1. **In Reference to Pain.**—Is there any pain? If so, of what character? Is it situated in the rectum? What is its relation to the act of defecation? Is it worse during an evacuation, shortly afterward, or some time after the movement? Is itching, a sense of fullness, or heat experienced?

2. **Regarding Protrusion.**—Is there any swelling or protrusion at the anus? Does this occur only at defecation, or is it independent of this act? Does it bleed? Does it go back spontaneously, or has the patient to return it?

3. **As to the Presence of a Discharge.**—Is there any discharge? If so, what is its nature (bloody, mucous, or purulent)? Is it offensive? Does it occur before or immediately after defecation, or is it independent of the action of the bowels?

4. **As to the Regularity of the Action of the Bowels.**—Is there a daily movement, or does constipation or diarrhea exist? What is the character of the fecal evacuation as to color, size, and consistence?

5. **General Interrogations.**—Does the patient cough, have night-sweats, spit blood, or has there been a loss of flesh? What are the habits of life, especially with reference to the use of alcoholic liquors, tobacco, and to indulgence in venery? Is there any specific history? Lastly, inquire as to any hereditary tendency to rectal trouble, malignant disease, kidney, liver, or heart affection. In women inquire into the condition of the sexual organs, etc. Whenever the idea of any operative procedure is entertained, the urine should be examined, and a thorough physical inspection of the patient made.

Having obtained the subjective symptoms and being satisfied as to the existence of rectal disease, we proceed to confirm the provisional diagnosis and to obtain positive information upon which to base the prognosis and to guide the treatment by making a thorough local examination. If possible, the patient should have the bowel emptied by an enema immediately before an examination is attempted. In the case of female patients especially the neglect of this will often render a thorough investigation impossible, without recourse to anesthesia, owing to the fear of an accident occurring—such as the escape of flatus. Under such circumstances the sphincter muscles may be so tightly closed that the surgeon is frustrated in the attempt to explore the parts. When a specular examination is necessary, as in the case of an investigation of the higher portions of the rectum or of the sigmoid flexure, it is absolutely essential that the contents of the bowels are removed.

Postures.—There are various postures in which this examination may be made. Some surgeons prefer the patient to lean over the back of an ordinary chair; others, to have them kneel upon a table with the head of the patient placed on his folded arms, by which means the buttocks are elevated and the intestines are allowed to gravitate from the seat of investigation; others, the lithotomy position; but for general use Adler thinks that the most comfortable as well as the most delicate posture for the patient, and that most convenient for the examiner, is for the patient to lie on a firm couch on the left side, the right shoulder turned away from the surgeon, the left arm brought behind the body, and the right thigh well flexed upon the abdomen. In examining for the presence of strictures or growths situated above the lower 4 inches of the rectum, by directing the patient to stand and strain, the diseased part will be brought nearer to the anus, so that at least an inch or more of the bowel may be explored than can be done when the patient assumes the usual position, even though directions are given to bear down.

Light.—Either natural or artificial light may be used. By means of a head-mirror (the operator sitting facing the light and the patient's back being from the same) the light may be concentrated upon any particular point requiring observation.

The instruments usually required are: A flexible probe made of silver, useful for the exploration of fistulous tracks; an exploring needle, or a small trocar, by means of which can be ascertained the nature of the contents of any swelling or fluid collection; Kelly's short and long proctoscope and his sigmoidoscope; sponge-holders; basins; and possibly a hypodermic syringe, with a flexible silver cannula attached, which is useful in detecting whether a fistula is complete or otherwise. Plenty of towels and cotton should be on hand.

Inspection of the Condition of the External Parts.—On separating the buttocks, the orifice of the anus will come into view. The radiating folds should be separated by the fingers, and cracks, excoriations, and fissures should be looked for. External hemorrhoids will also be noted, if present. By passing the finger around the anus and making pressure, any induration that exists will be detected; this may be due to a fistula or an abscess. If the parts are covered with a discharge, it should be wiped away and its source traced, as to whether it is from an external opening of a fistulous track, etc. Eruptions of any kind—eczematous, syphilitic, or otherwise—must also be noticed.

Digital Examination of the Interior of the Rectum.—The method of making the examination is as follows (Adler): The nail of the index-finger, being well-trimmed and the finger lubricated with carbolized linseed oil, is introduced into the bowel by a slow boring motion, in a direction at first slightly forward. This should be done gradually, so as to allow the sphincters time to relax; if attempted too hurriedly or in too forcible a manner, spasm of the muscles will to a certainty be induced. As the finger enters, the condition of the sphincters is noted. The strength, measured by the power of resistance, will be found to vary greatly in different people. In the aged or debilitated it is likely to be very weak; and just the reverse in the strong and healthy. In persons of a specially nervous tendency and in cases of irritable ulcer of the anus, a contraction may be met with, which, owing to the pain, will render an examination impossible without the use of an anesthetic.

The finger should now be passed its full length up the bowel, unless an obstruction exists, and by instructing the patient to bear down forcibly the rectum can be explored for a considerable distance. Additional length may be gained by passing the other fingers of the examining hand backward along the intergluteal groove, instead of closing them in the palm, as is generally done, and pressing the knuckles against the soft parts. The knuckles, in the latter procedure, prevent the full passage of the index-finger. In this manner about 3 1/2 or 4 inches of the rectum may be explored, together with the prostate, the neck of the bladder, the uterus, the anterior surface of the coccyx and the lower part of the sacrum, the ovaries and tubes, and the broad ligament. With an exceptionally long finger it may be possible to feel the seminal vesicles and the vasa deferentia.

In making an examination of the rectum it must be borne in mind that frequently two or more rectal affections coexist: as, for instance, a polypoid growth complicating a fissure, or malignant disease existing with fistula and hemorrhoids, etc.

Malignant infiltration, or stricture, can be detected if situated within reach. By sweeping the finger around the mucous membrane, its condition can be noted: a general smoothness, and absence of the normal folds indicating atony; ulceration can be recognized, and the attachment of polypi can be felt. In examining for a polypus it is important that the finger should be brought from above downward; as otherwise the growth may be pushed out of reach owing to the length of the pedicle, which is often considerably elongated. Fecal masses in the rectal pouch can be recognized without difficulty.

The finger is now to be partly withdrawn, passing the palmar surface around the entire surface of the mucous membrane as this is done, in order to note the existence of internal openings of fistulæ, the seat of ulcers, etc. As the outlet of the bowel is approached, internal piles may be perceived; but the fact should always be remembered that unless they are thickened by inflammatory changes they are extremely hard to recognize by the touch; in point of fact, the sensation conveyed to the finger is more apt to deceive the surgeon than any other rectal trouble.

The Use of the Speculum.—In the large majority of rectal diseases digital and ocular examination is sufficient for purposes of diagnosis; but for some cases the use of the speculum is desirable. This instrument is made in a variety of forms; the length of the tube to be selected depending on the portion of the bowel to be explored. Before being introduced into the rectum the speculum should be warmed and well-lubricated; it should then be inserted into the anus, and gently but slowly directed a little forward and upward for a distance of about an inch, as if to pass from the perineum to the umbilicus, in order that it may follow the course of the anal canal; having reached this depth, which is somewhat greater in the male than in the opposite sex, the point should be inclined backward, first slightly, and afterward to a greater extent, until the instrument is fully inserted. Should the interior view of the rectum be obstructed by blood, mucus, or feces, a mop of cotton attached to a holder, made for the purpose, should be used to cleanse the parts. With these instruments the interior of the rectum and the sigmoid flexure can be examined, and the exact condition of affairs ascertained. Some forms of speculum are furnished with blades or plates, which can be separated to the requisite extent by means of a screw attachment.

The use of the rectal bougie for diagnostic purposes Adler condemns. The introduction of these instruments is one of considerable difficulty, and requires greater practice than the passage of a urethral catheter; the danger of perforation is as great, and the result of such an accident is very much more serious, than in the urethra. In one case a fatal peritonitis will likely be started, while in the other a false passage will probably be the sequence. The use of the Kelly tube has obviated the necessity of employing the rectal bougie for the purpose of diagnosis.

Rectal Eversion as a Means of Diagnosis.—In examining the rectum in females, Stover has recommended eversion of the bowel by the fingers placed into the vagina. This method is useful in women who have borne children, but not in the young and unmarried. A portion of the anterior wall may thus be exposed.

The introduction of the hand into the rectum is a procedure which may be a means of exploration open to the surgeon, but it is doubtful if the amount of information obtainable by its use is sufficient to warrant the practice.

Exploration with a silver probe 7 or 8 inches in length is of value in detecting blind, external, internal, or complete anal fistula. Being flexible, it may be bent to any desired form.

Injections of various fluids, such as peroxid of hydrogen, a 2 percent solution of creolin, milk, or a weak iodin solution, often serve a useful purpose for detecting the internal opening of a fistulous tract.

RECTUM, INFLAMMATION (Proctitis).—**Catarrhal inflammation** of the mucous membrane may arise from various causes: Gonorrheal infection, especially in women; syphilis during the secondary stage; abuse of purgatives; gout; errors in diet, etc. Except when it is due to the first of these, it is rarely severe; there is a sense of heat and weight in the perineum, with a constant desire to defecate. The sphincter is in a state of painful spasm; the anus is hot and tender; the amount of mucus is increased, and this, escaping externally, leads to excoriation and perhaps superficial ulceration. As a rule, the symptoms subside as the cause is removed; sometimes, however, they become chronic; and occasionally, when severe, painful catarrhal ulcers develop, requiring special treatment.

Ulceration of the rectum is much more serious, not only for itself but from the way in which it leads to stricture and fistula. In some cases it is the result of injury, the introduction of foreign bodies, the use of enema tubes, or the passage of hard scybalous masses, especially as the circulation is often sluggish and the tissues badly nourished from the presence of varicose veins. In others it arises directly from thrombosis and inflammation of the veins, or from dysentery involving the rectum as well as colon. When this occurs, the ulcers formed are of a peculiarly irregular character; they spread in all directions, forming little islands, which, as cicatrization takes place, stand out as hard warty excrescences; or they undermine the mucous membrane, so that it leaves rigid cords passing across the interior from one part to another; and the scars are of such extreme density that not improbably many of them have been mistaken for scirrhus.

In other cases ulceration is due to syphilis. In its earlier stages this attacks the anus chiefly; condylomata and superficial sores occur around the margin, leaving irregular folds of skin between which are painful fissures, not unlike those at the angles of the nose and mouth. In the latter it breaks out on the mucous membrane, some distance from the anus, forming deep serpiginous sores, which may extend almost around the bowel. Tubercle is still more common, beginning in the adenoid tissue between and beneath the follicular glands. Little nodules make their appearance first, not larger than millet seeds, and only slightly raised above the surface; after a time these become caseous and break down, leaving shallow depressions, which grow larger and deeper, until at length they become circular sores with overhanging edges. In other cases the caseous deposit seems to infiltrate the adenoid tissue in the mucous and submucous layers before the surface gives way, and deep, irregular ulcers are formed, which almost at once become the orifices of tuberculous fistulæ.

Ulceration somewhat similar in character is not infrequently associated with albuminuria; probably it originates as catarrhal inflammation; after a time the lymphatic follicles become affected and break down; and then, as there is no longer any protection against septic infection, the deeper tissues become inflamed as well. In many cases it is difficult to distinguish this from the preceding; they both occur in patients whose health has failed and whose tissues are badly nourished; and they both lead to ulceration, and not infrequently to fistulous channels of very much the same description. In addition to these lupoid ulceration may attack the skin around the anus and the mucous membrane of the rectum. It is essentially destructive in character, and cicatrization is unusual. The edges and base are not hard, as in malignant disease; and the former are undermined and overhanging. Sometimes it remains stationary for a time, and is apparently beginning to heal; then it all breaks down again. It is only met with in tuberculous subjects, and probably is itself tuberculous. The only treatment that has proved of any use is scraping and the actual cautery; sometimes the pain, at least, can be relieved in this way for a time.

Symptoms.—In acute inflammation of the rectum the patient complains of a sense of heat and weight in the perineum, spreading over the back and thighs, and of violent straining and spasm of the sphincter. The skin is dry and feverish; the anus is very tender; the finger, if it is introduced, is tightly gripped; and the mucous membrane feels burning hot. In severe cases the constitutional symptoms are very marked; the pain radiates over the whole of the lower part of the body, and there is nearly always retention of urine.

The symptoms of ulceration depend upon its situation. When the anal margin is involved, they are so striking and so severe that this affection is described as *fissure of the anus* (see ANUS (Fissure)); when, on the other hand, they are higher up—above the level of the external sphincter—they are at first very vague. Diarrhea is the most prominent; as soon as the patient gets out of bed there is an immediate desire to go to the closet, and a small quantity of liquid feces, with some mucus like white of egg, comes away. The same thing occurs perhaps once or twice in the morning; and then, if the ulceration is not far advanced, the rest of the day is passed in comparative comfort; the rectum is empty and there is nothing to irritate it. In all but the slightest cases, however, there is a constant sense of fulness and tenesmus; normal motions are never passed; the amount of discharge increases; it loses its simple mucous character, and becomes dark, like coffee-grounds. Control over the sphincter is lost; the skin around the anus is constantly moist; it becomes covered with vegetations and excrescences, between which fissures form. Then the pain becomes more severe; after each motion it is intense, and in the intervals there is always a constant dull aching. Finally, the diarrhea becomes almost continuous; health and strength fail; the appetite is lost; colicky spasms and pains over the lower part of the abdomen grow more frequent; abscesses and fistulæ form around the bowel; the emaciation becomes extreme; and the patient sinks from exhaustion, if he is not carried off by some intercurrent disorder.

Diagnosis.—In advanced cases the appearance of the anus at once suggests the presence of more serious mischief. The thickened and pigmented folds, with deep and painful ulcers in between, and the eczematous condition of the skin, can only be caused by long-continued irritation; but the diagnosis can be made only with the finger or the speculum. The former is usually sufficient; the latter can only be used with an anesthetic, and with either the utmost gentleness is essential. Immediately inside the anus the mucous membrane is generally unaffected, though both in syphilis and advanced tubercular or lupoid disease it may be nearly as bad as the rest; higher up, the normal soft character of the bowel is entirely lost. The surface is rough and irregular; hard nodules project here and there; in some places the walls are dense and thick, like stricture tissue, and the passage is narrowed; in others there are soft smooth patches, surrounded with overhanging edges, which bleed at the least touch; and the finger, when it is withdrawn, is smeared with blood-stained mucus. Sometimes it is possible from this alone to form an opinion both as to the extent and cause of the disease. Syphilitic ulceration is often accompanied by other signs; tubercle rarely leads to the formation of dense cicatrices, and fistulæ generally make their appearance very soon. Dysentery, on the other hand, may destroy all trace of normal mucous membrane, and often extends far beyond the reach of the finger. In the majority, however, a careful inquiry into the history and into the other symptoms that are present is essential; and even then it is sometimes difficult to exclude the idea of malignant disease.

Treatment.—Rest is the first consideration. The patient must lie down for at least the greater part of the day, with the foot of the bed raised to prevent venous congestion. The feces must be kept as soft and as small as possible; everything that is stimulating or indigestible, or likely to leave a bulky residue, must be strictly avoided. Pure milk diet for a time is often advantageous. All straining must be prevented; the bowel must be washed out night and morning with warm water or an astringent lotion—nitrate of silver in the case of dysentery, lotio nigra for syphilis; and after this a simple unirritating ointment (calomel—10 grains to about 1 ounce—subnitrate of bismuth, iodoform, or nitrate of mercury) may be applied, either as a suppository or with a suitable ointment introducer. Starch and opium injections are excellent means of controlling the diarrhea.

In the meanwhile constitutional treatment must not be neglected. Potassium iodid must be given in syphilitic cases. Cod-liver oil, if the patient can take it, often answers better than anything, as there is nearly always great loss of flesh and strength, and it tends to keep the motions soft; if iron is given, care must be taken that the bowels are not confined. In a few cases, when the

ulcer is low down and the spasmodic contraction of the sphincter is severe, perfect rest may be obtained by subcutaneous division of the muscle or by stretching it; but this is seldom beneficial in the more severe forms. In these, when all local treatment fails, colotomy is the only resource (Moullin).

Periproctitis.—Inflammation around the rectum may occur at the anus, in the ischiorectal fossa, or higher up in connection with the insertion of the levator ani and the rectovesical fascia.

Inflammation around the margin of the anus in many cases is symptomatic of some deeper infection. There is a constant offensive discharge from the anus, the parts are continually moist, the epidermis is macerated, and the deeper papillary layer of the skin is exposed. Inflamed external hemorrhoids, small cutaneous boils, suppuration in connection with the hair follicles, and syphilitic eruptions are not uncommon. Of itself, it may be trivial in character, but it becomes of great importance from the tendency it has to leave behind it painful fissures and superficial fistulæ.

Ischiorectal abscess is more serious. It may be acute or chronic. In the former case the symptoms closely resemble those of proctitis. It may commence with a rigor; the pulse is quick, the tongue furred; there is the most intense throbbing in the perineum; sitting down is almost impossible; the rectum feels as if it was loaded with feces, but the least attempt at relief brings on the most violent pain and straining. On examination there is a hard brawny swelling by the side of the anus; the skin is red and edematous, pitting on pressure; and if the finger is introduced into the bowel, the hardness can be felt through the wall for some distance above. Sometimes the inflammation is even more acute than this, and a form of gangrenous cellulitis, which may prove fatal, sets in. In the chronic form, on the other hand, the swelling is painless, and often lasts for weeks. There is merely a soft, fluctuating swelling, filling the whole of the ischiorectal fossa and extending up by the side of the bowel, covered by a thin layer of discolored skin. Not infrequently the patient is almost unaware of its existence, and it may attain a very large size and burrow for a considerable distance before the skin gives way. When this happens, the opening is always large and ragged, with thin overhanging edges, like those of a scrofulous sore, and a fistula is almost certain to be left. The frequency with which these abscesses occur is accounted for by the ease with which septic absorption takes place through abrasions of the mucous surface, partly owing to the anatomy of the region. Owing to the rapid variations in size of the bowel, the tissues are badly supported; the circulation is feeble; there is a large amount of loose fat, with dilated veins; and the vessels have even a greater tendency to become varicose than those of the lower extremities.

Phlegmonous inflammation is rare, except in patients who are thoroughly broken down; most of the cases recorded have been in persons who were suffering from specific fevers. Acute abscess may usually be traced to injury; perforation of the mucous membrane from the inside by a fish-bone or other foreign body; tearing of the mucous surface from straining or the passage of hardened feces; or bruising of the subcutaneous tissue, leading to extravasation in the ischiorectal fossa or to venous thrombosis. The chronic form is probably due in a very large number of cases to the breaking down of tubercular deposit in connection with the adenoid tissue of the rectum; or it may be a complication of stricture, beginning either from an ulcer on the mucous surface or, independently of this, in the inflammatory exudation surrounding the bowel. In addition to this, suppuration may extend into the ischiorectal fossa from distant organs. Urinary abscess is not uncommon; necrosis of the sacrum or coccyx occasionally gives rise to it; coccygeal dermoid cysts may cause it; and it has been known in caries of the lumbar vertebræ.

Treatment.—Ischiorectal abscesses should be opened at once, and freely, or a fistula is almost certain to form. Even if there is merely a tense, hard, and painful swelling, it is better to run the risk of not finding pus. If the abscess is small and close to the rectum, so as to give rise to the suspicion that it is really intramural, the patient should be placed upon his side, with the knees drawn up, and the finger introduced into the bowel to fix the swelling and make it project toward the skin. Then a straight bistoury is introduced, and an incision, sufficiently free to give exit to the pus, made radially from the anus. Some of the outer fibers of the external sphincter are divided, to prevent the opening from closing too soon. True ischiorectal abscesses, on the other hand, must be laid freely open by a longitudinal incision, parallel to the anus, midway between it and the ischium; and as soon as the pus has escaped, the finger must be introduced, the cavity explored, and the partitions inside broken down. Afterward, the opening must be kept patent to insure the abscess healing from the bottom. Lint should be avoided, as the discharge is liable to collect behind it, and its removal is very painful. Guttapercha tissue, folded irregularly so as to fit inside the orifice without blocking it, is the most convenient. The cavity, if the dressing does not come away easily, can be syringed out behind it, and it does not absorb the discharge. The patient should be kept in bed, or at least lying down, until the abscess has healed. If it is an acute one this will not be many days; if it is chronic, the greatest care is necessary to prevent it degenerating into a fistula. The bowels should be well opened once, and then kept confined for several days, the diet being very light, so that there may not be an accumulation of feces. When they are opened, an effectual purge should be given to avoid straining.

Inflammation on the Visceral Surface of the Levator Ani.—This is nearly always caused by extension from some of the neighboring viscera, and if it involves the rectum, is nearly always associated with stricture. Occasionally it originates from the bowel; much more frequently from the uterus, following parturition or metritis, and probably it is for this reason that stricture of

the rectum is so much more common in women than in men. The inflammation may be acute, attended with high fever, and soon ending in suppuration; or chronic, spreading from one part to another until they are firmly bound down to each other and to the pelvis by bands of cicatricial tissue, which may be almost of cartilaginous hardness. When it starts from the region of the uterus, the anterior surface of the rectum is first involved. The inflammatory exudation spreads into the substance of the muscles until the fibers become atrophied and the walls hard and unyielding; the mucous membrane becomes rigid and unable to unfold itself; the constant irritation caused by the passage of the feces gradually leads to hyperemia and thickening of the submucous tissue; and, at length, a definite stricture is formed, which may either be tubular in shape, extending for some distance along the bowel, especially on the anterior surface, or sharp, well-defined, and annular, about 1 1/2 or 2 inches above the anus. If suppuration occurs, the abscesses may break into the bladder or vagina, or they may extend through the sacrosciatic foramina, or even burst into the peritoneal cavity (Moullin).

RECTUM, INJURIES.—Injuries of the rectum occasionally occur from falls upon sharp-pointed bodies, or from incautious attempts to pass a long enema tube or bougie. Should the peritoneal cavity be perforated, death is the almost invariable consequence, especially if any injection has been absorbed by the peritoneum before the mistake is discovered.

Treatment.—Opening the abdomen, flushing out the peritoneum, and sewing up the rent in the gut affords the only hope of cure.

Foreign Bodies in the Rectum.—Foreign bodies of many differing kinds have at times been accidentally or intentionally introduced into the rectum. Fish-bones that have been swallowed not infrequently become impacted just within the anus, there giving rise to much irritation or pain, and often causing an ischiorectal abscess. The removal of some of these bodies, when of large size, is frequently attended with considerable difficulty, requiring an anesthetic, dilatation of the sphincter, and the use of various forceps, or even the passage of the whole hand.

RECTUM, PROLAPSE.—Prolapsus recti is the protrusion of the mucous membrane of the lower part of the rectum, and, more rarely, of the muscular coat as well, through the anus. It is most common in children, but may occur at any age.

The causes are either a relaxed state of the sphincter, induced by general weakness; residence in hot climates, etc.; or excessive straining due to stricture of the urethra, phimosis, stone, ascarides, constipation, piles, or polypus.

Symptoms and Diagnosis.—It commonly appears as an irregular ring of mucous membrane, or when much is protruded as a cylindric, elongated swelling. When recent, it has the color of healthy mucous membrane; but if not soon reduced it may become livid and congested, in consequence of constriction of the blood-vessels by the sphincter. The strangulation may proceed to such an extent that the prolapsed portion may undergo mortification and slough away. In old-standing cases it becomes indurated and leathery from exposure. It may be diagnosed from polypus by the presence of a central aperture, and from intussusception by the mucous membrane being continuous with that of the sphincter. In intussusception a sulcus exists between the protruded part of the bowel and the sphincter.

Treatment.—Should the bowel be protruded or strangulated, an attempt should be made to reduce it. If it has only been prolapsed a short time, this is easily accomplished by gentle pressure, the parts having been well smeared with vaselin, and the buttocks raised. When of longer standing, firm pressure must be exercised on it for 10 minutes or so, or the finger may be introduced into the orifice and the bowel pressed back. If reduction fails and the part is much inflamed, an ice-bag may be applied, and another attempt subsequently made, when, if still unsuccessful, nothing remains but to allow the protruded part to slough off or to excise it. If the muscular coat protrudes, no operation should be done, lest the peritoneum be wounded. Having reduced the bowel, the cause of the prolapse should, if possible, be removed; and to prevent a recurrence, the nates may be strapped together, or a pad and T-bandage worn, and the motions passed at bedtime instead of in the morning, the patient lying on his side or back during defecation. Astringent lotions or ointments of sulphate of iron, galls, or tannin should be applied, or the mucous membrane painted with nitrate of silver, while any pendulous folds of skin may be snipped off, so as to cause some amount of contraction of the anus. In the meanwhile the motions should be rendered soft with gentle laxatives. Should these means, after being well persevered in, fail, a more serious operation may become necessary. Comparatively recently the main active treatment of rectal prolapse consisted in chemical or thermal destruction of protruding mucous membrane or of portions of the dilated anus, the scar contraction incident to healing leading to narrowing of the anus and support of the gut. Strangulation of the protruding tissues by means of ligatures was also recommended and often gave good results. All such measures ought to be discarded, as chemical and thermal action are difficult to regulate and the strangulation by ligature is distinctly dangerous. There are three distinct principles, each of which is the base of a modern method of operative treatment.

1. When the prolapse is due to sphincteric atony or looseness, the principle of treatment is to overcome this condition by narrowing the sphincter.

2. When the prolapse is due to want of superior support, such support must be provided.

3. When there is excess of rectum and much tissue is prolapsed, the protruded mass should be excised. Generally this excision must be supplemented by narrowing the sphincter.

Thus according to the indications in the individual case plastic operations may be performed upon the sphincter ani, the lumen of the rectum

narrowed, the rectum or sigmoid raised to a higher level and retained by sutures. The operation of sigmoidopexy, in which the peritoneal cavity is opened and the sigmoid flexure sutured to the abdominal walls is advocated by a number of surgeons. Excision of the prolapsed bowel is not advised.

RECTUM, STRICTURE.—Stricture of the rectum may be divided into the simple and the malignant.

The simple or fibrous stricture may be caused by the fibroid contraction of inflammatory products in the mucous and submucous coats, or of cicatrices following simple, syphilitic, or dysenteric ulceration; by injury, or operation on the bowel; or it may be the result of pelvic inflammations.

Pathology.—The stricture is generally situated from 1 to 2 inches from the anus, but may occur at any part. It may involve only a narrow, ring-like portion, when it is called annular; or it may include an inch or more of the gut, when it is sometimes spoken of as tubular. The strictured portion of the bowel consists in great part of fibrous tissue. The syphilitic variety is often combined with condylomata or ulceration about the anus, and the mucous membrane between the anus and the stricture is frequently ulcerated. The bowel above is generally distended with feces, the muscular coat hypertrophied, and the mucous membrane ulcerated; while in the neighborhood of the stricture the coats are often so thin that the least force causes them to give way. Fistulæ often form below the stricture, and hemorrhoids are a frequent concomitant.

Symptoms and Diagnosis.—Pain and difficulty in passing a motion, constipation, and, later, constipation alternating with diarrhea. The motions, when the stricture is near the anus, become small, ribbon-like, and streaked with discharge. There is a frequent desire to defecate, but little passes except gas and mucus, or pus, and the bowel feels as if it had not been emptied. In tight strictures or in strictures with ulceration fistulæ may sometimes form about the anus, and the patient gets worn out; and after many years, perhaps, of suffering may die of an attack of peritonitis or obstruction. The stricture is readily detected on passing the finger, but is often so tight that only the tip can be inserted. When this is the case, on no account should the finger be passed through it, as the slight force of passing the finger may rupture the attenuated walls, and peritonitis and death may follow.

Treatment.—As a rule, gradual dilatation by means of bougies should be first attempted, and will generally be successful; but the stricture must be kept dilated by the subsequent occasional passage of a bougie. In exceptional cases, when the stricture is very resistant, a bougie may be tied in. When the parts are much riddled by fistulæ, a division of the stricture may be necessary. This may be done by what is called internal or external **linear proctotomy.** In the former operation the knife, guided by the finger, is introduced through the stricture, which is then divided in a posterior direction; in the latter, the stricture, together with the external sphincter and other intervening soft parts, are completely divided down to the coccyx.

Malignant or Cancerous Stricture.—Cancer in all its forms may occur in the rectum, but the most common is a variety of carcinoma known as the columnar or adenoid. It occurs either as a fungating, more or less distinct tumor projecting into the lumen of the bowel; or as a laminar, nodular, or ring-like infiltration of its coats. In either case it is at first covered by apparently unaltered mucous membrane, which, however, is sooner or later destroyed by ulceration, leaving an ulcer with an uneven, proliferating, or excavated surface, everted edges, and an indurated base. As the disease extends, it involves the muscular coat, and subsequently the surrounding structures and organs, gluing them, as it were, to the rectum, and finally converting the whole into a cancerous mass. The lymphatic glands in the pelvis, and later the inguinal glands and others more removed, become affected, and the carcinoma may finally be disseminated, secondary growths being more especially met with in the liver.

The symptoms are often very insidious. At first there may be merely some uneasiness, hardly amounting to pain, about the anus; then more or less pain on defecation is noticed; the feces may be streaked with mucus or with blood, and a slimy discharge may be present. Later, the motions become small, flattened, or pipe-like when the stricture is near the anus, or scybalous when some distance above. The patient strains at stool, and feels as if his bowel had not been emptied; then there is constipation, alternating with diarrhea, and an offensive sanious discharge. Emaciation and cachexia now come on, with more local pain, and the patient dies of exhaustion, peritonitis, or during an attack of acute obstruction.

The diagnosis can only be arrived at by a local examination. The anus generally appears healthy, though probably patulous, and a healthy strip of mucous membrane generally exists between the anus and the growth. When the growth can be felt, its indurated base, and when ulceration has occurred, the everted edges of the ulcer, and the sanious and foul discharge, render the diagnosis generally easy. When beyond the reach of the finger, it may at times be brought down by the patient straining. The fungating form may be mistaken for a villous growth; the annular, for a simple fibrous stricture. A *villous growth* may be distinguished by its velvety and supple feel, by the fact that it does not ulcerate nor break down, by the absence of induration, by the thin and mucoid discharge, by the brightness and scarcity of the blood, by the unattached rectum, and by the duration of the disease. A *fibrous stricture* may be known by its longer duration, by being less indurated than the cancerous form, by the bowel not being fixed, and, when due to syphilis, by the absence of a healthy strip of mucous membrane between the growth and the anus.

Treatment.—If the disease is seen sufficiently early, and before it has involved the surrounding parts, if it is not situated too high up in the rectum, and if the general condition of the patient is other-

wise favorable, excision of the growth with the lower end of the rectum should be undertaken, as in this way the whole may be removed, and not without reasonable hope, in some of the less malignant forms of the disease, of its not returning. Some cases have been reported in which it has not done so for upward of 4 years. Previous to removal of the rectum it may be wise to perform inguinal colotomy, since after this operation there is less risk of the wound left by the excision becoming septic. When removal seems impracticable, or otherwise inadvisable, such palliative measures should be adopted as may render the last few months or years of the patient's life as comfortable as possible. Thus, the bowels should be kept gently relaxed, the diet regulated, and the pain relieved by morphin suppositories. In this way the patient can often follow his occupation in comparative comfort and with little inconvenience. Should, however, there be very frequent calls to defecate, much pain and irritation on the passage of feces, or obstruction threaten or have already occurred, colotomy should be performed. This operation should not, as is too frequently the case, be regarded merely as a last resource, to be undertaken when obstruction has come on, as then the danger of the operation is greatly increased. Nor should it be undertaken in every instance, since the inconvenience caused by the cancer is not always sufficient to justify the patient undergoing the risk (Walsham).

Excision of the rectum may be performed if the finger can be passed beyond the growth, if the growth is movable, if the glands are not involved, and if the patient is otherwise fairly healthy. The patient having been placed in the lithotomy position, and a staff introduced into the bladder, a curved bistoury should be passed along the finger up the rectum, and its point made to emerge near the coccyx, and the intervening tissues cut through in the middle line. By this incision a free exposure is obtained. Lateral incisions are next made on each side of the anus, meeting in front, and the bowel is rapidly cleared, either with the finger or with the handle of the scalpel, from the tissues of the ischiorectal fossa. The lower part of the rectum is now dissected more carefully from the urethra and prostate, and when it has been sufficiently freed, the ecraseur is placed above the growth, and the rectum removed, care being taken that the cord when tightened is not pulled down below the spot where it is intended to sever the bowel. If preferred, the scissors may be substituted for the ecraseur, the vessels being then tied as they are cut. When the growth does not involve the whole of the bowel, a strip of mucous membrane should, if possible, be left. The wound should be plugged for 24 hours with iodoform gauze if there is much oozing, and the parts subsequently irrigated frequently. More of the rectum may be removed by resection of the coccyx and lower part of the sacrum, the incision extending backward and to the left side (Kraske's operation).

RECTUM, TUMORS. Polypi.—The term polypus has been erroneously applied to almost any outgrowth from the mucous membrane that projects into the cavity of the bowel. A polypus should be pedunculated, but it may be sessile, provided the base is relatively small; and it may be a new growth altogether—adenoma or fibroma—or a mere overgrowth of the normal tissue of the part. Generally, polypi are single, growing within a short distance of the anus, from the dorsal surface of the bowel; but sometimes there are 2 or 3, and in a few instances there have been hundreds. As a rule, their size is not large; the fibrous ones are seldom larger than a walnut, and adenomata in most instances are not so large; but when there are 2 or 3 together, they have been known to block up the interior, and give rise to symptoms of obstruction. The soft polypus is most frequent in children. It is generally the size of a raspberry, bright red in color, smooth or slightly granular on the surface, and bleeds at the least touch. It is composed mainly of tubules lined with columnar epithelium, like Lieberkühn's follicles, held together by a delicate connective tissue, and dilated in places into cysts; sometimes there is a little more fibrous tissue, and occasionally a few unstriped muscular fibers. At first they are sessile, but as they rarely give rise to symptoms until they protrude from the anus, a long and slender pedicle is generally present by the time the diagnosis is made. Fibrous polypi, on the other hand, are rare except in adults. They spring apparently from the submucous layer, and are composed of fibrous tissue, which may be so hard as to creak when divided with a knife. It has beeen suggested that they are really adenoid polypi, which in course of time have become hardened and condensed by constant irritation. Occasionally, it is almost impossible to distinguish them from internal hemorrhoids.

Beside these, polypoid outgrowths of mucous membrane, hypertrophied from persistent irritation, are often present in cases of fissure just inside the anus.

Symptoms.—These are not definite until the pedicle is long enough to be grasped by the bowel. In children, bleeding from the anus is often the first thing noticed, and in the absence of injury may be regarded as almost conclusive. Sometimes the growth is extruded during defecation, and is caught by the sphincter, giving rise to pain and spasm; and it may even slough off, and undergo spontaneous cure. In adults hemorrhage is not so conspicuous, but there is usually a considerable discharge of mucus, like thin starch or white of egg, not only with the motions but in the intervals. If the polypus comes down, the pain and irritation may be very severe, and it may drag the bowel down with it so as to cause prolapse, or, if it is situated higher up, intussusception.

A protruding polypus can be recognized at once by its appearance. If it is not visible at first, an injection may be given, and the part examined immediately after. When the finger is introduced, it is advisable to pass it up to its full length at once, and search the mucous membrane as it is withdrawn; otherwise a polypus with a slender pedicle may be pushed up in front of it and missed.

Treatment. –Polypi may be removed by torsion

and ligation. The former answers very well in children, and if the pedicle is really twisted off, is not followed by hemorrhage; the latter is better if the pedicle is of any size, or if the growth is fibrous. An anesthetic is advisable. If a ligature is used, precautions should be taken to avoid ulceration.

Villous growths, similar to, but rather coarser than, the fimbriated papilloma of the bladder, are occasionally met with in the rectum. Allingham, who has had the widest experience with this condition, describes these growths as forming soft, lobulated, spongy masses, either sessile or with a pedicle formed from the subjacent mucous membrane. In most cases they grow from the posterior wall rather high up, and by far the greater number occur in people over 50 years of age. In some they cause severe hemorrhage, and the growth occasionally becomes prolapsed; but the most striking feature is the constant discharge of large quantities of thin watery mucus. The diagnosis, unless some portion of the growth is forced out through the anus, is exceedingly difficult, owing to the peculiarly soft, velvety feel of the mass, which prevents distinguishing it from the natural folds of the mucous membrane. The only treatment is free excision; and this is especially necessary, as in a large proportion of cases malignant disease follows (Moullin).

Nevus of the rectum is occasionally met with, and may give rise to very profuse hemorrhage.

Hemorrhoids.—See HEMORRHOIDS.

REFLEXES.—Reflex movement is caused by the stimulus of an afferent nerve, and the transference or return, by a center, of the impulse through an efferent nerve, resulting in movement or function of a peripheral organ. Reflexes may be motor, sensory, secretory, tactile, or inhibitory. See NERVOUS DISEASES (Examination). A table of reflexes is herewith appended.

REFLEXES, TABLE OF

NAME.	DEEP OR SUPERFICIAL.	HOW OBTAINED.	EFFECT PRODUCED.	SIGNIFICANCE.
Abdominal	Superficial	Sharp, sudden stroking of abdominal wall from margin of ribs downward.	Contraction of muscles about umbilicus.	Shows integrity of cord from eighth to twelfth dorsal nerve.
Ankle-clonus	Deep	By sudden complete flexion of foot, by pressing hand against sole.	Clonus contractions of tendo Achillis, dependent upon alternate contraction and relaxation of anterior tibial and calf muscles.	As in knee-jerk.
Argyll Robertson		See Robertson, Argyll.		
Babinski	Deep	Irritation of the skin of the sole of the foot.	Extension instead of flexion of the toes.	Lesion of pyramidal tract. Found in organic, but not hysteric, hemiplegia.
Biceps	Deep	Tapping tendon of biceps.	Contraction of biceps muscle.	Same cases as increased knee-jerk.
Ciliospinal	Superficial	By irritation of the skin of the neck.	Pupillary dilatation.	
Conjunctival (corneal).	Superficial	Irritation of conjunctiva	Contraction of orbicularis palpebrarum.	Abolished by complete anesthesia, deep stupor coma.
Cremasteric	Superficial	Stimulation of skin on front and inner aspect of thigh.	Retraction of testicle on same side.	Shows integrity of cord between the first and second lumbar pairs of nerves.
Crossed	Deep	Stimulation of one side of body.	Reflex on opposite side of body.	
Deep		Reflexes developed by percussion of tendons or bones.		
Dorsal	Superficial	Same as *Erector spinæ*.		
Elbow-jerk.				
Epigastric	Superficial	Stimulation of skin in fifth or sixth intercostal space near axilla.	Dimpling in the epigastrium, due to contraction of the highest fibers of the rectus abdominis muscle.	Shows integrity of cord from fourth to seventh dorsal nerves.
Erector spinæ	Superficial	Stimulation of skin along border of erector spinæ muscle.	Local contraction of these muscles.	Integrity of dorsal region of cord.

REFLEXES, TABLE OF

Name.	Deep or Superficial.	How Obtained.	Effect Produced.	Significance.
Front-tap	See *Tendo Achillis*.			
Gluteal	Superficial	Firm sudden stroking of skin over buttock.	Contraction of glutei	Shows integrity of cord at fourth and fifth lumbar nerves.
Interscapular	Superficial	See *Scapular*.		
Iris-contraction	Superficial	See *Pupillary*.		
Jaw-jerk, or jaw-clonus.	Superficial	Downward stroke with a hammer on the lower jaw hanging passively or gently supported by the hand.	Clonic movements of inferior maxilla.	Rarely present in health.
Knee-jerk	Deep	By striking patellar tendon after rendering it tense by flexing the knee at right angle.	Contraction of quadriceps muscle, foot jerked forward.	Normal in health. *Absent* in locomotor ataxia, destructive lesions of lower part of cord, alcoholic paraplegia, affections of the anterior gray cornua, infantile paralysis, † meningitis, diphtheritic paralysis, atrophic palsy, pseudohypertrophic muscular paralysis, diabetes, etc. *Increased in* diseases of the pyramidal tracts, in spinal irritability, tumors of brain, cerebrospinal sclerosis, lateral sclerosis, after epileptic seizures or unilateral convulsions.
Laryngeal	Superficial	Irritation of fauces, larynx, etc.	Cough.	
Lumbar	Superficial	Same as *Erector spinæ*.		
Nasal	Superficial	Irritation of Schneiderian membrane.	Sneezing.	
Obliquus	Superficial	Irritation of skin below Poupart's ligament.	Contraction of fibers of external oblique in females; corresponds to cremasteric in males, although it can also be caused in males.	
Ophthalmic (supra-orbital).	Superficial	Blow struck over supra-orbital nerve.	Slight contraction of orbicularis palpebrarum muscle.	
Palatal	Superficial	Irritation	Swallowing.	
Palmar	Superficial	Tickling of palm	Contraction of digital flexors.	Shows that cervical region of cord is normal
Patellar	Deep	Same as *Knee-jerk*.		
Patellar, paradoxic.	Superficial	Percussing patellar tendon with the patient in the dorsal decubitus.	Contraction of the adductor, but not of the quadriceps muscle. If the patient be in the sitting posture the normal reflex is elicited.	Spinal concussion.
Penis-percussion	Superficial	See *Virile*.		
Periosteal	Deep	Tapping the bones of the forearm or leg.	Sharp contractions of the muscles.	Indicates disease of the spinal cord (amyotrophic lateral sclerosis).
Peroneal	Superficial	Stroke on peroneal muscles when tense or when the foot is turned inward.	Reflex movements.	

REFLEXES, TABLE OF

Name.	Deep or Superficial.	How Obtained.	Effect Produced.	Significance.
Pharyngeal	Superficial	Irritation	Swallowing	
Plantar	Superficial	Stroking sole of foot.	Contraction of toes	Muscular exertion.
Platysma	Superficial	Pinching the platysma myoides muscle.	Dilatation of pupil.	
Pupillary		Exposure of retina to light.	Contraction of iris	Absent in basal meningitis, etc.
Paradoxic Pupillary.		Stimulation of retina by light.	Dilatation of pupil	In rare abnormal states.
Paradoxic Patellar.	See *Patellar, Paradoxic.*			
Reinforced	Any reflex is heightened by coincident muscular exertion of other parts than those being tested or by mental distraction.			
Robertson, Argyll		Light and accommodation.	Pupil reacts in accommodation, but not to light.	Locomotor ataxia.
Scapular	Superficial	Irritation of interscapular region.	Contraction of scapular muscles.	Shows integrity of cord between upper two or three dorsal and lower two or three cervical nerves.
Skin	Superficial	See *Platysma.*		
Sole		Same as *Plantar.*		
Spinal		Those reflex actions emanating from centers in the spinal cord.		
Superficial		Such as are developed from irritation of the skin.		
Tendo Achillis, or front tap contraction.	Superficial	By striking muscles on anterior part of leg, while in extension, the foot being extended by the hand upon the sole.	Reflex contraction of gastrocnemius.	Considered by Gowers as a delicate test of heightened spinal irritability.
Toe (great)	Superficial	Strong flexion of great toe.	Involuntary flexion of foot, then flexion of leg, and, lastly, flexion of the thigh on the pelvis.	Met with in cases in which the knee-jerk and other tendon-reflexes are strongly developed.
Virile	Superficial	Sharp percussion of back of penis, the sheath having been made tense.	Retraction of bulbocavernous portion.	Occurs in health.
Wrist-clonus	Deep	By pressing hand backward, causing extreme extension.	A series of jerking movements of the hand.	In the late rigidity of hemiplegia.

REFRACTION OF THE EYE.—The case of test-lenses should contain a set of + spheric lenses and − spheric lenses in pairs from 0.12 D. to 20 D.; a set of + cylinders and − cylinders from 0.12 to at least 6 D., and a set of prisms from 0.5 degree to at least 20 degrees; several plain-colored glasses, opaque glasses, blanks, stenopaic discs, etc., and a trial-frame.

Trial-frames for test-lenses are of several varieties. The most common form consists of an arrangement whereby the nose-piece may be rapidly adjusted by means of a screw, so as to make the frame conform to any height or depth of the bridge of the patient's nose. A vertical and horizontal adjustment by a rack-and-pinion movement on the nose-piece enables us to quickly and perfectly adjust the frame to any peculiarity of the patient's face. A millimetric scale with a pointer moved by a double rack-and-pinion device gives the distance between the pupils at a glance. The lens-holder consists of two hollow grooves, with a slot in each eye-piece to permit rotation of cylindric lenses with handles. On the outside of each eye-piece are hooks for adjusting an additional lens or a blinder. The markings on the eye-pieces begin at zero at the nasal side, and run to the temporal side to 180 degrees. The axis at which the cylinder is inclined is found by comparing the axis marked on the test-cylinder with the coinciding number on the trial-frame. However, as the trial-frame is not often perfectly adjusted, it is well for the surgeon to learn to estimate the angle, particularly in the vertical and horizontal meridians, with his eye. In placing strong lenses in the trial-frame it is well to have the convex surface of convex lenses turned away from the eye, and the concave surfaces

of concave lenses turned toward the eye. In all cases the lenses should be placed as near the eye as possible.

Practical Procedure with the Test-lenses.—Having been assured that all the accommodation is suspended, seat the patient to the left of the table containing the test-lenses, and commence the examination with the right eye, covering the left with an opaque lens or metal disc. Then ask the patient to read down the card situated at 5 or 6 meters' distance, until he comes to the letters that are indistinct; then commence the application of the lenses. Experience will give a good idea what lens to start with, by noting the amount of interference with vision after mydriasis. If the patient is able to recognize only the largest letters on the card, he is either amblyopic, myopic, or highly hyperopic, and is quite likely in every case astigmatic. If the patient is amblyopic from intraocular disease or other cause, the application of a pin-hole perforated disc will not increase his vision, and it is not likely that glasses will improve his sight. If the trouble is only refractive, he will at once notice an improvement in vision through the small perforation. If he is astigmatic, he will select the stenopaic disc (a blank disc with a small open slit, described under ASTIGMATISM (*q. v.*)) at an angle corresponding to the axis of his astigmatism, and the two meridians may be refracted separately by spheric lenses alone.

It is perhaps well to assume the simplest examination of a moderate degree of ametropia. First using a low power + spheric lens (0.25), inquire if the confused letters are improved by it; if the patient answers yes, try a corresponding strength astigmatic lens starting at axis 90 degrees, and inquire if the vision is still better; then rotate the cylinder in the frame, finding the axis at which the letters are seen best. If the patient prefers the cylinder to the spheric lens, put on the cylinder at the axis preferred, and determine the line read with this correction. A low power + spheric lens (0.25) is held in front of the eye that is already corrected by a cylinder, and inquiry is made whether or not the vision is improved, and also whether a correspondingly low + cylinder still further improves the vision; if the spheric lens is preferred to the cylinder, it is put in the trial-frame, back of the cylinder first applied, and the same mode of procedure further pursued, testing with a low spheric lens and then a low cylinder until the vision can no longer be improved. The result is then noted and the examination of the other eye commenced in the same manner.

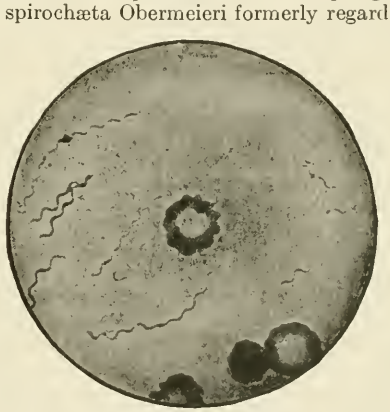
If, however, neither a + spheric nor a + cylinder lens improves the vision, a − spheric and a − cylinder are used in the preceding manner. It sometimes happens that a + cylinder is accepted, but further improvement cannot be obtained by an advance in the strength of a cylinder, or by the addition of a + spheric lens; in such case immediately resort to a − spheric lens or a − cylinder, placed at an axis at right angles to the position at which the + cylinder was preferred. Occasionally rotating a cylindric lens of one eye, with both eyes corrected and participating in vision, will definitely determine a doubtful axis better than if the fellow-eye is excluded by an opaque disc.

An exact knowledge of the correct method of using the test-lenses can only be obtained by long experience; a few other practical points are given in the discussion of the various forms of ametropia. See ASTIGMATISM, HYPEROPIA, MYOPIA EYESTRAIN.

Other Methods of Determining Refraction of the Eye.—In this discussion the many other ingenious methods devised will be left to the numerous text-books on ophthalmology. For practical purposes it is only necessary to describe the ordinary and universally used subjective method with test-cards and test-lenses, and the objective methods of importance—namely, refraction with the retinoscope, with the ophthalmoscope, and the estimation of corneal astigmatism by the ophthalmometer. See OPHTHALMOMETER, OPHTHALMOSCOPY, RETINOSCOPY, VISION (Tests).

RELAPSING FEVER (Febris Recurrens; Spirillum Fever; Famine Fever; Seven-day Fever; Typhus Icterodes).—An acute infectious disease characterized by two or more febrile relapses separated by periods of total remission, and caused by the inoculation and multiplication of the spirochete of Obermeier.

Etiology.—The specific cause of relapsing fever is the spirochæta Obermeieri formerly regarded as



SPIRILLA OF RELAPSING FEVER FROM BLOOD OF A MAN.—(*Kolle and Wassermann.*)

a bacterium of the genus spirocheta but now regarded as probably a protozoan parasite—a trypanosome. First discovered by Obermeier in the blood of cases, it is known by his name. It is a narrow spiral about 0.025 to 0.05 mm. (1/1000 to 1/500 inch) in length; that is, its length is from 3 to 6 times the width of a red blood-disc. It is found floating among the blood-discs during the fever. Before the crisis and in the intervals the organism is not found; but small, glistening spherules, said to be its spores, take its place. Confirmation of the contagious nature of the disease is found in the fact that it has been communicated from one human being to another by inoculation of blood, and to monkeys in the same way. It may be supposed that the organism is given off in the breath or from the skin. The operation of the cause is undoubtedly favored by overcrowding,

by filth, and by destitution. Yet the disease is not confined to the poorly fed. Neither age, sex, nationality, nor season are factors in its causation.

There is no essential morbid anatomy, and such as is found corresponds with that of typhus. Most conspicuous is enlargement of the spleen.

Symptoms.—The period of incubation varies greatly, so that it is put down at from 2 to 14 days. According to Murchison there may actually be no interval between exposure and the invasion. The latter is sudden by a chill, fever, intense pain in the back and limbs, with dizziness. This abrupt invasion is a distinctive feature, and in perhaps none of the contagious diseases is it as a rule so marked. Exceptionally only is there a short period of malaise with loss of appetite. On invasion the temperature rises rapidly and quickly reaches 104° F. The patient cannot retain his feet and promptly takes to his bed, feeling very sick rather than profoundly weak; there may be nausea and vomiting and even convulsions in the young; the pulse rises rapidly, more rapidly than in typhus, reaching 140 on the second day, and later 150 and 160. The patient may be delirious, but the typhoid symptoms are not usually so profound as in typhus, and the tongue remains moist. Jaundice appears in a certain number of cases on the third or fourth day, usually in 1 out of every 12 cases, occasionally as often as 1 in every 4 or 5. The temperature during the paroxysm fluctuates slightly, being higher in the evening. Sweating and sudamina are often present and occasionally petechiæ, but there is no characteristic eruption. Rarely, a roseolous rash appears in small spots, or it may be a mottling like that of typhus, which, however, always disappears on pressure, and disappears altogether in 3 or 4 days, differing in these respects from the similar eruption of typhus. Herpes may be present. There is occasionally abdominal tenderness in the epigastric or iliac region and the enlarged spleen may be easily detected, but there are no active intestinal symptoms. The liver is also slightly enlarged, extending lower than in health. The spirillum is to be found in the blood and should always be looked for. It may readily be detected with a power of 500 diameters without any special preparation of the blood, care being taken simply to secure a thin film.

If the invasion of relapsing fever is sudden, its termination is not less so. It is by crisis, beginning usually with sweating. After 5 or 6 days of unabated fever, sweating sets in, which soon becomes profuse, the temperature falls rapidly to normal or even subnormal, the various discomforts fade away, and in the course of a few hours the patient is apparently well. Rarely the crisis may be ushered in by a diarrhea, an epistaxis, or the appearance of menstruation. The crisis does not always take place at the same stage of the disease. It may occur as early as the third day or not until the tenth, and even the fifteenth, but most commonly on the seventh. While the crisis is ordinarily followed by some relaxation and faintness, there soon ensues a rapid recovery of natural and healthful feeling. Occasionally, however, the depression is greater, and a feeling as of collapse occurs, especially in delicate or elderly persons. Again, in a week from the crisis—generally on the fourteenth day from the primary chill—another occurs, or a series of them, with fever, and the paroxysm repeats itself, to be again succeeded by a crisis at a somewhat shorter interval. There may be a third or even fourth and fifth paroxysm; more commonly they are limited to two or at most three. Each succeeding attack is shorter than the previous one. Occasionally there is no relapse, the disease terminating with the first crisis. Convalescence, usually rapid, is sometimes prolonged, and the duration of the entire illness may be put down at from 18 to 90 days, and the patient rarely returns to work within 6 weeks. One attack does not confer immunity from another (Tyson).

Complications.—Among the complications may be mentioned bronchitis, pneumonia, nephritis, and hematuria. The spleen may enlarge until it ruptures. It may attain a weight of 4 1/2 pounds, and may be the seat of infarcts. Albuminuria occurs as in other fevers characterized by high temperatures. Pregnant women usually abort in the relapse, and the child, if not still-born, survives but a few hours. Postfebrile paralysis may occur, and troublesome ophthalmia succeeds in some epidemics.

Diagnosis.—**Yellow fever** has many points of resemblance, but has a shorter febrile stage, remission not so complete, vomiting late and characteristic, normal spleen, and the late appearance of yellow color.

Remittent fever begins with a decided chill, followed by fever and sweats, and not the progressive rise of temperature until the fifth or seventh day. Examination of the blood will reveal a different organism from that of relapsing fever.

Prognosis.—Recovery is the rule, but protracted, and decided emaciation results.

Treatment.—The febrile paroxysm demands much the same treatment as typhus: Careful nursing; sponging or cool bathing; nutritious, easily assimilable food, and stimulation, although the latter is less important than in typhus. No drug has the power to prevent the recurrence of the relapse, although quinin is indicated, and, as in other adynamic fevers, is useful as a roborant. It is reasonable to expect that acetphenetidin, acetanilid, or antipyrin will relieve the muscular pains. Should they not suffice, morphin, hypodermically, can be relied upon. A serum has been elaborated from the blood of infected horses and the results following its use seem gratifying.

REMITTENT FEVER.—See Malarial Fevers.

RENAL CALCULUS.—See Kidney (Stone).

RENAL INSUFFICIENCY.—See Phenolsulphonephthalein Test.

RESINOL.—A product obtained by the destructive distillation of resin. It occurs as a yellowish oily liquid, and is used as a solvent for phenol, aristol, iodol, camphor, cocain, carbolic acid, creosote, phosphorus, and many alkaloids. Its physiologic action and uses are those of tar. In chronic scaly skin-diseases, especially psoriasis and chronic eczema, it is serviceable.

RESINS (Resinæ).—The proximate principles called by this name are neither the commercial resins nor the resins of pharmacy, all of which are complex bodies, but include only the chemical individuals of resinous character existing in nature, as those in copaiba, cannabis, gamboge, guaiac, gurjun, etc. Even these, in their commercial form, are accompanied by other principles. It is difficult to define the resins correctly, but they are generally considered to be oxidation products of hydrocarbons, such as terpenes. They are mostly brittle, amorphous, uncrystallizable solids, insoluble in water, but soluble in alcohol, ether, chloroform, benzin, etc. Most of them are of acid character, combining with alkalies to form a kind of soap, these "resin-soaps" being soluble in water and giving up their resins again to the action of acids. They soften or melt when heated and solidify again on cooling.

The substances ordinarily called resins are usually classified as follows:

True resins are hard, compact products of oxidation, and are made up chiefly of resin acids. Such are copal, damar, mastic, sandarach, dragon's blood, gum-lac and amber. **Gum-resins** are natural mixtures of gum and resin. When they are rubbed up with water the gummy matter dissolves and the resin is suspended in the form of an emulsion. Such are olibanum (frankincense), myrrh, ammoniac, asafetida, galbanum and tragacanth. **Oleo-resins** include all mixtures of volatile oils and resins of whatever consistency, also the balsams or mixtures of resins with benzoic and cinnamic acids. Such are copaiba, crude turpentine, storax, and the true balsams—benzoin, balsam of Peru and balsam of Tolu. See Oleo-resins. **Pharmaceutical resins** are solid preparations obtained by precipitating the resinous principles of plants from their alcoholic solutions by the agency of water. They differ from alcoholic extracts in containing only those principles which are soluble in alcohol and insoluble in water, while the extracts contain all principles which are soluble in alcohol. Including resina itself, which is the residue left after distilling off the volatile oil from turpentine, there are 4 official resins: Resina; R. Jalapæ; R. Podophylli; R. Scammonii.

RESORCINOL.—$C_6H_4(OH)_2$. Metadioxybenzene, a substance produced from different resins, and from umbelliferous gum-resins on fusion with caustic potash. It is isomeric with hydroquinon. It crystallizes in colorless rhombic prisms or plates, melts at 118° C., and boils at 276° C. It resembles carbolic acid in many of its properties, but it is less toxic; it is odorless, antiseptic, and a powerful germicide. It is valuable chiefly as an antipyretic in malarial fevers, and locally as a lotion in diphtheria and certain skin-diseases. Dose, 1 to 10 grains; as an antipyretic, 5 grains every 2 hours, or 15 to 30 grains not repeated. It is readily soluble in water, alcohol, and ether. In dyeing it yields a fine purple-red coloring-matter, and several other dyes of commercial importance.

Poisoning.—Toxic doses (15 grains to each 35 ounces of weight) paralyze the motor tracts in the spinal cord, but do not affect the general sensibility. It is eliminated chiefly by the urine, which it colors a bluish-violet hue. The best test of its presence is the solution of the perchlorid of iron, which produces with it a dark-violet, almost black, color. Atropin and other cardiac and respiratory stimulants, cerebral excitants, and agents that raise the arterial tension are physiologically antagonistic.

In subacute or chronic eczema:

R. Resorcin, Zinc oxid,	each,	ʒ j
Cold cream,		ʒ x.

Apply to the affected parts twice daily.

RESPIRATION.—See Artificial Respiration, Chest (Examination).

REST CURE.—What is known as the "rest cure" or "rest treatment" was perfected in this country by S. Weir Mitchell. The treatment is especially directed toward the restoration of the vitality of the feeble or overworked by a combination of isolation from friends, rest in bed, and excessive or forced feeding, together with the thorough use of massage and electricity. The cases best suited for this treatment are those in which an enfeebled condition has resulted from an infectious disease, from pneumonia, etc., those of chronic dyspepsia, malarial toxemia, neurasthenia, spinal irritation, and hysterics.

By this method an entire change in surroundings, diet, and mode of life is instituted with the hope that "routine" may be combated and mental activity reduced to the minimum. From 4 to 6 weeks absolute rest in bed is required in most cases.

During the first week only milk is allowed, 4 ounces of which are given every 2 hours and gradually increased until 10 to 12 ounces are given every 3 hours. Stimulating drugs are prohibited, the dominant idea being to place the whole nervous system in a state of profound rest. Nutritive tonics and digestants only are permitted.

To counteract depression and exhaustion, which necessarily ensues from confinement to bed, massage and electricity are employed daily. Proper periods are chosen for massage, usually selecting some period an hour or two after meals. The patient lying in bed, the operator, first beginning at the toes, carefully kneads the parts in all directions; the muscles of the foot are then similarly treated, then the ankles, legs, and body, while at the same time the joints are bent in all directions.

It is essential that the anatomic relations of the muscles should be known in order that passive exercise of each may be encouraged. From 20 minutes to 1 hour are spent in this exercise. In treating the larger muscles they should be grasped firmly, pressed downward, and then kneaded. All massage movements should be in the direction of the heart, in order that the circulation may be naturally stimulated. The form of electricity employed is the faradic current of very moderate intensity with a slow interrupter. A space of 4 or 5 inches should interpose between the two poles, and sufficient time allowed to elapse in order that a full muscular contraction may ensue. After the arms and legs have been treated in this manner for some time, the rapid interrupter is used;

one pole is applied to the neck, the other to the heel for 10 minutes, then to the other heel for an equal length of time. Forty minutes should be given to this application.

Proper mental and bodily habits are demanded. The patient is aroused about 7 A. M., given a cup of coffee, tea, or cocoa, and subsequently a cold bath while in bed, bathing each limb alternately; an hour later a generous breakfast is allowed, and at 10.30 milk, broth, or soup is given. At 11 A. M. massage is employed, followed by a glass of milk. At 1 P. M. a liberal dinner is given, and at 3 P. M. liquid food. At 6 P. M. a moderate supper is served, and at 9 P. M. a glass of milk. Frequently, a dry scrub-bath may be given before the patient is allowed to sleep.

In 3 or 4 weeks the patient may be allowed to sit up out of bed for an hour or two, and a few days later may take excursions out of doors for from a half or three-quarters of an hour. At the end of 6 weeks the patient is advised to spend several months at the seashore, and, if possible, a short period in the mountains.

RETENTION OF URINE.—See URINE (Retention).

RETINA, DISEASES.—Hyperemia of the retina is detected by an increase in the size of the retinal vessels, particularly noticeable over the disc, which appears pinkish in contrast. It is caused by stasis or irritation. In stasis-hyperemia the thickness of the veins in comparison with the arteries is noticed. Irritation-hyperemia usually accompanies inflammation of some other portion of the eye, or it may be a sign of eye-strain. It is quite common in persons with some uncorrected refractive error or muscular imbalance, who use their eyes to excess.

Treatment should be directed to correction of any ametropia or muscular trouble, and the eye should be put at rest and shielded with protective glasses. If the hyperemia is supposed to be a local expression of cerebral congestion, the treatment for the latter affection should be instituted.

Retinal hemorrhage is seldom an independent affection, but is usually associated with some disease or injury of the retina; or it may be the result of some condition provocative of hemorrhage in any other organ, such as atheroma of the arteries, hypertrophy of the left ventricle, scorbutus, hemorrhagic purpura, nephritis, diabetes, pernicious anemia, etc. In such conditions the immediate cause may be muscular strain, violent coughing, or sudden change in the intraocular tension after operation. Hemorrhage following occlusion of the retinal vessels will be mentioned later.

Diagnosis with the ophthalmoscope is easy if the media are clear and if the remaining portion of the retina and disc is unaffected. In such a case a fresh clot appears as a bluish-red blotch on a white background; or, if the clot is old, a brownish-red blotch is seen; or the only remnants of the hemorrhage may be a spot of yellowish-white degeneration, perhaps associated with pigment deposits. The hemorrhage is flame-shaped when in the internal layers, rounded when in the external layers, and massive when between the retina and hyaloid membrane of the vitreous (subhyaloid). If other blotches are seen in the retina and the whole fungus is hazy, the condition is called hemorrhagic retinitis.

Prognosis depends on the cause and recurrence of hemorrhages; unfortunately, the prognosis of affections causing retinal hemorrhage is usually bad. The amount of visual disturbance depends on the location and size of the clot. Hemorrhage in the macula is serious. Multiple hemorrhages may cause a glaucomatous condition, producing blindness.

Treatment must be directed to the general causative condition. Patients should be put to bed and the eyes bandaged. Congestion may be relieved by leeches or dry cups to the temples. Mercurials and iodids, together with diaphoresis, may promote absorption.

Retinitis.—It is probable that idiopathic retinitis never occurs. Inflammation of the retina is generally due to some disease of the general system, such as syphilis, renal disease, diabetes, leukemia, etc. In cases of prolonged exposure or excessive use of the retina the resultant affection is more in the nature of a functional trouble than a true inflammation. Retinitis may be due to an extension of inflammation from the neighboring structures, principally the ciliary body, choroid, and optic nerve. Panophthalmitis produces an immediate suppuration of the retina.

The subjective symptoms of retinitis are usually dimness of vision, scotoma, metamorphopsia, etc. **The objective symptoms** elicited by the ophthalmoscope are sometimes quite characteristic of the causal trouble, although differential diagnosis is at times very difficult. However, the condition discovered is often a valuable indicator in substantiating systemic evidence of the general disease, and is an important factor in prognosis.

Albuminuric retinitis is almost always bilateral, although a number of unilateral cases are recorded. The light-sense, color-sense, and visual field are usually undisturbed. Dimness of vision progresses slowly, and sometimes it is difficult for the patients to count fingers. This affection often accompanies the nephritis of pregnancy. Uremia, coincident with renal disease, may cause complete blindness, but this cannot be attributed to retinitis, but rather to a transient effect upon the cuneus lobe by the uremic poison.

Ophthalmoscopic changes differ in the various stages, although they are most marked in advanced renal disease. The changes in the fundus are generally confined to the posterior pole and region adjoining. Hyperemia is at first noticed, but in the advanced disease white spots or patches are seen about the papilla, and later fine white dots are noticed grouped about the macula in the shape of a star with the fovea in the center. Finally, hemorrhages and fatty degeneration, with paleness of the disc and contraction of the vessels, may occur just before death. In some cases, instead of white spots, there may be numerous widespread hemorrhages, or, again, only congestion and simple redness of the disc.

Prognosis.—The exact relation between retinitis

and the coincident renal disease is not definitely established. However, it may usually be said that a definite case of albuminuric retinitis will have a fatal issue within 2 or 3 years, although the visual disturbance may not increase, and may even improve in fatal, chronic cases. Cases have been observed in which the patients have lived from 5 to 10 years after typical albuminuric retinitis had been established. In interstitial nephritis particularly, retinitis is a serious sign. After recovery from acute nephritis an associate retinitis may clear up and the vision become normal. The prognosis of both life and vision is better in the albuminuric retinitis of pregnancy, and in cases in which only one eye becomes involved.

Treatment must be that of the original disease. In hemorrhagic cases, rest, bandaging of the eyes, and possibly the instillation of atropin, in weak solution (1 grain to 1 ounce), are advisable. The appearance of albuminuric retinitis in pregnancy is regarded by many as an indication for the induction of abortion. See NEPHRITIS.

Diabetic retinitis is often indistinguishable from albuminuric retinitis by the ophthalmoscope alone. The diagnosis can only be made by the test for glycosuria. The prognosis is probably not so bad as in the foregoing disease, and dietary and hygienic treatment may establish a cure.

Syphilitic retinitis is a diffuse instead of a local inflammation, as in the preceding diseases, and may be unilateral or bilateral. A general cloudiness, most apparent at the optic disc, and gradually shading off into the periphery of the fundus, is noticed. White lines may be observed along the course of the blood-vessels. There are numerous dust-like opacities in the vitreous. Hemorrhages are less frequent than in the preceding forms. The treatment is purely constitutional.

Leukemic retinitis is characterized by the pale-yellow appearance of the fundus, always bilateral. There is a marked tendency toward hemorrhages; sometimes circular white clots and prominent blood-bordered spots are seen at the periphery of the retina. Diagnosis should be substantiated by microscopic examination of the blood. The treatment is that of leukemia.

Retinitis of pernicious anemia presents an edematous condition of the retina, diffuse retinitis, with distended veins and pallid blood. The disc appears dirty greenish-white, against a yellowish eye-ground.

Retinitis Pigmentosa.—A pigmentary degeneration of the retina sometimes found in descendants of consanguineous marriages, or of syphilitic parents. It occurs commonly in members of the same family.

Symptoms and Diagnosis.—The chief subjective symptoms are night-blindness, due to the reduced sensitiveness of the retina; concentric contraction of the field of vision, often coupled with nystagmus, causing the patient great inconvenience from inability to find his way, although his central vision may be acute. The constant bowing of the head in walking is a characteristic sign. The fundus has a very characteristic appearance. The disc is yellowish and its edge is somewhat obscured, and the vessels are narrowed, accompanied by fine bands, and fade off into the periphery. Dark streaks of pigmentation, beginning at the periphery, trail over the fundus, and gradually progress toward the macula. In appearance these have been compared to the Haversian bone-canals. Cases of retinitis pigmentosa without the distinctive pigmentation are occasionally found. There is evidence of pigment-atrophy at the periphery, slightly subnormal night-vision, narrowed color-field, etc.

Treatment is useless. All that can be done is to keep the patient in good health and spirits, and surround him with hygienic conditions conducive to the arrest of any degenerative process.

Thrombosis and Embolism of the Retinal Vessels.—Embolism of the central artery of the retina is rare. Both the ophthalmic and central retinal arteries branch at right angles from their parent stems, and an embolus is easily swept by them. The characteristic subjective symptom is sudden blindness in one eye, probably after some slight exertion. There may be temporary improvement during the succeeding weeks, but the prognosis is very unfavorable. The differential diagnosis between thrombosis and embolism with the ophthalmoscope is sometimes difficult. Hemorrhages are more numerous in thrombosis, and there is intense swelling of the nerve and retina. There is pallor of the disc and retina in embolism, and marked diminution in the size of the vessels. The veins become tortuous and very irregular. The central portion of the retina becomes hazy and grayish, the macula standing out in sharp contrast by its maintenance of the normal red color, the classic "cherry-red spot," supposed to be due to the non-existence of the nerve-fiber layer at the fovea, allowing the choroidal vessels to show through. Finally, atrophy of the disc and retina ensue, and the vessels become obliterated and replaced by white streaks. Involvement of only a branch of the central artery is followed by an anemic and degenerated sector-like area supplied by the affected artery. The diagnosis should be confirmed by the discovery of some systemic source of embolus or thrombus, such as endocarditis, or other organic heart affection, phlebitis, pyemia, etc.

Treatment is of little avail; but sometimes in very recent cases it may be possible to remove the embolus by massage of the eyeball, or by reduction of the internal tension, as by sclerotomy. General treatment is, of course, indicated.

Detachment of the Retina.—The most common cause is disease of the choroid consequent upon myopia of high degree. Chronic inflammation of the eyeball or of the retina alone, fluid effusions or hemorrhage between the retina and choroid, injuries, new growths, diseases of the vitreous, removal or dislocation of the lens, and parasites, are other causes. Any condition in which the intraocular tension is suddenly lowered—as, for instance, by the rapid escape of vitreous after a corneal section—predisposes to retinal detachment.

Symptoms and Diagnosis.—The premonitory signs are flickerings and the appearance of dazzling sparks before the eyes, and attacks of momen-

tary blindness. The detachment takes place suddenly, and the field of vision is obscured by what seems to be a dark cloud before the eyes. The detachment is only partial at first, and the retina is still nourished by its own vessels, its functions being impaired rather than destroyed. Naturally, the refractive condition of the eyes is more hyperopic, but as the detached portion of the retina constitutes irregular folds, which constantly move with every movement of the eye, metamorphopsia and other anomalous visual disturbances are present. By the ophthalmoscope there is absence of the red reflex in the region of the detachment. In advanced cases a bluish-gray curtain is seen floating freely in the vitreous, and many even be seen by the naked eye. The picture may be confused by vitreous opacities, which frequently accompany this condition.

Prognosis is dependent on the cause. If caused by intraocular tumor, the case may be considered hopeless. If due to pronounced myopia, one eye is usually attacked after the other, and blindness is unavoidable. In the other conditions the progress of the detachment may possibly be arrested, but we can hardly hope for improvement, although instances of alleged reattachment without treatment have been reported.

Treatment consists of prolonged rest in bed with protection of the eyes from light by a pressure-band age. Antiphlogistic measures should be adopted; diaphoresis with the salicylates, or by hypodermic injection of pilocarpin, may prove of benefit. Several cases are reported to have been cured by a course of tuberculin treatment. See TUBERCULOSIS (Ocular).

The operative treatments that have recently been recommended are puncture through the sclerotic, allowing escape of the subretinal fluid, injection of an artificial vitreous in front of the prolapsed retina, or injection of a few drops of iodin in the vitreous. The real value of these measures is doubtful.

Glioma of the Retina.—A malignant tumor, soft and highly vascular, developing in the retinal connective tissue (sometimes designated neuroglia).

Symptoms.—It occurs chiefly in children from 1 to 4 years old. On account of the youth of the patient and the absence of pain, the early subjective symptom—visual disturbance—escapes unnoticed. The child may be totally blind for some time without the parents' knowledge, attention to the eye first being called by the bright shimmer in the pupil, the so-called "cat's eye." In the first stage of the disease the ophthalmoscopic examination shows a yellowish prominence surrounded by small nodules, toward which dilated retinal vessels converge. In the second stage there is probably increased tension, and the growth begins to push its way forward, carrying the retina, lens, and iris with it. The cornea and the aqueous may become opaque, and the conjunctival vessels intensely congested. Internal inflammation progressively increases, and the tumor may escape through a perforation in the cornea or penetrate the sclera, and appear as a spongy bleeding mass between the lids. The final stage is extension along the optic nerve, or metastasis to the neighboring structures.

Diagnosis is easy after the second stage is reached. In their early stages suppurative choroiditis or hyalitis may produce symptoms so closely resembling glioma that they have been called pseudoglioma. However, in choroiditis inflammation precedes the blindness, and the eye is soft. If there is doubt as to the diagnosis, the case should be treated as glioma, to prevent an error, which may prove fatal.

Prognosis.—Unfortunately, it is usual for the child to be brought for treatment after the disease has progressed sufficiently to cause the "cat's eye" or other prominent objective symptoms, and it may be too late even to save the child's life. There is absolutely no hope of preserving the affected eye.

Treatment.—Not only should the affected eye be immediately enucleated, but the optic nerve should be divided as far back as possible, and if there is the slightest sign of invasion of the orbital tissues, they must be removed and the orbit cauterized.

RETINOSCOPY (Shadow-test).—The method of estimating the refraction of an eye by reflecting into it rays of light from a plane or concave mirror, and observing the movement that the retinal illumination makes by rotating the mirror. To avoid confusion, the description of retinoscopy that follows will apply to the plane mirror, which is to be preferred to the concave mirror, as it is decidedly more satisfactory for general use and convenience.

The principle of retinoscopy is the finding of the point of reversal, or myopic far-point. Should the eye under examination be emmetropic or hyperopic, it must be given an artificial far-point.

Advantages.—Of all the objective methods of refraction, retinoscopy in the hands of the expert is the most exact, but, like all objective methods, its results should, when possible, be confirmed with the trial-lenses.

Retinoscopy offers the following advantages:

1. The character of the refraction is quickly diagnosed.

2. The refraction is estimated without the verbal assistance of the patient.

3. No expensive apparatus is necessarily required.

4. Little time is taken to estimate the refraction.

5. It is of inestimable value in the young, in the feeble-minded, the illiterate, in cases of amblyopia, nystagmus, and aphakia; and in such cases the retinoscopic correction may be ordered.

The retinoscope, or mirror, is of varying form and size. The one recommended is the small plane mirror, 2 cm, in diameter, on a 4 cm. metal disc, with a 2 mm. sight-hole at the center of the mirror, made by removing the silvering and *not by* cutting a hole through the glass.

The light should be steady, clear, and white, and secured to a movable bracket. For general use the Argand burner is best. As only a small portion of the flame is used, it is necessary to cover most of it with a screen.

The screen, or cover-chimney, is made of thin asbestos and of sufficient size to fit easily over the glass chimney of the Argand burner. The opening used, generally 1 cm. in diameter, should be opposite to the brightest part of the flame. An asbestos cover-chimney is used in preference to metal, as it intercepts most of the heat.

The room for retinoscopy must be darkened, and the darker the better; all sources of light except the one in use must be excluded. This must be insisted upon, as darkness offers the best contrast to the test.

Position of the Light and Mirror.—The rays of light coming out of the opening in the light-screen should be 5 or 6 inches in front and to the left of the observer, so that the rays may pass in front of the left eye and fall upon the mirror held before the right eye, thus leaving the observer's left eye in comparative darkness; or this may be reversed if the observer is left-handed. The observer should keep both eyes wide open.

In order to see the movements distinctly the observer should wear his correcting glasses, but need not make any note of his accommodation as in using the ophthalmoscope.

The patient must have his accommodation thoroughly relaxed with a reliable cycloplegic, and be comfortably seated in front of the observer, *preferably at* 1 *meter distance*, with his vision steadily fixed on the observer's forehead just above the mirror; or, even better, the patient may concentrate his vision on the edge of the metal disc of the mirror, but never directly into the mirror, as that would soon irritate and compel him to close his eye. In cases of squint it is particularly necessary to cover one eye while its fellow is being refracted.

To Find the Point of Reversal.—In observing the retinal illumination, the most important thing to study is the direction in which it moves, or whether it moves at all. For example, having determined at 1 meter distance, with a + 2.00 D. lens before the patient's eye, that the retinal illumination moves in the same direction in which the mirror is tilted, and then, substituting a + 2.25 D., and the illumination appears to move in the opposite direction, the observer will know at once that the difference in the strength of these lenses, + 2.12 D., would bring the emergent rays to a focus on his retina and that no movement of the retinal illumination could be made out, and this point, when found, is the point of reversal or artificial far-point.

Emmetropia.—The rays of light from an emmetropic eye proceed parallel, and by reflecting the rays of light into such an eye from a distance of 1 meter the observer sees a small bright retinal illumination, which moves rapidly in the same meridian through which the light is passed. By placing a + 1.00 D. lens in front of such an eye all apparent movement in the pupillary area ceases, showing that the + 1.00 D. has bent the emergent rays and brought them to a focus on the observer's retina. This + 1.00 D. has made this emmetropic eye myopic just 1 D., so that in taking the patient thus refracted from the dark room to test his vision at 6 meters, this 1 D. of artificial myopia must be removed, thus proving the emmetropic condition.

Hyperopia.—In hyperopia the same conditions hold true as in emmetropia. For example, having placed a + 3.00 D. in front of the eye and found that the previously slow movement with the mirror has ceased, and substituting a + 3.25 D. makes it move opposite, it will be known at once that the + 3.00 D. was the correcting glass for 1 meter; or, in other words, that the original divergent rays proceeding from the eye were bent by the + 3.00 D. and brought to a focus on the observer's retina. Two D. of this + 3.00 D. would have made the eye emmetropic, but the additional + 1.00 D. made the eye myopic just that amount, and taking the patient from the dark room this 1.00 D. of artificial myopia must be taken from the dark-room result, which would leave + 2.00 D. as the amount of the hyperopia.

Myopia.—The rays of light from a myopic eye always proceed convergently, and to the observer seated at 1 meter distance the retinal illumination appears to move opposite to the direction in which the mirror is moved *if* the myopia exceeds 1 D., and to move *with* the movement of the mirror if the myopia is *less* than 1 D. An eye that is myopic just 1 D. has its emergent rays focusing at 1 meter, and the observer with his eye at this point does not recognize any apparent movement in the pupillary area.

For example, an eye that is myopic 4.00 D. has its emergent rays focusing at 10 inches, and the observer at 1 meter has the apparent movement of the retinal illumination moving opposite to the movement of the mirror. If a −3.00 D. is placed in front of this eye, the emergent rays than focus at 1 meter, at which point the observer does not appreciate any movement of the retinal illumination. It will thus be seen that the eye that is myopic more than 1.00 D. retains 1 D. of its myopia when tested at 1 meter, and this 1.00 D. must be supplied in taking the patient from the dark room to test his distant vision.

If the observer will remember to always use a plus lens when the retinal illumination moves with the movement of the mirror, and a minus lens when it moves opposite, and allow for the 1. D. of myopia **when working at 1 meter,** he will have the following rule to guide him: namely, **to add a minus 1.00 D. to the dark-room result in every instance**—*i. e.*,

Dark room	0.00 D.	+0.25 D.	+0.50 D.	+0.75 D.	+1.00 D.
add	−1.00	−1.00	−1.00	−1.00	−1.00
Result	−1.00	−0.75	−0.50	−0.25	−0.00

Regular Astigmatism.—The presence of this condition when looking in the eye before any neutralizing lens has been placed in position, can be determined when a band of light is seen extending across the pupil, or when it is possible to note a difference in the rate of movement of the retinal illuminations of any two meridians at right angles to each other. If the spheric error is high and the cylinder a low one, then it will not always be possible to recognize the characteristic band of light (astigmatism) until the approximate neutralizing sphere has been added.

The axis subtended by the band of light after the requisite sphere has corrected the meridian of

least ametropia is the axis for the cylinder in the prescription to be given.

The better way to neutralize cases of astigmatism is to use spheric lenses in preference to cylinders, for by so doing the difficulty of placing cylinders on the exact axis is avoided; for example, in the following formula, +S. 2.00+C. 1.00 axis 90 degrees, it will be found that a + 3.00 sphere in the dark room will correct the 90 degrees meridian and partly correct the 180 degrees meridian; and that a +4.00 sphere will correct the 180 degrees and overcorrect the 90 degrees meridian, making a difference in the strength of the two spheres employed of 1.00 D., which is the amount of the cylinder required. After thus obtaining the result, the observer may, if so disposed, confirm it by placing the spherocylinder combination.

Irregular Astigmatism.—This condition is either in the cornea or lens, generally in the former, making it difficult in any instance to study the refraction, as the reflex is more or less obscured by areas of darkness, so that to study the condition the observer may have to change his working distance toward or from the eye. The kinetoscopic picture obtained by moving the mirror so as to make the light describe a circle around the pupillary edge of the iris is quite diagnostic of the corneal condition. Whatever result is obtained, the observer must take care to refract in the area of the cornea that will correspond to the small pupil when the effects of the cycloplegic pass away. It is best in these cases to retain the correction found as a guide in a postcycloplegic manifest refraction.

Conic Cornea.—In this condition the observer is impressed at once with the bright, round, central illumination that moves opposite to the movement of the mirror, the peripheral movement being with the mirror, unless the margin is myopic also, but of less degree. The best way to refract a case of this kind is to follow the suggestion given for refracting cases of irregular astigmatism.

RETROFLEXION.—See Uterus (Retrodisplacements).

RETROPERITONEAL TUMORS.—There are certain rare tumors which arise behind the peritoneum, having a fixed attachment to the back of the abdomen and the intestines in front. Among these may be included kidney, suprarenal, pelvic, and pancreatic tumors, which are elsewhere described. Of rarer occurrence are the retroperitoneal lipoma, cysts of obscure origin, whether multilocular or dermoid, and lymphadenomatous and lympho-sarcomatous tumors of the lymphatic glands. The diagnosis of such conditions can only be completed by exploration, when it has been found possible in simple cases to shell them out (Spencer and Gask).

RETROPHARYNGEAL ABSCESS.—Abscess behind the pharynx or esophagus. It is due to caries of the cervical vertebræ, or, more rarely, to suppuration of the retropharyngeal lymphatic glands. Again, it may have an idiopathic origin, as is the case with scrofulous, tuberculous, and rachitic children. See Spine (Caries).

Symptoms.—At first there is difficulty in swallowing, and to this are soon joined stiff neck, tenderness of the cervical vertebræ, and the snuffling voice. Later, the head is bent strongly backward as far as possible to prevent dyspnea; respiration becomes difficult and stertorous, but not whistling, as in croup, while the facial muscles twitch, and speech is unintelligible. The posterior wall of the pharynx, at first only reddened and somewhat swollen, soon evidently protrudes as a fluctuating tumor, which sometimes crowds forward the uvula. Finally, the abscess opens, and an enormous quantity of pus is poured forth into the mouth, and if this happens during sleep, the pus may flow down into the larynx and result possibly in suffocation.

Prognosis is serious, though not necessarily fatal.

Treatment.—The patient should be put to bed and small pieces of ice used locally. Timely incision must be employed after the abscess forms, in consequence of suppuration of the lymphatic glands; but if the abscess arises from caries of a cervical vertebra, incision must be delayed until there is real danger from suffocation. After opening, rest in bed, lying on the back, for months is necessary. Iodid of iron may be prescribed.

RETROVERSION.—See Uterus (Retrodisplacements).

RHACHITIS.—See Rickets.

RHAGADES.—Linear cracks or fissures in the skin, whether due to injury or to disease. They are most frequently seen on the palmar and plantar surfaces of the hands and feet, at the angles of the mouth, at the anus, and at the flexures. They are painful on movement. They are often the early manifestations of congenital syphilis, the secretions from these lesions being very virulent, and consitute a frequent source of infection.

RHAMNUS PURSHIANA.—See Cascara Sagrada.

RHATANY.—See Krameria.

RHEUM.—See Rhubarb.

RHEUMATISM, ACUTE ARTICULAR.

Synonyms.—Rheumatic fever, inflammatory rheumatism.

Rheumatism is an acute infectious disease characterized by high fever, inflammation of the large joints, acid sweats, and a disposition to cardiac involvement.

Etiology.—No specific bacterium has yet been discovered and the distinct causative factor is still unknown. There is evidence of some severe poison circulating in the system, having a predilection for the joints, endocardium, and other serous membranes.

Heredity, damp climate with sudden changes in the temperature, exposure to the cold and wet, lowered vitality, are all conducive to rheumatism. It is a disease of young adults and has a tendency to recur. Of the different theories that have been advanced as to the causes of rheumatism may be mentioned (1) metabolic, (2) nervous, and (3) germ theory. Most authorities at the present time admit that the disease is infectious.

Various microorganisms have been isolated from the exudate of the joints of rheumatic

patients, which have caused arthritis and endocarditis in lower animals. Probably, as Flexner and Barker have suggested, acute articular rheumatism may be caused by the infection of the blood by any one of several species of pyogenic organisms, at a time when the conditions were not favorable to the development of a general septicemia, but which may produce an inflammation of one or more serous membranes; hence may occur a pericarditis, pleurisy, or peritonitis of rheumatic origin.

H. C. Wood, Gurich, etc., have shown that suppurative conditions in the tonsils or teeth may be the fundamental cause of acute articular rheumatism and other general conditions.

Other affections, such as scarlet fever and gonorrhea, are associated with a synovitis which closely resembles acute rheumatism, but are due to the specific cause of each of those diseases, and are not truly rheumatic.

Pathology.—The membranes and ligaments show a high grade of inflammation, being reddened, swollen, and there is an effusion of albuminous fluid into the joint-cavity, containing many leukocytes and flakes of fibrin. The inflammatory process producing an increased amount of fibrin in the circulating medium is one of the marked characteristics of this disease.

Usually, the attack ends in recovery, but there may be a hyperplastic proliferation of the synovial membrane, fibrous metaplasia of the cartilage, and fibrocartilaginous ankylosis of the joint.

The blood changes in rheumatism are very marked. Rapid anemia develops early and the red cells may show a loss of 1,500,000 per cubic millimeter; there is a corresponding loss of the hemoglobin, which may be reduced to 50 percent; leukocytosis is the rule, and the white blood-corpuscles may run as high as 39,000 per cubic millimeter. The fibrin is greatly increased. Lactic acid is in excess.

Symptoms and Clinical Course.—The onset is usually quite sudden, although there may have been a history of anorexia, sore throat, pains in the affected parts, or a general body "ache." The inflammatory process first attacks the larger joints, which become reddened, swollen, and excessively tender. Often the inflammation may subside quickly in one joint to attack another. The parts most often affected are the joints of the knee, elbow, shoulder, wrist, and ankle. Occasionally, however, one joint alone is involved. There is a sudden onset of high fever, 103° to 104° F., and the pulse is usually greatly accentuated. With the onset of fever acid sweats occur, and the patient may be bathed with the excretion almost constantly. The sour odor is quite characteristic. The urine, as in gout and lithemia, is high-colored, scanty, and loaded with an excess of uric acid and urates.

Complications.—(1) Hyperpyrexia; (2) endocarditis (very common); (3) pericarditis; (4) myocarditis; (5) pneumonia; (6) pleurisy; (7) cerebral symptoms, as delirium, convulsions, meningitis; (8) cutaneous symptoms—scarlatiniform rash, urticaria, purpura; (9) rheumatic nodules; (10) peritonitis.

Sequels.—Chorea, acute nephritis, exophthalmic goiter and chronic joint changes.

Diagnosis.—The following table illustrates the characteristic points of the affections likely to be confused with rheumatism:

Gout.	Septic Arthritis.	Osteomyelitis.
1. Occurs late in life.	1. Septic focus, tending to suppuration, present. Onset slower.	1. History of long-continued pain, which is worse at night.
2. Fever not high.	2. Hyperpyrexia not marked.	2. Moderate fever.
3. No acid sweats.	3. No acid sweats...	3. Acid sweats absent.
4. Affects small joints.		4. Often affects long bones.
	5. Heart-lesions rare.	5. Heart-lesions rare.

Other forms of infectious arthritis such as scarlatinal, gonorrheal, and also tuberculous and traumatic must be eliminated.

Prognosis is guardedly favorable. Complications are very common. Recurrence and a crippled heart are to be feared. Occasionally the disease becomes subacute, all the symptoms becoming less prominent but more prolonged. Rarely it may become chronic. The subacute type may exist independently of any previous acute attack and is markedly resistant to treatment.

Treatment.—The parts must be placed at absolute rest, and the patient should lie between blankets. It is well to envelop the affected joint in soft wool or flannel.

The diet should be composed of light broths, soups, beef-juice, milk, while there is fever; tea and coffee should be restricted to the minimum; vegetables and fruits of all kinds may be allowed with each meal.

The hyperpyrexia should be constantly watched, and is best controlled by the cold bath or cold packs. The remedy which seems to be most curative is some pharmaceutic preparation of salicylic acid, such as sodium salicylate:

℞. Sodium salicylate, Aromatic elixir, each, ʒ iij
Water, add enough to make, ʒ iij.

One teaspoonful every 4 hours.

If not well borne by stomach, the salicylates may be given by rectal injection of 20 to 40 grains.

The bowels should be evacuated with fractional doses of calomel—1/4 grain may be given every hour until 6 doses have been taken—followed by 1/2 ounce of Rochelle salt. Rochelle salt (1/2 ounce) may be given every 2 days to keep the bowels open.

The function of the kidneys should be carefully considered, and diuretics are distinctly indicated.

℞. Lithium citrate, ʒ jss
Sweet spirit of niter, ʒ v
Solution of potassium citrate, ʒ ij
Simple elixir, ʒ iv
Water, add enough to make ʒ iv.

Two teaspoonfuls every 3 or 4 hours.

℞. Potassium citrate, ℥ iij
Peppermint water, ℥ j
Water, add enough to make ℥ iv.
Two teaspoonfuls every 3 or 4 hours.

Conjointly with the salicylates and alkalies, phenacetin may be used for the pain. Sometimes morphin may be necessary.

Aspirin (*q. v.*) in doses of 5 to 15 grains has been proved to be a most efficient substitute for the older salicylates, as it has the advantage of not producing the unpleasant effects of the latter.

A healthy action of the skin may be preserved by the use of flannel bedding and hot drinks, such as lemonade, hot beef-juice, and soups.

Local Treatment.—A piece of flannel may be dipped in a mixture of lead-water and laudanum, applied to the affected part, and the whole enveloped in wool or flannel and kept at rest.

℞. Tincture of opium, ℥ iv
Solution of lead subacetate, ℥ iijss.
One tablespoonful to a pint of water.

℞. Belladonna liniment, ℥ iv
Soap liniment, add enough to make ℥ iij.
Apply on flannel cloth once daily.

Either of these local applications may be covered with oiled silk. A liniment containing salicylic acid is often very efficacious. Oil of gaultheria in olive oil (1:2) is excellent for local application.

Should endocarditis supervene, successive blisters should be applied over the heart. An ice-bag over this area often relieves pain, lowers the temperature, and lessens the frequency of the heart-beat.

As soon as the patient is able to be out of bed, massage and electricity applied to the joints are valuable, and tonics are necessary:

℞. Strychnin sulphate, gr. j
Quinin sulphate, ℥ ij
Mass of carbonate of iron, ℥ jss.
Make into 50 pills. One pill after each meal.

℞. Elixir of phosphates of iron, quinin, and strychnin, ℥ iv.
Teaspoonful after each meal.

RHEUMATISM, CHRONIC ARTICULAR.—A chronic inflammation of the soft parts of the joint, not due to trauma, or tuberculosis or septic infection.

Etiology.—Same as acute, except that it occurs usually late in life and especially among the working-class. Though as a rule appearing independently, it may be a sequel to the subacute form or it may be followed by an acute or subacute attack. Present research is pointing to microbic origin.

Pathology.—Similar to the acute but more pronounced. The capsule, tendons, and their sheaths are thickened and cause increase in size of the joint. Neuritis and muscular atrophy may supervene about the joint. Ankylosis may occur.

Symptoms.—The main symptoms are pain increased by movement and stiffness diminished by exercise. These are augmented by cold and damp weather. Tenderness and slight swelling may be found. Later ankylosis may occur. Fibrous changes of the heart muscle and valves are frequent.

Prognosis.—While life is not shortened, the disease generally progresses.

Treatment is mainly preventive. If subject to exposure, the patient should select an occupation which is less liable to increase the danger of an attack. Nutrition should be preserved by good food. As long as the condition of the patient permits, out-door exercise should be insisted upon. Tonics, such as iron, strychnin, cod-liver oil, arsenic, should be administered. The bowels should be kept open with salines or laxatives, such as—

℞. Fluidextract of cascara, Glycerin, } each, ℥ j.

Or a pill containing aloin (1 grain), strychnin (1/60 grain), and belladonna (1/8 grain) may be given.

Should indigestion be present, lactopepsin (10 grains) may be given after meals.

℞. Pepsin, Dilute hydrochloric acid, } each, ℥ ij
Compound tincture of gentian, ℥ j
Elixir of curacoa, ℥ iv
Water, add enough to make ℥ iij.
One teaspoonful after meals.

Any of the diuretics mentioned for the acute form may be given if the urine becomes high-colored or scanty.

Hot baths at night may be taken two or three times a week, and followed by thorough massage. Massage aids in breaking up the old adhesions and helps to restore the normal circulation. Vibratory massage may be beneficial. It is well to keep the affected joints wrapped up in flannel. Iodin or blisters may be useful. Sometimes an ointment of ichthyol, mercury and belladonna will prove valuable. Chloral-camphor rubbed in well is effective. Scotch douches and moist compresses (hot and cold) may aid in the treatment. For great pain the actual cautery may be tried. The galvanic current may also be used for a period of 20 minutes 3 times a week. The hot dry air treatment is effective in some cases. Great relief may follow the application of the high frequency current. Of internal remedies not one has been found to be of any distinct advantage. Sometimes an acute exacerbation may be controlled by salicylates. Potassium iodid (10 grains) may be given after meals for periods of 10 days or 2 weeks. Guaiac has been recommended; it should be given in the form of troches. The following prescription is commended:

℞. Guaiac, ℥ iij
Oil of lemon, ♏ vj
Oil of cloves, ♏ ij
Sugar, ℥ j
Acacia, ℥ ss
Confection of rose, a sufficient quantity.
Divide into 30 troches. One after each meal.

See also JOINTS (Diseases).

RHEUMATISM, INFANTILE.—It should be remembered that articular symptoms are relatively less prominent in children than in adults. The same is true of the profuse acid sweating so frequent with the adult. On the other hand, wandering rheumatic pains—the so called "growing pains"—and rheumatic tonsillitis are among the more frequent symptoms of rheumatism in children. Pain, fever, swelling of the joints, and heart symptoms occur, of course, in typical cases of rheumatism, but of these the heart symptoms are chiefly to be dreaded. Pain is quite likely to be slight and more of the nature of tenderness and disinclination to move rather than sharp pain, and hence is often mistaken for a sprain. Fever, as a rule, is neither high nor long-continued, so that the heart symptoms are often the first to attract the attention of the parents. It is not always easy to decide whether we have to do with endocarditis, pericarditis, or both combined; but while it will be found that both are attended with restlessness, labored breathing, and elevated temperature, we expect to find a mitral murmur in endocarditis, systolic, and near the apex (ulcerative endocarditis is attended by fever and chills). Pericarditis usually is more painful than endocarditis, generally gives friction sounds, with the cardiac sounds more distinctly at the base than at the apex.

Diagnosis.—It is by no means always easy to make a positive diagnosis of rheumatism in a child unless there is coincident heart trouble. A rheumatic family history, recurrent tonsillitis, or chorea, may give us valuable hints as to the attack, but antirheumatic remedies are often the best means of differentiation in doubtful cases.

Treatment.—It is of first importance that the child should be clad in a flannel night-gown, put to bed, and kept under blankets until pain and tenderness have disappeared. If the joints are swollen and tender, they should be wrapped in cotton batting after rubbing with liniment; one of efficiency is the following:

℞. Oil of gaultheria, } each, ʒ ss
Spirit of chloroform, }
Soap liniment, ʒ iij.

Of internal remedies the salicylates justly hold the first place, though they sometimes produce hebetude and depression of the heart's action without any appreciable effect in warding off heart complications. Aspirin is usually preferable to sodium salicylate because of its having no by-effects. Da Costa prefers the bicarbonate of sodium in mint-water until the urine becomes alkaline. Quinin sometimes acts well when all the usual remedies have failed, and opiates, especially codein, are permissible for pain. Iodids are the chief reliance in pericarditis and endocarditis. Absolute rest must be insisted upon.

RHEUMATISM, MUSCULAR (Rheumatic Myoitis, Myalgia).—A painful condition of voluntary muscles and their aponeurotic coverings, especially aggravated by motion and pressure. It affects especially large muscles, such as those of the neck, the shoulders, the arms, the intercostal muscles, the back, the thighs, and the calves of the legs.

Etiology and Pathology.—Exposure to cold, and especially to drafts of cool air, as from an open door or window, are the most frequent causes. The acute form, at least, does not wander, but persists in the muscles primarily attacked until relieved. Its true nature is unknown, and whether it is an affection of the muscular substance or of the intermuscular connective tissue or of the minute branches of sensory nerves distributed throughout the muscles is also unknown. Certain forms of muscular rheumatism, especially of the back, are ascribed to gout. An infectious origin has been suggested. It is sometimes associated with articular rheumatism, but has probably a different etiology, though similar exciting causes operate to produce it. Similar pain often succeeds muscular strain, but it is doubtful if this should be called muscular rheumatism. The division of muscular rheumatism into acute and chronic is based upon the duration of the pain and disposition to recurrence. The term chronic is justified for those forms which recur with changes in the weather, and are either excited or relieved by them. It, too, is less localized than the acute. On the other hand, it is not inaptly at times called wandering. It is more frequent in men than in women, because the former are more exposed to its cause.

Symptoms.—The only invariable symptom is pain, aggravated by motion or pressure. Sometimes there is swelling. It is usually rather sudden in its onset, requiring at most but a few hours, and often less, to develop it. It is never accompanied by marked constitutional disturbance. The pulse may be somewhat accelerated and the temperature approach 100° F., but more often there is no fever at all.

Muscular rheumatism is specially named according as it involves certain muscles. Thus, **lumbago** is a painful affection of the lumbar muscles and their tendinous attachments. The attacks come on under the conditions already named, but sometimes suddenly without discoverable cause.

Stiff neck, or **torticollis,** is an affection of the side and back of the neck, forcing the patient to hold his head to one side as the situation of least discomfort, and when he desires to turn his head, he is forced to turn the whole body. Sometimes it becomes chronic and is rather difficult to cure. It is more frequently met with in children and young adults. **Omalgia** is a similar condition of the muscles of the shoulder and upper arm, making motion exquisitely painful. Ankylosis of the shoulder-joint may be caused by delayed motion. **Pleurodynia** affects the intercostal muscles and makes breathing and coughing very painful, while a deep breath becomes impossible, and sneezing an agony. The pectoral and serratus muscles may also be involved when the pain is felt in their locality. It is more frequent on the left side.

The duration of the acute form is brief, seldom lasting more than a few days, though there may be a tendency to relapse. The chronic forms are indefinite in duration.

Diagnosis.—This is easy for the coarser acute forms of omalgia, stiff neck, and lumbago. Muscular rheumatism may, however, be confounded with neuritis and neuralgia. In muscular rheumatism the pain is more diffuse; in neuritis there are pain and tenderness, more localized and along the course of large nerve-trunks. Muscular rheumatism and neuritis are distinctly worse on motion; neuralgia is less so. Rheumatism is commonly relieved by the warmth of the bed; neuritis may be aggravated; while neuralgia is indifferent, though increased by cold winds. Pleurodynia is sometimes difficult to distinguish from intercostal neuralgia, but attention to the points named will prevent mistakes. Neuritis of the brachial nerve-trunks resembles omalgia, but the former is early followed by atrophy, while muscular rheumatism is not. From pleurisy, pleurodynia is easily distinguished by the absence of fever and of physical signs. The lancinating pains of locomotor ataxia and the pains of incipient disease of the vertebræ resemble at first those of lumbago, but the special symptoms of these diseases are soon superadded.

Treatment.—The acute form of muscular rheumatism is occasionally amenable to treatment by the salicylates and salicin. Salipyrin and aspirin have been used with great benefit. The group of muscles treated must be placed at absolute rest, and in the case of the thorax this is best accomplished by strapping the side with adhesive plaster. Rest may, however, be overdone; and in the case of muscles like those of the shoulder, atrophy may result from too prolonged rest. Another measure of great value is dry heat, applied by means of a hot-water bag covered with flannel, or by a warm flat-iron. A flannel cloth should be interposed. With these measures massage may be associated. Of less permanent utility are hot poultices, although they allay pain at least. The same effect is accomplished by moist hot air or vapor (steam) baths, which in special establishments can be localized.

The chronic form is also treated by massage, passive motion, and electricity, either the induced or direct current. Counterirritation by liniments, such as those made with chloroform, ammonium hydrate, or turpentine, have long enjoyed a reputation, but at the present day it is beginning to be questioned as to whether, after all, it is not the friction rather than the liniment itself that produces the good effect. Acupuncture, consisting of the puncture by needles deeply thrust into the skin, is a measure that has some advocates, especially in the treatment of lumbago. Hydrotherapy is more likely to be useful, and here the warm or cold pack is the better method of application. Dry cupping is also often of service. General treatment should not be neglected; cod-liver oil, iron, strychnin, quinin, and good food should be given when the patient is run down (Tyson).

Vibratory massage or the hot dry air treatment may be beneficial. The high-frequency current has given excellent results.

RHEUMATOID ARTHRITIS.—See JOINTS (Diseases).

RHINITIS, ACUTE (Coryza). Varieties.—(1) Simple rhinitis; (2) specific rhinitis.

Etiology. Simple Rhinitis.—(1) Exposure to the cold and wet; (2) inhalation of dust or chemicals; (3) predisposing causes, such as rheumatic diathesis, tuberculosis, and asthma.

Specific rhinitis is due to diphtheria and scarlet fever.

Pathology.—There is vasomotor dilatation with engorgement of the blood-vessels in the mucous membrane, the latter being covered by a mucoserous exudation. The membrane is red and swollen.

Symptoms.—The symptoms are generally ushered in with a severe spell of sneezing, dryness of nasal chambers, hoarseness, headache, and a feeling of chilliness. Large quantities of mucoserous material may be expelled after a few hours, and the choanæ may be entirely occluded by thick, tenacious material. See NOSE (Examination). Often the Eustachian tube becomes clogged up, causing a ringing or buzzing noise, and temporary deafness may be set up.

Prognosis is favorable for simple acute rhinitis.

General Treatment.—Probably the patient would always be cured of his cold quicker if he could be induced to go to bed, or, if not, to remain in a room kept at the same temperature during the day.

Coexisting with the congestion of the nasal mucous membrane there is very likely a partial cessation in the activity of the emunctories of the body; therefore it is most important to use means to promote their activity.

The bowels may be moved by means of fractional doses (1/6 grain) of calomel, salines, Seidlitz powders, or solution of magnesium citrate.

To limit the nasal secretion by contracting the capillaries, Lennox Browne recommends:

℞. Tincture of belladonna, } each, ♏ xx
Tincture of opium, }
Camphor water, ℥ iv.

Two tablespoonfuls 2 hours after meals.

Probably that which may give quickest relief is a hot foot-bath taken at bedtime. The water should be as hot as can be borne, and the limbs should be bathed as high up as the knees. Fifteen or 20 minutes may be well spent in applying this measure of relief, and the process again repeated during the night, and for several consecutive nights if necessary. A small amount of powdered mustard may be added to the bath. Hot drinks, such as lemonade containing a small amount of brandy, may be given after the foot-bath to promote diaphoresis. Quinin (4 to 6 grains) and salol (2 to 4 grains) aid in restoring warmth to the body, and may be used every 3 or 4 hours. Dover's powder (7 grains) is recommended by many good writers.

Local treatment in some cases does good, and in others harm. In the acute stage, if a spray is used at all, only the gentlest force is permissible.

If the anterior naris is entirely occluded, it may be relieved by applying a few drops of a solution of cocain (4 percent) on a pledget of cotton, and the nostril can be subsequently cleansed by

means of some form of douche containing an alkaline solution, such as that advised by Carl Seiler —cold cream (1 ounce) or liquid vaselin containing menthol (4 grains)—may be brushed over the nares to relieve congestion. See also CORYZA.

Treatment of Specific Rhinitis.—See DIPHTHERIA, SCARLET FEVER.

RHINITIS, CHRONIC (Chronic Nasal Catarrh).—**Etiology** is the same as that of acute rhinitis, and it may result from an acute attack.

Pathology. Hypertrophic Form.—Cellular infiltration causes an overgrowth of tissue, giving rise to a spongy condition. The process most often affects the middle and inferior turbinated bones, and may be localized. In many cases deflection of the septum has been found, and nasal spurs are common. The surface is covered with a thick tenacious mucus.

Atrophic Form.—Instead of a hypertrophic condition there may be atrophy of the mucous membrane often involving the bone and giving rise to enlargement of the nasal chamber. On the surface of the mucous membrane a greenish or yellowish and very offensive secretion is usually found, containing various microorganisms. Greenish or mottled crusts may be found scattered over the surface of the nares. This form is also spoken of as ozena. See NOSE (Caries).

Symptoms.—There is generally a feeling of stuffiness or inability to breathe through the nostrils, especially noticeable in the morning; a frequent desire to clear the throat; the voice is harsh, indistinct, or nasal in character; the breath-sounds seem forcible or wheezing; the hearing and taste may become impaired, and from the occlusion of the nares the habit of mouth-breathing may be established.

Often only one nasal chamber is affected, and the patient may complain of being able to breathe only through one or the other side of the nose. A physical examination reveals its character.

In the atrophic form headache may be more common, and the secretion, instead of being mucoserous, has a greenish or purulent cast, often containing greenish crusts.

Complications.—Deafness is common.

Diagnosis is based on anterior and posterior rhinoscopy.

Prognosis is guardedly favorable. The condition is prone to reappear.

General Treatment.—While the local treatment of the disease is probably of most importance, the general condition of the patient must never be neglected. Careful inquiry should be made regarding the habits, such as inveterate use of tobacco, overloading the stomach, bathing at unseasonable hours or in water too cold, and also the condition of the digestion and state of the bowels.

If the general system is below par, a tonic—such as the elixir of the phosphates of iron, quinin, and strychnin (1 dram)—is advisable, taken after meals.

The constipation should be treated by appropriate remedies. See CONSTIPATION.

Local Treatment.—The nasal chambers should be thoroughly cleansed and kept in as healthful a condition as possible by the use of alkaline antiseptic sprays or douches. A good cleansing fluid is composed of listerine (1 part) and water (2 parts).

The fluid for the spray may also be made by dissolving a tablet, according to the formulas of Dobell or Seiler, in about 2 ounces of water, and used by means of the compressed-air apparatus (preferably) or the glass hand-atomizer. Both the anterior and posterior nares are cleared of mucus and dust by this method. The small glass nasal douche seems to be effective in mild cases.

If the compressed-air apparatus is used, much care should be exercised not to use too great a force, as damage to the sensitive membrane may ensue. Usually, a pressure of from 5 to 7 pounds is sufficient. The nasal chambers may be cleansed in this manner 2 or 3 times a week.

Before using the liquids during old weather it is best to slightly warm them. Carbolic acid should be used with caution about the nasal chamber, as it has been known to produce anosmia.

Subsequent to the cleansing process the following solution feels refreshing:

℞.	Eucalyptol, Menthol,	} each,	gr. j.
	Liquid vaselin,		ʒ j.

Use as a spray.

A drop or two of the compound tincture of benzoin may then be sprayed over the parts to advantage.

Here a word of warning against the indiscriminate use of the nasal douche is appropriate. In cases of nasal hypersecretion due to other causes than inflammation of the nasal and retronasal mucous membrane, sinusitis, deviation of the septum, some new growth in the nasal cavity, etc., it is still common practice to have recourse to the nasal douche. In the majority of such cases this is useless, and it may seriously injure the epithelium of the nasal mucous membrane. In numerous cases the power of smell was lost in this way, and experiment has shown that no active antiseptic solution is free from danger to the sense of smell. The nasal douche is, also, frequently the cause of distressing headaches, probably accounted for by fluid passing into the sinuses. One of the gravest dangers is that water may reach the middle ear through the Eustachian tube and cause suppurative otitis media.

Sprays or douches keep the parts clean but they do not altogether relieve the hypertrophy. This condition may often be relieved by a partial destruction of the tissue by means of the galvanocautery or chromic acid.

Before these caustics are applied the parts are thoroughly anesthetized by means of a solution of cocain (5 to 10 percent). The cautery point is then plunged into the hypertrophied tissue in a direction parallel with the inferior border of the bone. In mild cases this operation, repeated 2 or 3 times, suffices. In the more chronic forms linear superficial cauterizations may also be made. At least a week should elapse from the time of one application to the next.

Hypertrophies on the posterior portion of the turbinated bodies are best removed with the knife, saw, or suture, as, being in close proximity to the Eustachian tube, the cicatrix formed by cautery might produce them. There are many operations for straightening septal deviations. The application of chromic acid to hypertrophies has been advised by a few specialists with good results. The parts are anesthetized with a solution of cocain (10 per cent), and the acid is applied by means of a metal probe. Its use is not altogether free from danger of poisoning. See Nose (Caries, Deformities).

RHINOPHYMA.—See Acne Rosacea.

RHINOPLASTY.—See Nose (Deformities).

RHINOSCOPY. See Nose (Examination).

RHUBARB (Rheum).—The dried rhizome of *R. officinale*, *R. palmatum*, or other species of *Rheum*. It contains three closely related anthracene derivatives, *chrysophan*, yielding chrysophanic acid, *emodin*, and *rhein*, which are the cathartic principles; also several bitter resins, a variety of tannic acid, calcium oxalate, starch, sugar, pectin, and other plant constituents. The species of rhubarb cultivated in the United States are devoid of cathartic power, but their leaf-stalks are used as a fruit. Dose of the powdered root, as a stomachic 1 to 5 grains, as a purgative 10 to 30 grains.

Rhubarb is highly esteemed as a cathartic for children on account of the mildness of its action. The tonic and astringent action following its catharsis makes it a valuable agent in diarrheas due to the presence of irritating matter in the bowel, and to correct atonic indigestion accompanied by diarrhea. For hemorrhoids with constipation its gentle action makes it peculiarly suitable, its astringent after-effect being entirely overcome by from 2- to 4-dram doses of olive oil nightly. It may be combined with a mercurial or with sodium bicarbonate. In small doses the tincture is a very efficient stomachic tonic, improving appetite, increasing the flow of the gastric juice, assisting digestion, and promoting the action of the liver without producing any cathartic results. The preparations most in use for children are the aromatic syrup and the mistura rhei et sodæ.

Incompatible with *rhubarb* preparations are: Mineral acids, catechu infusion, cinchona infusion, galls infusion, lead acetate, lime-water, mercuric chlorid, silver nitrate, tartar emetic, zinc sulphate.

Preparations.—**Extractum R.** Dose, 1 to 10 grains. **Fluidextractum R.** Dose, 10 to 30 grains. **Pilulæ R. Compositæ**, each pill contains of rhubarb about 2 grains, aloes 1 1/2, myrrh 1, oil of peppermint 1/10 grain. Dose, 1 to 5 pills. **Tinctura R.**, has of rhubarb 20, cardamom 4, glycerin 10, alcohol and water to 100. Dose, 1/2 to 3 drams. **Tinctura R. Aromatica**, has of rhubarb 20, cinnamon 4, cloves 4, nutmeg 2, glycerin 10, alcohol and water to 100. Dose, 10 to 60 minims. **Syrupus R.**, has of the fluidextract 10, spirit of cinnamon 0.4, potassium carbonate 1, glycerin 5, water 5, syrup to 100. Dose, for an infant, 1 dram; for older children, 2 to 4 drams. **Syrupus R. Aromaticus**, has of the aromatic tincture 15, syrup 85. Dose, as the syrup. **Pulvis R. Compositus**, has of rhubarb 25, magnesia 65, ginger 10. Dose, a teaspoonful. **Mistura R. et Sodæ**, has of sodium bicarbonate 3 1/2, fluidextract of rhubarb 1 1/2, fluidextract of ipecac 1/3, glycerin 35, spirit of peppermint 3 1/2, water to 100. Dose, 1/2 to 4 drams.

In summer diarrhea of children:

℞.	Aromatic syrup of rhubarb,	ʒ vj
	Sodium bicarbonate,	ʒ ij
	Deodorated tincture of opium,	♏ xxxvj
	Peppermint water, add enough to make	ʒ iij.

To a child of from 4 to 6 years give a teaspoonful every 3 hours.

RHUS GLABRA (Smooth Sumach).—The dried fruit of *R. Glabra*. The leaves and bark have an astringent and bitter taste, and are also used medicinally. It contains tannin, coloring matter, also potassium and calcium malates.

Fluidextractum Rhois Glabræ. Dose, 5 to 30 minims. Sumach-berries form a useful acidulous and astringent drink or gargle in catarrhal pharyngitis, stomatitis, and aphthæ. An infusion (one ounce to the pint) or the official fluidextract may be used as a wash and dressing for ulcers and wounds. Internally the berries are useful remedies for mild catarrhal affections of the stomach and bowels.

RHUS TOXICODENDRON.—See Ivy Poisoning.

RIB, CERVICAL.—See Cervical Rib.

RIBS, FRACTURE.—This is a most frequent injury, occurring more often about the fifth to the eighth ribs, in middle-aged males, and in old persons. Direct violence usually produces fractures on only one side of the body, while indirect violence affects one or both sides or breaks one rib in several places. Fractures may be produced by muscular action, as in coughing and sneezing. They are seldom compound, save from gun-shot injury. Fractures of the ribs may be **complicated** by: An external wound; a wound of the pleura and lung, or pericardium and heart; laceration of a blood-vessel, as an intercostal artery; penetration of the diaphragm; and more rarely by perforation of the peritoneum, and wound of the liver or spleen. Hence they may be followed by emphysema, pneumothorax, hemothorax, hemoptysis, hemopericardium, and later by pleurisy, pneumonia, pericarditis, or peritonitis.

Treatment.—The object of treatment is to so immobilize the fractured rib as to put it in the most favorable state for repair. The erect posture is better than the prone. Displacement outward is corrected by direct pressure, while displacement inward is usually rectified by ordinary breathing or deep breathing brought about by anesthesia. As a temporary expedient only the forcibly applied broad rib-roller may be used. Broad bands (2 inches wide) of adhesive strips, extending from the spine to the sternum, and overlapping freely, applied with the arms held over the head while forced expiration is employed, and being put on from 6 to 7 inches below the seat of fracture successively upward, are commonly used. An inelastic spiral or figure-of-eight bandage may be put over the strips. The strips should

be worn for 3 or 4 weeks; fresh pieces being reapplied about once a week, the chest being rubbed with soap liniment, dried, and excoriations treated, as by zinc ointment. Cold, damp, and drafts are especially to be avoided; the diet should be nonstimulating, and cough should be checked by opiates and expectorants. In those over 60 years of age stimulating expectorants are called for, or a steam-tent may be used several times daily.

Confinement in bed is necessary when fracture of the rib is complicated with dangerous visceral injury. The circulation is to be reduced, the patient treated with adhesive strips as before described, put to bed, and diaphoretics and expectorants—such as a mixture of squill, ipecacuanha, ammonium acetate, chloroform, and opium—employed. When there is emphysema, it usually disappears of itself, but it may be necessary to open the cellular tissue and employ pressure under antiseptic precautions. If a sudden attack of dyspnea comes on, it is then advisable to bleed the patient almost to syncope. Pleurisy ensuing from fracture of the rib is mostly local, and is to be treated the same as ordinary inflammations of such membranes. So severe may be the visceral injury, or the patient's state, that it may be advisable to resect a rib, and on investigation treat such complication as may be found, and drain. Hemorrhage from an internal bleeding point indicates the resection of a rib, finding the bleeding point, and ligation thereof. See PLEURISY.

When the costal cartilages are fractured, an attempt should be made to reduce the displacement: if forward, by drawing back the shoulders; or if backward, by employing deep inspiration. A truss may be employed over the projection caused by a broken cartilage for a day or two to reduce the deformity. The case should be dressed and treated the same as a fractured rib—removing the dressings in 4 weeks.

RIBS, RESECTION.—See PLEURISY (Treatment).

RICINUS.—See CASTOR OIL.

RICKETS (Rachitis).—A disease characterized by nutritional changes, deformities of the bones, weakness of the muscles and ligaments, and various nervous disorders. It occurs especially between the ages of 6 months and 2 years. See BONE (Diseases).

Etiology.—The principal cause of rickets is improper feeding. Unhygienic surroundings, hereditary weakness, and feebleness of the digestive powers are also important factors in producing this disease. Breast-fed babies are seldom affected; but when the mother's milk is scanty and poor, as is likely to be the case when the child is weaned late, rickets may occur. Those suffer most frequently who are artificially fed, who receive their nourishment irregularly, and are fed on improper substances, as starches, condensed milk, cow's milk boiled, unmodified, or of an inferior quality, and the various proprietary foods. As the class that most often rear their children in this manner are also those whose hygienic surroundings are of the worst, naturally it is among them that rickets is most common.

The latest theory is that rickets is a "**deficiency disease,**" due to a *lack of vitamines* in the child's diet. The following facts have been adduced in support of this theory: (1) Rickets is less frequent and milder in breast-fed children; healthy breast milk always contains vitamines. (2) Breast feeding has a favorable effect on rickety children. (3) The nourishment of nursing women is often totally inadequate, and this may lead to deficiency of vitamines in their milk. (4) During the winter months the food supply of cows is often inferior, this leading to an inferior quality of milk. (5) The harmful effect produced on the vitamines of milk by prolonged boiling. (6) The harmful results of feeding children with starchy foods, which are poor in vitamines. (7) The beneficial effect of cod-liver oil, which contains vitamines, and also apparently a substance which aids the metabolism of lime salts in rickety children.

Pathology.—Bronchitis is very common. The stomach and intestines are often dilated; the liver may be enlarged, and enlargement of the spleen is frequently present. The only characteristic lesions of rickets, however, are those found in the bones. There are an increased production of cartilage at the epiphysis and excessive cell growth beneath the periosteum, while the process of ossification goes on very slowly or is entirely arrested, which accounts for the unnatural flexibility present in rachitic bones. Normally the bones contain about two-thirds inorganic and one-third organic matter; but in rickets there is a marked deficiency in the proportion of lime salts, and the proportions mentioned above may in severe cases be reversed—there being present twice as much organic as inorganic matter.

There are also characteristic changes in the form of the bones, the principal ones being curvatures and enlargement of the epiphyses of the long bones, and thickening of the bones of the skull.

Symptoms.—The early symptoms may be so mild as to be overlooked. In more severe cases there will be restless sleep, profuse sweating of the head, digestive and nervous disturbances, and perhaps slight fever.

Bending of the ribs (the rachitic rosary), caused by nodules formed at the junction of the costal cartilages and the ribs, and enlargement of the wrist-joints are the earliest noticeable changes in the bones. Dentition in most cases is delayed or arrested, and the fontanels remain open. The appetite is capricious: constipation, which may alternate with diarrhea, is usually marked, and the abdomen is enlarged (often enormously) and tympanitic.

Most rachitic patients are anemic, fat, and flabby, and they are very liable to suffer from inflammations of the mucous membranes, as gastro-intestinal catarrh, bronchitis, and pneumonia. Tenderness of the epiphyses and bones may be present, but is neither a constant nor reliable symptom, and when present to a marked degree suggests scorbutus rather than rickets.

Nervous symptoms are frequent and important; the nerve-centers are in an unstable condition and discharge on the slightest provocation, giving rise

to restlessness at night, to laryngismus stridulus, tetany, or general convulsions.

The deformities most uniformly found as a result of rickets are flat feet, enlarged epiphyses, bow-legs or knock-knees, a malformed thorax (pigeon-breast), and a large square head. In severe cases the spine may become deformed, and not infrequently there occur deformities of the pelvis.

The course of rickets is chronic, the active symptoms continuing for a period of from 2 or 3 to 18 or 20 months. The earliest symptoms of improvement are a diminution of the nervous symptoms, and of the head sweats, improvement in the anemia, and an increase in the muscular power. When improvement once begins, it usually goes steadily forward, relapses being exceedingly rare.

Diagnosis.—The early symptoms mentioned—sweating of the head, craniotabes, great restlessness at night, and delayed dentition—when occurring together are diagnostic of rachitis, but in cases when these symptoms are obscure, the exact nature of the affection may be doubtful before the bones show the characteristic changes.

Hereditary syphilis presents some symptoms which may be taken for rickets, but the lesions of the skin and mucous membrane and the difference in the character of the bone lesions are diagnostic. When there is enlargement of the long bones in syphilis, it is not confined to the epiphysis but involves the end of the diaphysis, and it often is accompanied by a condition that closely simulates a callus. There is a distinct tendency to fracture in syphilis rather than to the bending that is common in rickets.

The diagnosis between rickets and scurvy is mentioned under the description of the latter disease. See Scurvy.

Prognosis.—Many dangers attend rickets on account of the weakly state of the child. He is especially liable to bronchitis and bronchopneumonia, which are particularly dangerous owing to the weakness of the ribs and the feebleness of the respiratory muscles.

One of the effects of rickets is to stunt the child's growth as well as to leave him with deformities. The lowering of the health produced by rickets may last for many years, but in the majority of cases the symptoms and signs of this disease, if they come under treatment, disappear, and the child may grow up into a healthy adult.

Treatment.—The treatment of rickets is chiefly dietetic and hygienic. When possible, the patient should be taken to live in the country, or better—as the salt air is especially beneficial—at the seashore. He should be kept in the open air as much as possible, guarding against bronchitis by keeping him well covered with a woolen blanket and by keeping his feet warm. The living room should be accessible to sunlight, and the child should be given a daily warm salt-bath, followed by an inunction of cod-liver oil.

The food should be adapted to the child's age, and given in proper amounts and at regular intervals. See Infant Feeding. The sugar and starches should be reduced in the food, and the proprietary infant foods not given. Beef-juice should be added to the infant's diet. This is prepared by taking 1 pound of finely chopped round steak, 6 ounces of cold water, and a pinch of salt; place in a covered jar and stand on ice or in a cold place for 5 or 6 hours. This is now strained and all the juice squeezed out of the meat by placing it in coarse muslin and twisting it very hard. One teaspoonful of this may be given in the milk, or separately before taking the bottle, 3 times a day to a child 6 months old, increasing the amount gradually to 4 to 6 tablespoonfuls daily at 11 or 12 months. From 10 to 18 months there should be added to the diet list eggs, scraped raw meat, orange-juice, and fresh fruits.

Cod-liver oil should be given in all cases, and, except in hot summer weather, it is usually well tolerated. It is best given pure, the dose being from 10 drops to a teaspoonful 3 times a day, according to the child's age and its capacity for digesting it. It may be combined as follows:

℞. Syrup of lactophosphate of lime, } each, ʒ ij
Lime-water, }
Cod-liver oil, ʒ iv.
From 1/2 to 2 teaspoonfuls 3 times a day.

Or with phosphorus:

℞. Phosphorated oil, ʒ ss
Cod-liver oil, ʒ vj.
From 1/4 to 1 teaspoonful 3 or 4 times a day.

For the anemia iron should be given. One or 2 drops of the syrup of iodid of iron may be added to each dose in the above recipes, or it may be given as in one of the following:

℞. Syrup of iodid of iron, ʒ j to ij
Simple syrup, ʒ iij.
One-half of a teaspoonful in a little water 3 times a day.

℞. Citrate of iron and quinin, gr. x
Cod-liver oil, } each, ʒ ij.
Glycerin, }
One-half to 1 teaspoonful 3 times a day.

For the relief of sweating when profuse give 1/800 to 1/200 grain of atropin 3 or 4 times a day.

When digestive disturbances are present, they should receive appropriate treatment. As a rule, such simple remedies as calomel and soda, in small doses, and essence of pepsin will meet the indications.

Many of the deformities resulting from the softness of the bones may be prevented by precautionary measures. The children must not be allowed to sit up before their vertebral column will support them. They must not be carried about in the erect posture nor on the same arm always, and they must be discouraged from walking before their limbs are sufficiently strengthened. When there is craniotabes (thinning of the skull), the weight of the head must, as much as possible, be kept from falling upon that part of the skull. In very many cases slight deformities of the extremities are outgrown. Friction and intelligent manipulation of the ex-

tremities will do much to strengthen the muscles and straighten the bones, but braces should be applied if the deformity does not yield to these measures.

The deformity of the spine may be much benefited by postural treatment. The patient should lie upon a hard bed, no pillow should be allowed under the head; but in severe cases one should be placed beneath the back so that the spine is slightly raised. For a few minutes every day the child should be placed upon the face and the deformity overcome by raising the buttocks while pressure is made upon the spine. Friction and massage should be employed to strengthen the muscles. In severe cases an apparatus, as a brace or plaster jacket, should be worn a few hours every day. Little can be done toward correcting deformed bones by apparatus after the child is 2 1/2 years old, as the bones have then become hardened. After this time surgical treatment is the only means of cure.

RIGGS'S DISEASE.—See PYORRHŒA ALVEOLARIS.

RIGOR.—The phenomena—all referable to the central nervous system—that constitute a rigor frequently portend serious illness. The attack frequently shakes every muscle, the teeth chatter, the face twitches, eyelids and mouth-corners irregularly move or twitch, temperature often rises, and the sensation of intense cold ensues. Besides other motor symptoms, disturbances of function occur. A rigor is sometimes produced by traumatic influence, as after sudden dilatation of the urethra by a catheter; but we are by no means enlightened as to the pathologic state of the central nervous system that produces the rigor preceding the onset of disease.

A rigor occurring during the course of an illness, and not due to malaria, should suggest pus formation or thrombosis. In malarial fever and in acute diseases, especially pneumonia and erysipelas, rigors are usually premonitory symptoms.

The most usual **treatment** of a rigor has been that of stimulation and heat, through the use of brandy and hot water, hot bottles, and blankets. It is the disturbance of the heart that urges the necessity for treatment; and any drug that narcotizes the nerve-centers has a preventive effect on rigors. Chloroform will arrest a rigor, and morphin and quinin will prevent and arrest rigors due to catheterism. Practically, the administration of 1/4 to 1/3 grain of morphin hypodermically, with maintenance of external heat through hot-water bottles, hot blankets, or heated air, and the occasional use of hot alcoholic drinks, will suffice. See CHILL.

RIGOR MORTIS.—The muscular rigidity that occurs shortly after death, due to chemic changes resulting in the production of myosin. See DEATH (Signs).

RINGWORM OF THE BEARD (Tinea Sycosis; Barber's Itch).—A contagious, vegetable parasitic affection, attacking the hairs and hair follicles of the bearded region.

Symptoms.—The disease begins with the appearance of small, rounded, scaly, reddish patches (tinea circinata). The hairs and their follicles soon become invaded, with the production of swelling and induration and the appearance of nodular or lumpy tumefactions. Numerous pustules mark the sites of the hair follicles. These soon rupture and give exit to a yellowish pus, which dries in the form of crusts. The hairs are dry and brittle, and either break off or fall out. The chin, neck, and submaxillary region are the regions most frequently affected. The upper lip is almost never attacked. Itching and burning are present in varying degrees. The disease, when untreated, persists indefinitely. Unless treatment is extremely thorough, relapses are liable to occur.

Etiology.—The disease is due to the invasion of the hair follicles by the ectothrix variety of the trichophyton fungus. The affection is usually acquired in the barber shop. The disease, however, is not infrequently contracted from horses and cattle. When acquired from such sources, it is apt to be more severe.

Pathology.—Both the hair and the hair follicles contain the fungus. As in tinea tonsurans, the spores greatly predominate over the mycelium. Secondary inflammation of the follicles and surrounding tissues, with swelling, infiltration, and suppuration, are present in well-marked cases.

Diagnosis.—The chief affection to be differentiated is ordinary sycosis.

TINEA SYCOSIS.	SYCOSIS.
1. A typical case shows large, lumpy, or nodular tumefactions.	1. A typical case shows small, discrete pustules pierced by hairs.
2. Hairs broken and easily extracted. Roots usually dry.	2. Hairs firmly attached until free suppuration occurs. Roots often swollen with pus.
3. Course rapid. Marked changes from week to week.	3. Course slow. Little change from week to week.
4. Upper lip almost never involved.	4. Upper lip frequently involved.
5. Trichophyton fungus in hairs.	5. Absence of fungus in hairs.

Prognosis.—The disease is at times rebellious to treatment, although most cases get well in 1 or 2 months. Relapses are common.

Treatment.—The treatment consists of epilation and the use of parasiticide applications. Crusts should be softened with bland oils and then removed with soap and warm water, after which the part should be shaved. Shaving and epilation of the diseased hairs should then be practised upon alternate days.

The following applications are all efficient:

℞.	Precipitated sulphur,	ʒ j
	Petrolatum,	℥ j.
℞.	Sodium thiosulphate,	ʒ j
	Water,	℥ j.
℞.	Mercuric chlorid,	gr. j
	Water,	℥ j.

These should be applied 2 or 3 times a day.

RINGWORM OF THE BODY (Tinea Circinata).—A contagious, vegetable parasitic disease, due to the trichophyton megalosporon, or large-spored fungus, or the microsporon audouini or small-spored fungus, and characterized by annular vesiculosquamous patches upon the body surface. Of the trichophyton there are two main varieties, the endothrix which causes the transitory forms of macules, and the ectothrix to which is due the severely inflammatory type of the disease. Ringworm of the general surface for the bearded region is due generally to the ectothrix; that of the scalp is usually caused by the endothrix. In children, however, ringworm of the scalp is as a rule due to the microsporon though occasionally to the trichophyton.

Symptoms.—The disease begins as one or several rounded or irregular pea-sized, hyperemic, scaly patches. In a few days these assume a circular shape with minute papules or vesicles around the circumference.

Peripheral spreading and central healing progress hand in hand, so that the patches when fully developed are distinctly annular or ring-shaped. They are of a dull pinkish or reddish color, with slightly elevated borders, which exhibit a branny desquamation. Itching is usually slight. The face, neck, and backs of the hands are the most frequent seats.

In **tinea cruris** (*eczema marginatum, tinea trichophytina cruris*) the clinical appearances are so much modified as frequently to simulate an eczema intertrigo. The patches are large, diffuse, of a dull or brownish-red color, with a well-defined marginated, and at times slightly elevated, border. Outlying circinate patches are usually present.

The eruption spreads with remarkable rapidity, successively involving the thighs, groins, genitals, mons veneris, and nates. Eczema is apt to complicate the affection. The itching is often severe, particularly at night.

Tinea Trichophytina Unguium (*Onychomycosis, Ringworm of the Nails*).—Occasionally, the nails are invaded by the ringworm fungus. They become opaque, white, thickened, and soft or brittle. Two or three nails are usually affected. The disease runs a chronic course, and is refractory to treatment.

Pathology.—The fungus is found in the epidermis, particularly in the corneous layer. Mycelium is abundant, spores scanty. The former consists of long, slender, sharply contoured, bifurcated, jointed threads. The spores are rounded, highly refractive bodies, varying from 1/1000 to 1/600 inch in diameter.

Diagnosis.—Tinea circinata may be distinguished from eczema, psoriasis, and seborrhea by the superficial character of the lesions, their annular configuration, the history, the course, and, finally and conclusively, by the microscopic examination.

Method of Examining for the Fungus.—Epidermic scales are scraped off with a knife and placed on a microscopic slide with a drop of caustic potash (20 to 40 percent). A cover-glass is then applied, with sufficient pressure to flatten out the scales. The fungus is best studied with an oil-immersion lens, although it can be seen with the dry system.

Prognosis.—As a rule, the affection yields promptly to treatment. Tinea cruris is more rebellious than the ordinary form.

Treatment.—The treatment consists in the use of parasiticide ointments and lotions. Mercury, sulphur, beta-naphthol, resorcin, tar, and chrysarobin are all valuable. An efficient formula is:

℞. Ammoniated mercury, gr. xx to xl
Zinc oxid ointment, ℥ j.

Thiosulphate of sodium (1 dram to 1 ounce of water) and bichlorid of mercury (1 to 3 grains to 1 ounce of water) are useful applications, especially in tinea cruris.

RINGWORM OF THE SCALP (Tinea Tonsurans).—A contagious, vegetable, parasitic disease, characterized by circumscribed areas of partial baldness, with evidence of disease of the hairs.

Symptoms.—The disease begins with small, rounded, reddened scaly patches, occurring upon any portion of the hairy scalp. Soon the follicles become invaded and circumscribed hair-fall results. Typical lesions consist of partially bald, discrete, rounded, coin-sized, slightly reddened patches covered with grayish scales. The follicles are prominent, producing a "goose-flesh" appearance. The hairs are lusterless, and consist of "broken or gnawed-off stumps." They lie loosely in the follicles and are easily extracted.

In rare cases ringworm may affect the scalp diffusely, without the production of circumscribed patches (*disseminated ringworm*).

The only subjective symptom is itching, which is usually of a mild character. The disease occurs almost exclusively in children. In adults it is so rare as to constitute a dermatologic curiosity.

The course of the affection is extremely chronic. When cure results, full restoration of hair takes place.

Tinea kerion is a highly inflammatory ringworm terminating in suppuration. The patches are reddish or yellowish, raised, edematous, and boggy; they are honeycombed with distended openings of hair follicles, through which exudes a yellowish pus. Burning, itching, tenderness, and pain are present in a variable degree. The suppuration of a ringworm hastens its cure, but is apt to destroy the follicles and produce permanent baldness.

Etiology.—The cause of the disease is the trichophyton fungus or the microsporon audouini. Ringworm is essentially a disease of childhood. The affection is communicated from one child to another by means of caps, brushes, combs, towels, etc. It may also be contracted from the lower animals, such as the cat, dog, horse, or ox. Tinea circinata in the adult may produce tinea tonsurans in the child, and vice versa.

Pathology.—The fungus is found in the hair, the hair follicle, and the epidermis. In this form of the disease the spores are extremely abundant in the hair, producing under the microscope a fish-roe appearance. The mycelium is scanty or absent. The hair is prepared by immersion in liquor

potassæ, and is examined without staining. Only broken-off hairs are to be selected for examination.

Diagnosis.—The characteristic features of tinea tonsurans are circumscribed patches of partial baldness, grayish scales, goose-flesh appearance, broken-off stumps of hair, and the presence of the fungus.

These points will enable one to distinguish the disease from eczema, psoriasis, and seborrhea. The differential diagnosis from alopecia areata is here appended:

Tinea Tonsurans.	Alopecia Areata.
1. Slow and insidious onset.	1. Rapid onset.
2. Patches are	2. Patches are
(*a*) Covered with "broken-off stumps."	(*a*) Totally devoid of hair.
(*b*) More or less reddened.	(*b*) Pale and whitish.
(*c*) Rough and scaly.	(*c*) Smooth and soft.
(*d*) Follicles prominent; goose-flesh appearance.	(*d*) Follicles contracted.
3. Trichophyton fungus present.	3. Absence of fungus.
4. Occurs almost exclusively in children.	4. Common in adolescence and in adults.

Prognosis.—As to ultimate cure, favorable. As to duration guarded. Most cases persist from 6 months to 1 1/2 years.

Treatment.—The treatment consists of (1) daily soap and hot water cleansings; (2) epilation of diseased hairs; and (3) application of parasiticide ointments and lotions. The scalp will bear remedies of greater strength than the nonhairy surfaces.

The head should be washed vigorously each day with soap and hot water. For this purpose ordinary soap may be employed or, preferably, a soap containing tar. This accomplishes the double purpose of cleansing the scalp of fungus and scales and of preventing surface extension. The parasiticide effect of the washing may be increased by allowing the soapsuds to remain upon the scalp for from 15 to 20 minutes. The hair should be cut short in order to facilitate the application of the various medicaments.

The diseased hair should be extracted either with a broad-blade epilating forceps or the small end of a spoon and the thumb. Epilation is of value in effecting the removal of a considerable amount of fungus in the hair, in opening the follicle, and permitting the ingress of the parasiticide application.

The choice of the particular ointment or lotion is not a matter of great importance. It is the thorough and persevering use of the same that brings success. Sulphur, mercury, beta-naphthol, carbolic acid, resorcin, salicylic acid, tar, chrysarobin, and a host of remedies have been used, but those above mentioned are the most valuable. The following ointment will be found useful in most cases:

℞. Precipitated sulphur, ʒ j to ij
Petrolatum, ℥ j.

This is to be rubbed into the patches vigorously once or twice a day. One may use, in conjunction, a lotion of sodium thiosulphate, one dram to the ounce. Beta-naphthol is a remedy of great value, and has the advantage of being free from odor:

℞. Beta-naphthol, ʒ j
Petrolatum, ℥ j.

A lotion of the bichlorid of mercury may often be employed with advantage. Beginning with 1 grain to the ounce, one may gradually increase to 4 or 5 grains.

A word as to the prevention of the spreading of ringworm: Towels, brushes, combs, caps, soap, and other articles used by a ringworm patient should never be used by any one else. Physicians should prohibit children affected with tinea tonsurans from attending school until they are entirely cured. It is a great hardship upon a child to enforce its absence from school for a year or more, but it is the only method of stamping out this affection.

RISUS SARDONICUS.—A peculiar expression of the face, in which the features are distorted by spasm of the muscles so as to present the appearance of a painful grin or laugh. It is most usually observed in tetanus. After a full dose of strychnin (1/12 grain), among other symptoms, the face will take on an unmeaning smile, or risus sardonicus. The condition in itself is not to be treated, but its cause demands immediate removal.

RITTER'S DISEASE.—See Dermatitis Exfoliativa Neonatorum.

ROCKY MOUNTAIN SPOTTED FEVER.—An acute infectious disease occurring in Montana, Idaho, Nevada and Wyoming, and characterized by chills, fever, muscular pains, headache and a maculopapular or petechial eruption.

Etiology.—This is unknown; but the disease is spread by the bite of a tick, Dermacentor occidentalis.

Symptoms.—Most cases develop in the early spring, and are marked by a brief period of malaise, followed by chills, fever, headache, and pains in bones, joints, and muscles. On about the third to the sixth day a maculopapular or petechial rash appears; it is generally most marked about the hands and feet, but may occur on the face and trunk.

Diagnosis.—This is made by the location, time of year, and a history of a tick bite. It is to be diagnosed from typhoid, typhus, dengue, cerebrospinal meningitis; but the characteristics of these diseases are so marked that differentiation should not be difficult.

Treatment.—Protection against tick bites is of the utmost importance. Cold sponging, quinin, and later tonics, are indicated.

RODENT ULCER (Jacob's Ulcer; Cancroid Ulcer; Ulcus Exedens; Noli me Tangere).—A peculiar form of superficial epithelioma, almost invariably limited to the upper two-thirds of the face. It occurs in old age, and begins as a little nodule which ulcerates. The ulcer is round, oval, or irregular, with indurated everted edges and a smooth, glossy, pinkish surface; the discharge is

slight, pain is absent, adjacent lymph glands are not involved, metastases do not occur, and the general health is unimpaired except in the later stages, death resulting from hemorrhage or from the local destruction of important organs. The disease progresses very slowly, sometimes lasting 30 or 40 years, and occasionally cicatrizes in spots, the scars later breaking down. The ulcer advances principally along the surface, although in the later stages it extends deeply and destroys everything in its path, including the bones. The disease may originate in any of the epidermal structures. See EPITHELIOMA.

ROENTGEN RAYS.—The discovery by Prof. Roentgen of Wurtzburg of a new form of radiant energy emanating from a Crooke's tube has given rise to the new science of Roentgenology. He found that this new form of energy was capable of penetrating substances formerly considered opaque, in degrees varying with the vaccum in the tube, and the density of the object penetrated.

It affected the silver salts of the photographic plate, and the fluorescent salts spread upon a screen called a fluoroscope with proportionate degrees of intensity and thus lent itself readily to use in diagnosis. He did not invent any apparatus, but showed that the rays he discovered could be applied to physical diagnosis.

Roentgenology is the application to diagnosis and therapy of the unknown (X) or Roentgen rays. This science is subdivided into (*a*) *Roentgenography*, physical diagnosis by means of these rays and the photographic plate, (*b*) *Roentgenoscopy*, their use with the fluoroscope, and (*c*) *Roentgenotherapy*, treatment by this form of irradiation.

The development of apparatus has rendered the rays more powerful and less dangerous to the patient in experienced hands, but more dangerous both to patient and operator in the hands of the inexperienced. Their use must therefore be confined to those who have acquired special knowledge, and only in such hands can valuable results be expected.

The Dangers of the Roentgen Rays.—The advancement in technic and apparatus practically limits the danger to those who have little or no experience. The increase in power, which makes diagnosis now possible by an exposure of only a few seconds, augments the danger in the hands of the inexperienced. Medical knowledge is essential to their valuable application in diagnosis and in therapy; it is needed to appreciate the change produced, and to regulate the dose accordingly.

The series of lamentable, often fatal, accidents to operators has shown the necessity for special training. Though the patient is less liable to injury from the more powerful apparatus, the danger to the untaught operator is greater.

The Apparatus.—The evolution of efficient apparatus has been rapid. The Ruhmkorff coil of the physical laboratory even when improved was crude and difficult to handle. The modern Roentgen generator is more powerful and yet simpler in manipulation. It is a machine, as simple to run as an ordinary electric motor, without the disadvantages and complications of inverse currents, electrolytic or mechanical interrupters, and the constant expense and annoyance attendant upon their regulation and repair. It furnishes an unlimited supply of unidirectional high-potential current necessary to energize the Roentgen tube. It is an efficient and easily controlled mechanism of great power.

The problem of effective technic has, however, become more rather than less complicated, since more efficient modifications in its application have been made, thus rendering diagnosis more accurate.

Such efficient apparatus can be run in connection with any commercial electric lighting or power circuit, but must be adapted to the particular current to be employed.

The Roentgen Tube.—This is a modified Crooke's tube adapted to the purposes of Roentgenology. It is now the most complicated part of the apparatus to understand and requires efficient technic. Since the rays emanating from the Roentgen tube in action vary with its vacuum in penetration and therapeutic value, they must be adapted to the particular form of diagnosis to be made and to the disease to be treated.

Other essential accessory pieces of apparatus have been developed, the *milliamperemeter* to measure the amount of current passing through the tube; the *static voltmeter* to measure the tension of the current and the relative vacuum of the tube, *i. e.*, the penetrating power of the rays while the tube is in operation; filters, which by removing undesired rays have increased the safety and efficiency of the rays in diagnosis and treatment.

These contrivances, while reducing the time of exposures in diagnosis from minutes to fractions of a second, have rendered technic essential and yet more involved.

In practice Roentgenology is divided into diagnosis and therapy.

Roentgenography is a method of physical diagnosis by means of the Roentgen rays and the photographic plate. A *Roentgenogram* is a photographic negative produced by this method upon which tue Roentgen diagnosis is based. A Roentgenogram can be produced by any one who can run the apparatus, but one upon which a valuable diagnosis can be based can only be made by a medically educated operator knowing the essential special technic. For diagnostic purposes there is desired not a picture, but a Roentgenogram which shows the tissues in which a lesion is supposed to exist.

The value of the Roentgen diagnosis is dependent upon the medical training of the operator, his technical ability in employing this method and his clinical experience in translating the resulting data.

The tube must be placed in proper relation to the part to be examined and the photographic plate; the quality of rays must be adapted to the tissues to be studied; the exposure must be correct, in order to determine the presence or absence of the supposed pathologic lesion. Anatomical,

clinical and special technical knowledge combined with experience are therefore essential to an accurate Roentgen diagnosis.

Stereoroentgenograms are pairs of Roentgenograms so made that when each is viewed by one eye of the observer in the stereoscope the effect of a true perspective is produced. By this method the distortion produced by the divergence of the rays emanating from the tube is corrected and transformed into a true perspective or a realization of the third dimension. It has the advantage of showing the lesion in its true anatomic relations, not as a shadow, but, as it were, within a semi-transparent body. Thus the position of the bones in dislocations, the fragments in fractures, the location of foreign bodies, or the minute masses of tubercle in tuberculosis of the lungs are seen in their true anatomic relations to the surrounding normal structures.

The development of more efficient apparatus has shortened the time of exposure, so that voluntarily movable organs can be shown in sharp detail after exposure of a fraction of a second in most examinations; while no exposure, except in very stout individuals, should exceed 15 to 20 seconds, unless taken with portable apparatus. The examination of patients in their homes is easy and practical, but necessitates less powerful apparatus and longer exposures.

Applications of Roentgenography.—In internal medicine it has rendered diagnosis more accurate by clearly demonstrating the size, position, and form of aneurysms, aortic dilatations, changes in the size and position of the heart, mediastinal new growths, and strictures and new growths of the esophagus. In the lungs it locates and shows all macroscopic, pathologic changes, while in tuberculosis of the lungs it definitely determines the presence, position and size of areas of congestion, consolidation, softening and cavity formation, as well as the effect of adhesions and contractions upon the mediastinal viscera and the diaphragm. Early enlargement of the peribronchial lymph nodes can be shown before they can be detected by physical signs, while stereoscopic pictures reveal minute clusters of tubercle scattered throughout the lung.

The application of this method to the stomach after a bismuth meal has been given, reveals its normal or pathologic position and the presence or absence of motor insufficiency, pyloric obstruction, malignant disease, pathologic stricture of the stomach and intestines, or ptosis of these organs.

In the kidney, enlargements, displacements, abscesses, new growths and calculus formations can be revealed by this method. In renal calculus it is admittedly the most accurate method known. It determines the size, position and number of the calculi present in the kidney, ureter, or bladder, and no surgical intervention or expectant treatment is sanctioned without its employment. The differentiation between sthenic and asthenic forms of arthritis is another very valuable aid to internal medicine.

In surgery it is of great value in locating foreign bodies, in definitely determining the lines of fracture, the position and number of the fragments, the efficiency of reduction and of fixation appliances. The same is true of dislocations, while its value in excluding such injuries should not be overlooked.

It differentiates between the several forms of bone disease, showing the location, extent, and nature of cysts, tuberculosis, osteomyelitis, syphilis, malignant diseases.

In orthopedic surgery it is peculiarly adapted to the determination of the extent, location and character of bone defects, distortions and necroses, differentiating, for example, between achondroplasia and osteomyelitis, and elucidating the extent and character of the deformity present. It detects supernumerary bones and shows congenital malformations, defects and dislocations.

In otology and rhinology it reveals disease of the accessory sinuses, and the presence of abscesses and bone absorption in the mastoid cells.

Medicolegal Value.—The Roentgen rays produce a visible picture of pathologic conditions which could formerly be expressed only in the mental pictures formed by other methods of physical diagnosis. In medicolegal testimony it has the advantage of being evidence which can be seen and the meaning of which can be demonstrated to a jury. The question of interpretation is the only one capable of argument, and for that reason it is essential that expert testimony should be on hand for both sides, when any question of interpretation can be raised. In the majority of cases, especially of bone injury, the interpretation is obvious. This method possesses an additional advantage in that it shows not only the present condition, but also the extent of the original injury—a point which should always be brought out in malpractice suits. Its power to demonstrate the absence of any bone injury is particularly valuable when such an injury is falsely made the basis of a suit for damages.

Since this method has been admitted to be of scientific value and permitted as evidence in courts of justice, its employment in all cases of fracture forms the greatest safeguard to the surgeon against suits for malpractice. It furnishes evidence of the condition before treatment, the seriousness of the bone lesion, and if plates are made after the fracture is set and immobilized, demonstrates that efficient treatment has been instituted. The inference that the injury to function is proportionate to the distortion shown in the Roentgenogram is erroneous, for bones united with apparent distortion are frequently found after injury in limbs that have perfect function. The fact that the injury to ligaments and soft tissues is not shown by the Roentgenogram should be made clear, although they may be inferred from the injury demonstrable. It is therefore obvious that the evidence produced by this method cannot form the basis for determining the amount of functional injury sustained by the patient.

Roentgenotherapy.—The treatment of disease by means of the irradiations from a Crooke's or Roentgen tube.

The therapeutic value of the Roentgen rays has been so clearly demonstrated that this department of Roentgenology is firmly established. Pathologic studies have demonstrated that the Roentgen rays have a destructive action upon all tissues of low vitality and hence upon all cells resulting from disease, at the same time stimulating normal cells to greater activity. Thus this agent increases the local resistance of the normal tissues while it devitalizes the pathologic. This local action on metabolism in a measure accounts for the many successful applications of this agent.

The effective application of the Roentgen rays for therapeutic purposes demands careful study and experience. By timidity in their application the diseased cells instead of being destroyed may be stimulated to greater activity. By too severe treatment the normal cells may be injured and the local vitality and resistance so essential to recovery may be destroyed. The difficulties attending the proper use of this method account for divergent reports of success and failure.

The results obtained show that Roentgenotherapy is effective in many serious and especially chronic conditions intractable to other methods.

The field of this therapeutic agent is so wide that only a summary of some of its successful applications can be given.

In malignant disease some remarkable results have been produced. It has cured many inoperable and hopeless cases, while as a palliative measure it is the most efficient in affording, when properly applied, relief from pain. As postoperative treatment, its beneficial effect in malignant cases is shown in the reduced mortality rate of such cases. These results have led to its application in the earlier stages of the disease with proportionately better results.

In epithelioma (*q. v.*) and rodent ulcer it has been shown by many series of permanent results to be superior to other methods of treatment.

In tuberculous cervical adenitis it can be employed efficiently in the early stages of disease, when consent to radical treatment cannot be obtained, and while the patient is under medical treatment.

Successful results have been obtained in cases of recurrence after repeated operations. It produces healing in persistent sinuses and ulcerations that have defied surgical treatment. In these conditions it is therefore the method of choice.

In lupus vulgaris and lupus erythematosus it is the most effective treatment known, and produces permanent results with less scar formation.

In other cutaneous lesions such as acne, eczema, pruritus, ringworm, sycosis, etc., the results are remarkable, especially in the chronic forms that have resisted all other medication; this is especially true of the indurated acne and dry eczemas.

It has also been found valuable in diseases such as the neuralgias and neuroses, goiter (both simple, and exophthalmic), as well as other conditions, affording, in many instances, relief from pain, and permanent cure. To obtain the best results, however, treatment should be instituted in the earliest stages of disease.

ROSE (Rosa).—Represented in official pharmacy by the petals of one species and the volatile oil from another.

Rosa Damascena, *Damask Rose,* is the source of the official oil of rose, which is distilled from the fresh flowers.

Rosa Gallica, *Red Rose,* is the petals of *Rosa gallica,* collected before expanding. They contain an aromatic oil, tannic and gallic acids, *quercitrin,* coloring matter, salts, etc.

Rose water has no strictly medical properties, but is an agreeable excipient for lotions, collyria, and urethral injections. The ointment, commonly termed *cold cream,* is a pleasant emollient and protective agent, generally used for chapped hands and other superficial skin affections. Red Rose is classed among the astringents, as it contains an appreciable amount of tannic and gallic acids. A compound infusion, containing sugar and dilute sulphuric acid, was formerly official, and is used as an agreeable gargle for the throat and mouth in inflamed and ulcerated conditions. The chief uses of the rose preparations are as vehicles for other agents, or to impart flavor and odor to extemporaneous prescriptions.

Preparations.—R. Oleum, *Attar of Rose,* is a volatile oil distilled from the fresh flowers of *Rosa damascena.* It is a pale-yellowish, transparent liquid, having a strong odor of rose, a sweetish taste and a slightly acid reaction, but slightly soluble in alcohol. It consists of an aromatic oxygenated elæopten and an odorless solid stearopten (rose-camphor). Being very expensive it is much adulterated with other volatile oils. It is used chiefly for perfuming cosmetic preparations, ointments and lotions, and as the basis of the following three preparations. **R. Aqua Fortior,** *Triple Rose Water,* is water saturated with the volatile oil of rose petals. An agreeable excipient and flavoring agent. Dose, 1/2 to 4 drams. **R. Aqua** consists of equal volumes of the preceding and distilled water, mixed together immediately before use. It is an ingredient of mistura ferri composita. Dose, 1 to 8 drams. **Unguentum Aquæ R.,** *Cold Cream,* has of stronger rose water 19, expressed oil of almond 56, spermaceti 12 1/2, white wax 12, and sodium borate 1/2. **Fluidextractum R.,** prepared from red rose with glycerin and diluted alcohol. Dose, 5 to 60 minims. **Confectio R.,** has of red rose 8, sugar 64, honey 12, stronger rose water 16, beaten together into a mass. Dose, 10 to 60 grains. **Mel. R.,** *Honey of Rose,* has of the fluidextract 12, and clarified honey to 100. Dose, 1 to 2 drams. **Syrupus R.,** has of the fluidextract 12 1/2 percent. Dose, 1 to 2 drams for flavoring. Red rose is an ingredient of Pil. Aloes et Mastiches. The confection is an ingredient of Pil. Aloes et Ferri.

ROSE COLD.—See HAY-FEVER.

ROSEMARY (Rosmarinus).—The leaves of *R. officinalis.* Its properties are due to a volatile oil and a resinous principle. Rosemary was formerly considered emmenagog, galactagog, and diuretic. It is chiefly used as an external stimulant in liniments and lotions, especially to the scalp, in

alopecia (usually combined with cantharides). R., Oleum, the volatile oil. Dose, 1 to 5 minims.

ROSEOLA.—A rose rash. See ERYTHEMA, RUBELLA, SYPHILIS, TYPHOID FEVER, VACCINATION.

ROSMARINUS.—See ROSEMARY.

ROUGH ON RATS.—A paste for poisoning rats, occasionally used as a means of suicide. The active ingredient in most of these pastes is arsenic, and acute arsenic-poisoning results from its ingestion. See ARSENIC.

ROUND LIGAMENTS.—See ALEXANDER'S OPERATION.

ROUND-WORMS.—See WORMS.

RUBEFACIENTS.—Substances that by irritation of the ends of the nerve filaments of the skin cause distention of the capillaries and reddening of the skin. If left too long in contact with the surface, exudation between the cuticle and true skin may ensue, when the agent becomes a vesicant; or it may destroy the tissue and form a slough, when it is an escharotic. Muscular atrophy may be induced by rubefacients. The following is a list: Mustard, capsicum, camphor, ammonia, mezereon, arnica, alcohol, ether, chloroform, iodin, menthol, oil of cajuput, oil of turpentine, volatile oils, pitch, friction, and hot water. See COUNTERIRRITATION.

RUBELLA (Rötheln; German Measles; Roseola.—An acute infectious disease of a mild nature, and characterized by slight inflammation of the mucous membrane of the conjunctiva, mouth, nose, and fauces; enlargement of the cervical glands; mild fever, and a papular eruption of the skin.

Etiology.—Rubella is contagious, and may occur in epidemics or sporadically. Though probably microbic in origin, the specific organism has not been isolated. It is spread by the cutaneous exhalations and breath and by fomites, especially in hospitals or crowded quarters; it is very contagious, but in family practice it is but slightly so, the cases often confined to a single household. The incubation period is from 10 to 12 days, though it may vary; but as a rule it is longer than in measles.

The stage of invasion is from 1 to 3 days, but in mild cases the appearance of the rash may be the first indication of the disease.

Symptoms.—Usually for a period of a few days before the rash appears there will be chilliness, pain in the legs and back, a dull heavy feeling, and perhaps slight fever. There may be suffusion of the eyes and coryza. Enlargement of the tonsils and of the cervical lymph-glands are common.

Just before or with the appearance of the rash there is a rise in temperature—99° to 100° F., or in severe cases 102° to 103° F. These symptoms in certain cases may be very mild or altogether wanting, the appearance of the rash, as stated, being the first sign of infection. The rash first appears on the face and extends downward over the body. In some cases, however, only one part of the body may show any eruption; in others every part, including the palms of the hands and soles of the feet, may be covered. The roof of the mouth and fauces usually are more or less generally covered with the rash.

The eruption is multiform, confluent, and of a pale or rosy red color. The patches do not have any regular shape or form, and the skin between them may be hyperemic and itching. It reaches its height on different parts of the body in succession, fading in one part while appearing in another. The duration of the rash is from 2 to 5 days. Slight branny desquamation usually appears. A slight brownish pigmentation often follows the rash, but disappears in a few days.

The temperature varies, but usually there is fever—100° to 102° F.—while the eruption is at its height.

Sore throat of greater or less severity is usually present, as is also a dry bronchial cough. In severe cases vomiting may occur during the eruptive period, but, as a rule, the constitutional effects are very slight, the patient with difficulty being kept in bed. The duration is 3 days to a week; when uncomplicated, the convalescence is rapid. The complications that may occur are severe bronchitis, pneumonia, and gastrointestinal catarrh; but they are not frequent, most children escaping any serious consequences of the affection.

Diagnosis.—In sporadic cases there is no rule by which rubella may positively be distinguished from measles, or in certain cases from mild scarlatina.

The milder onset, the character of the eruption, and mild symptoms throughout, with the absence of complications and sequels, will, however, serve to differentiate it from a well-marked case of either of these diseases, with their characteristic onset, rash, and course. The eruption does not last so long as that of measles. There is more distinct mottling than in scarlatina.

The following table will be a guide in distinguishing rubella from erythema and urticaria:

RUBELLA.	ERYTHEMA.	URTICARIA.
Rash occurs first on face.	On hands and feet..	In wheals on arms and legs.
Coryza.....	None.....	None.
No itching at first..	Burning pain.....	Intense itching.
Contagious.....	Not so.....	Not so.
Microbic origin....	Reflex origin.....	Gastric origin.

The prognosis in uncomplicated cases or except when occurring in children weak and debilitated from other causes, is invariably favorable.

Treatment.—The child should be confined to a room with a temperature from 68° to 70° F., and when feverish kept in bed. A daily warm bath or warm sponging, followed by inunctions of cacao-butter, should be given, and the bowels kept open with small doses of calomel, to which, when there are fever and restlessness, should be added phenacetin or acetanilid, 1/2 grain for each year of the child's age, every 3 hours. When there is coryza or sore throat, the patient should be treated with a mild alkaline wash, and for the cough, when present, a mixture as given for measles should be prescribed. The child should be isolated for a period of at least 2 weeks.

RUBEOLA.—See Measles.

RUBUS (Blackberry).—It contains more than 10 percent of tannic acid. It is very astringent, and is highly esteemed in summer and infantile diarrheas. Dose, 10 to 30 grains. **R. Fluidextractum.** Dose, 10 to 30 minims. **R. Syrupus.** Dose, 1/2 to 2 drams.

RUMINATION (Merycism).—A remarkable and rare condition in which patients regurgitate and chew the cud, like ruminants. It occurs in neurasthenic or hysteric persons, epileptics, and idiots. It may be hereditary. Certain persons have the power of returning food from the stomach to the mouth at will.

In several instances recorded the return of the food took place in about 15 minutes after finishing the meal, and usually had no acid taste, and had not undergone any digestion. The medical treatment of the condition consists in the use of ipecacuanha and aloes twice daily, and administration of a tonic before meals.

RUPIA.—A term used to denote a peculiar variety of pustular syphiloderm. See Syphilis.

RUPTURE.—See Hernia.

RUPTURE OF UTERUS.—See Postpartum Hemorrhage.

RUSSO'S TEST.—See Typhoid Fever.

RYE.—See Ergot.

S

SABAL.—The fruit of *Serenoa serrulata*, the saw-palmetto. Sabal is sedative, nutritive, tonic and diuretic. It has been used with much benefit in the enuresis of old men, enlargement of the tonsils, spasmodic croup, chronic sore throat, and gonorrhea. The elixir saw-palmetto and santal compound is highly esteemed in incontinence of urine, vesical catarrh, and urethritis. Dose of the fluidextract, 1 dram.

SABINA.—See SAVINE.

SABROMIN.—Dibrombehenate of calcium. It has the same action as the bromids, but its effect is less rapid and more prolonged. It is said to be free from the disadvantages of the bromids. Dose the same as that of potassium bromid.

SACCHARATE.—Compound of saccharic acid and a base, or compounds of cane-sugar with a base. **S. of Iron** (ferrum oxydatum saccharatum solubile, Ger. Ph.), a compound of cane-sugar and iron, important as an antidote for arsenic. **S. of Lead**, a salt of saccharic acid and lead, used in forming the nitrosaccharate of lead, which has been vaunted as a safe and effective solvent for urinary calculus. **S. of Lime**, a compound of cane-sugar with lime. A syrup charged with it has been recommended as a cure for chronic rheumatism. A solution of this compound is a good antidote in carbolic acid poisoning. **Saccharated Carbonate of Iron**, a greenish-gray powder containing sulphate of iron. **S. Iodid of Iron**, iodid of iron with milk-sugar. **S. Pepsin**, milk-sugar with pepsin from the stomach of the hog.

SACCHARIN. $C_6H_4\langle^{CO}_{SO_2}\rangle NH$.—Benzosulphimid, derived from coal-tar, occurring as six-sided, colorless tablets, melting at 224° C. It is 280 times sweeter than cane-sugar. It is used as a substitute for sugar in diabetes, and is recommended for use in the treatment of corpulency and gout. It is also antiseptic, and has been found useful in erysipelas, septic fever, and gonorrhea. Dose, 1/2 to 5 grains.

SAFFRON.—See COLCHICUM.

SAFROL. $C_{10}H_{10}O_2$.—The methylene ether of allyl pyrocatechol, found in oil of sassafras and other oils. It is used in headache, neuralgia, and subacute rheumatism. Dose, 1 to 10 minims. It is also employed for perfuming soap.

SAINT VITUS' DANCE.—See CHOREA.

SAJODIN.—Monoiodobehenate of calcium. A substitute for the iodids. Although containing a smaller quantity of iodin than potassium iodid, sajodin is claimed to be equally efficient. It is said to have been proven exceptionally free from the unpleasant and deleterious by-effects of the iodids. It is used for the same purposes as potassium iodid. Dose, 15 to 45 grains daily.

SALICIN.—A glucosid occurring in the bark and leaves of willows and some poplars. It forms shining crystals that dissolve easily in hot water and alcohol, and melt at 198° C. Its taste is bitter. It possesses tonic properties, and is used as a substitute for salicylic acid in the treatment of rheumatism. Dose, 10 to 30 grains.

SALICYLIC ACID. $C_7H_6O_3$.—Orthooxybenzoic acid; occurs in a free condition in the buds of *Spiræa ulmaria*, in the oil of wintergreen, and in other varieties of gaultheria. It is also obtained synthetically. It consists of four-sided prisms, and crystallizes readily from hot water in long needles. Is soluble in water, and very soluble in chloroform; melts at 155° to 156° F. It is a powerful antiseptic and is used as such in surgery and dermatology in solution and ointment. It is much used in the treatment of acute articular rheumatism and myalgia. Dose, 5 to 15 grains.

Lithii Salicylas, a white, or grayish-white powder, odorless, sweetish, very soluble in water and in alcohol. Dose, 5 to 30 grains. **Sodii Salicylas**, a white, amorphous powder soluble in 3/4 of water and in 6 of alcohol, also in glycerin. Dose, 5 to 30 grains. **Strontii Salicylas**, a white, crystalline powder, soluble in 18 of water and in 66 of alcohol. Dose, 5 to 30 grains. **Methylis Salicylas**, *artificial oil of wintergreen*, is an ester, produced synthetically; and is the principal constituent of oil of gaultheria and oil of betula. It is soluble in all proportions in alcohol or glacial acetic acid. Dose, 5 to 30 minims, suspended in sugared water. **Phenylis Salicylas**, *salol*, is the salicylic ester of phenyl, and occurs as a white, crystalline powder, odorless and almost tasteless, nearly insoluble in water, soluble in 10 of alcohol, and very soluble in ether, chloroform and oils. On being warmed with an alkali it splits up into salicylic acid 60, and phenol 40. Dose, 5 to 15 grains, frequently repeated, in compressed tablets or in cachets, or suspended by mucilage of acacia or of tragacanth. See SALOL. **Physostigminæ Salicylas.** See PHYSOSTIGMA. **Oleum Betulæ** *oil of sweet birch*, is a volatile oil distilled from the bark of *Betula lenta*, the sweet birch. It is identical with methyl salicylate and nearly identical with oil of gaultheria. Dose, 5 to 30 minims. **Oleum Gaultheriæ**, *oil of wintergreen*, consists almost entirely of methyl salicylate, and is nearly identical with the preceding. See GAULTHERIA.

Sodium Salicylate is more soluble than the acid and less irritant to the stomach, while in doses about 50 percent larger it is equally efficient. It is employed in 3- to 5-grain doses internally after meals, to arrest gastric fermentation and to prevent acidity and flatulence. It is used instead of the acid in acute inflammatory rheumatism, muscular rheumatism, phlebitis, rheumatic neuritis and other irregular forms of rheumatism, with immediate benefit in most cases, and it sometimes gives temporary relief in chronic rheumatism. In

gout and its manifestations, especially migraine and sciatica, it frequently proves highly effective; and it has been used with satisfaction in cases showing a tendency to the formation of gall-stones. It is useful in the glycosuria of gouty subjects, and in the nervous irritability of lithemic persons. It is ranked as almost specific in pneumonia by many practitioners, and is very efficient in non-syphilitic inflammations of the eyeball, whether rheumatic or not, especially interstitial keratitis, if given in large doses. It is highly efficient in quinsy, and has been commended as an alterative diuretic for the removal of serous pleuritic effusions. When large doses are prescribed the patient should be kept in bed, and brandy, strychnin, and digitalis should be administered to counteract its depressant action. The salicylates are contraindicated in meningeal inflammation or congestion, middle ear disease, renal insufficiency, albuminuria, and nephritis.

Lithium Salicylate is believed to be particularly applicable in lithemia, gout, rheumatic arthritis, and the various manifestations of the uric acid diathesis.

Strontium Salicylate is not apt to derange the stomach, but is too slow in its action to be of value when a rapid and powerful influence is desired. In 5-grain doses it is one of the best intestinal antiseptics, giving better results than salol or naphthalene. In 10- to 15-grain doses it is one of the most efficient salicylates for chronic gout and lithemia with intestinal indigestion (Wood).

SALIFORMIN (Urotropin Salicylate).—Saliformin is a genitourinary antiseptic and is recommended as a uric-acid solvent. Its action is similar to that of a mixture of hexamethylenamin and salicylic acid, for it is largely hydrolyzed into its constituents in the presence of water. Dose, 5 to 30 grains.

SALINE INFUSION.—See Infusion of Salines.

SALINES.—See Cathartics, Mineral Waters.

SALIPYRIN.—A white powder, the salicylate of antipyrin, consisting of 57.7 parts of salicylic acid and 42.3 parts of antipyrin. It is readily soluble in water and has been recommended as an analgesic and antipyretic in doses of 10 to 20 grains.

SALIVATION.—An excessive secretion of saliva. It may be produced by certain poisons, by such drugs as mercury and pilocarpin, or by nervous disturbances. See Mercury (Poisoning), Sialagogs.

SALOL (Phenyl Salicylate). $C_{13}H_{10}O_3$.—A white, odorless, crystalline substance. It is used as an intestinal antiseptic and as a substitute for salicylic acid, being less irritating to the stomach. Dose, 5 to 15 grains. It is decomposed in the intestines into salicylic acid and phenol. On this account it has been employed to test the motor power of the stomach. A few grains are given in capsule and the urine is tested at intervals for the decomposition products of salicylic acid.

Salol is one of the most efficient remedies for duodenal catarrh, catarrh of the bile-ducts, and catarrhal jaundice; also in the bilious form of sick headache, and in some forms of neuralgia. It is a remedy of very great value in typhoid fever; disinfecting the ulcerated intestines, it promotes the healing process therein and hinders reinfection. It is highly recommended in dysentery, in cholera, and in infantile diarrhea. Given in the latter affection, a dark staining of the child's diapers is often noticed, which is due to the development of carbolic acid from the remedy. Its greatest power is manifested over acute rheumatism, in which disease many clinicians maintain that it has no superior, if given in 15- to 30-grain doses, up to 2 drams in the 24 hours, and continued for some time after the acute symptoms have subsided. In large doses, however, it is liable to induce symptoms of carbolic acid poisoning, which may be met by administering sodium sulphate or any other sulphate. It proves to be an efficient disinfectant in catarrh of the bladder, its constituents being excreted with the urine, and coming in contact with the vesical mucous membrane for a considerable length of time. It is much quicker in its action upon the urine than ammonium benzoate, as in a day or two, ordinarily, the urine loses its foul odor and alkalinity and becomes clear.

Externally, it is employed as an antiseptic and deodorant powder, against impetigo, eczema, sycosis, and other skin-diseases; and has done good service as an insufflation in the treatment of ozena. In spirituous solutions (5 percent) it is used with various flavoring agents in the preparation of mouth-washes and dentifrices; and it also enters into the composition of soaps, face powders, and other toilet articles.

In cholera morbus:

℞.	Salol,	ʒ j
	Bismuth, subnitrate,	ʒ ij
	Chalk-mixture, add enough to make	ʒ iij.

Two teaspoonfuls every 2 hours.

SALOPHEN.—A derivative of salicylic acid, occurring as minute, white, crystalline scales, odorless and tasteless, insoluble in water, but soluble in alcohol. It is decomposed by alkalies. The actions of salophen resemble those of phenyl salicylate (salol). It is not changed in the stomach, but is broken up in the intestine, liberating salicylic acid and acetylparamidophenol, which is not toxic. Its dose is 5 to 15 grains up to 1 or 1 1/2 drams in 24 hours. It is used as a substitute for salol, than which it is said to be far less poisonous. It can be very effectually combined with phenacetin in the treatment of neuralgia. In long-standing sciatica a 10 percent solution hypodermically into the gluteal muscles has given good results. It has been employed with decided benefit in intestinal dyspepsia with flatulence. See Salol.

SALOQUININ.—(Salochinin.) The salicylic ester of quinin. It is a tasteless, crystalline powder, insoluble in water. It is said to possess the virtues of quinin as well as those of salicylic acid, and is used efficiently as an antipyretic and antineuralgic. Dose, 5 to 30 grains.

SALPINGITIS.—See Fallopian Tubes (Inflammation).

SALTATORY SPASM.—See NERVOUS DISEASES (Examination).

SALTPETER.—Native potassium nitrate. It occurs in colorless, hard, rhombic prisms of sharp, saline, and bitter taste, and is soluble in about 9.5 of water at 59° F., or in 4 of boiling water, but is insoluble in alcohol. The dose is from 20 grains to 1/2 dram, well diluted. It is a refrigerant diaphoretic and diuretic in febrile and inflammatory affections, especially of the trachea and bronchi. It is useful in asthma, pneumonia, and rheumatism.

The fumes of the following burning niter paper are serviceable in spasmodic asthma:

℞. Potassium nitrate, 2 1/2 parts
Powdered belladonna leaves, 1/2 part
Powdered stramonium leaves, 5 parts
White sugar, pulverized, 1/2 part.

Dissolve the niter in just enough water to make a saturated solution, mix with the leaves, dry into a coarse powder, and add the sugar. A small quantity is to be placed on a tin plate, ignited, and the smoke inhaled.

Poisoning.—There is no chemic antidote. Emetics or stomach-pump, demulcent drinks, and emollient enemata, particularly milk, should be administered. Opium is the best antagonist for the subsequent depression. Aromatics and brandy may be given. See POTASSIUM.

SALT RHEUM.—See ECZEMA.

SALVARSAN.—See SYPHILIS.

SANDALWOOD (Santalum).—The wood of a species of *Santalum album* and *S. citrinum*, or yellow sandalwood. It yields oil of santal, an astringent oil, useful in chronic bronchitis and gonorrhea. It is often adulterated with oil of cedar. Dose of the **volatile oil**, 5 to 15 minims, in emulsion or capsule. *S. rubrum*, red saunders, the wood of *Pterocarpus santolinus*, imparts a brilliant red color to ether and alcohol.

SANGUINARIA (Blood-root).—The dried rhizome of *S. canadensis*. It contains the alkaloids sanguinarin, chelerythrin, protopin, and homochelidonin. Dose of the powdered root as an expectorant, 1 to 5 grains; as an emetic, 10 to 30 grains; best given in pill. In large doses it causes vomiting and purging. Toxic doses cause convulsions, and then paralysis; death results from failure of respiration. As a stomachic and hepatic stimulant it is employed in small doses (3 drops of the tincture). It is used as an expectorant in chronic bronchitis. Chronic nasal catarrh, asthma, and acute bronchitis are remarkably amenable to the influence of sanguinaria, particularly when it is given in 10-drop doses of the tincture. It is used as a specific emetic in croup, though its action is uncertain and harsh. It is incompatible with alkalies, tannin, and most of the metallic salts. Its antagonists are amyl nitrite, opium, atropin, and such drugs as antagonize the depression of the circulation and the local irritant action.

Preparations. Fluidextract.—Dose, 1 to 5 minims as an expectorant; 10 to 60 minims as an emetic (cautiously). **S., Tinct.**, 10 percent strong. Dose, 5 to 30 minims as an expectorant; 1 to 3 drams as an emetic. **Sanguinarin**, the alkaloid, unof. Dose, 1/12 to 1/8 grain; as an emetic, 1/2 to 1 grain.

SANOSE.—An albumin preparation, stated to consist of 80 percent of casein and 20 percent of albumose. It is a white, odorless, and tasteless powder, which readily forms emulsions with water. It is used as a food and tonic, preferably in form of emulsion.

SANTALUM.—See SANDALWOOD.

SANTONICA (Levant Wormseed).—The flower heads of *Artemisia pauciflora*, the properties of which are due to a crystalline principle, santonin. The flower heads yield about 2 percent of santonin, which is a very efficient anthelmintic against the round-worm, Ascaris lumbricoides. Dose, 1/4 to 2 grains. The tape-worm is not affected by santonin. Santonin should be given, as are all vermifuges, with preceding catharsis and starvation. Sodium santoninate should not be used, as it is absorbed by the system rather than by the intestinal parasite. The crystals of santonin rather than the powder should be employed. A saline purge should be given, preferably followed in a half-hour by a 2- or 3-grain dose of calomel, if no bowel movement has occurred within 10 hours after taking the santonin.

℞. Santonin, gr.v
Powdered white sugar, ʒ iij
Powdered acacia, gr. viij.
Mix well and add:
Mucilage of acacia, gtt. xvj
Water, sufficient quantity.

Make into 10 troches. Give 1 or 2 as directed.

See ANTHELMINTICS.

In large doses it produces yellow vision and gives a yellow color to the urine. In toxic doses it causes headache, vertigo, sometimes convulsions, and death by respiratory paralysis. **Santonini, Troch.**, each contains 1/2 of a grain of the active principle. Dose, 1 to 5.

SAPO.—See SOAP.

SAPREMIA.—See SEPSIS.

SARCINA.—A genus of Schizomycetes, or bacteria, having spheric or ovoid cells dividing in three directions, thus producing cubic masses of greater or less size. See BACTERIOLOGY.

SARCOMA.—A connective-tissue tumor in which the cells so predominate in number, and often in size, that the intercellular substance becomes a secondary element. It may also be defined as a tumor made up of embryonal connective tissue. Sarcomata are malignant tumors, the small-celled forms and those of soft consistency excelling in this respect. They appear, as a rule, at an earlier age than carcinoma. The problem of their causation is not solved: in many instances it is possible to trace a history of injury. It is probable, however, that the trauma merely acts as a predisposing cause. To the naked eye sarcoma appears, as the etymology of the word indicates, flesh-like. Microscopically, the picture varies with the variety of tumor, whether it is a round-cell, a spindle-cell, or a giant-cell sarcoma, or one

of the other derivative forms. Sarcomata are well supplied with blood, which, however, is not contained in true vessels, but in spaces lined by endothelium. They are often combined with other new growths, especially with the so-called mixed tumors and with certain congenital neoplasms, as the rhabdomyoma. The most frequent seats of sarcoma are the connective tissue of the skin, periosteum, intermuscular septa, tendons, subserous connective tissue, and the eye.

Treatment.—Operable growths should be early and thoroughly excised. Inoperable growths have been treated by inoculations with the streptococcus of erysipelas by reason of the fact that an attack of erysipelas sometimes has effected a cure. Recently a number of inoperable cases have been decidedly benefited by injections of Coley's fluid (a sterilized culture of the streptococcus of erysipelas and the bacillus prodigiosus).

"The initial injections are preferably made remote from the tumor, either in the pectoral regions or buttocks. After the susceptibility of the patient has been determined, if the tumor is easily accessible, best results are usually obtained by alternating with local injections. For the remote injections, it is important that the minimum dose should not be over 1/2 minim, and for the local injections (made into the tumor itself) 1/8–1/4 minim is sufficient to start with. Accuracy of the dose may be obtained by diluting the toxins with 3 to 4 times the amount of freshly boiled water. The dose should be increased by 1/2 minim daily up to the point of producing a marked reaction, temperature 102° to 104° F., after which 3 to 4 treatments a week should be sufficient. If due care is taken to secure asepsis, and if one is careful not to give too large doses, or initial dose, the toxins are practically devoid of danger. In a very few cases irritation of the kidneys developed, and it is therefore well to have regular analyses of the urine made during the period of treatment.

"Coley's last paper, read before Brussels Congress in 1913, contains a report of 80 personal cases successfully treated with the toxins, as well as a tabulated list of 102 cases successfully treated by other men. Of the personal cases successfully treated with the toxins, 59 have remained well over three years, namely:

13 well from	15–20 years
5 well from	10–15 years
25 well from	5–20 years
16 well from	3– 5 years

"The tables of other men's cases treated with the mixed toxins, show 63 having remained well over three years:

4 well from	15–20 years
8 well from	10–15 years
19 well from	5–10 years
32 well from	3– 5 years

"It is worthy of note that all types are represented in this series of cases, but the type least favorably influenced by the toxins, is the melanotic.

"It is a noteworthy fact that seventeen of Dr. Coley's successful cases were lymphosarcomas; this is especially interesting, inasmuch as there are no cases on record of a cure of lymphosarcoma either by surgery or X-ray, after more than one gland had become involved. Coley believes that the most promising field for the toxins lies in the routine administration immediately after primary operation, keeping the injections up for a number of months. He also advocates the preliminary use of the toxins in sarcomas of the long bones, before amputating, in the hope of saving the limb, and reports upward of 20 cases in which the limb as well as the life of the patient had been saved by such preliminary treatment" (Potter).

The X-rays have proved curative in a number of cases of sarcoma. See Carcinoma, Tumors, Bone (Diseases).

SARSAPARILLA.—The dried root of *Smilax medica*, and several other species of the smilax family, native to tropical America. It contains an essential oil and several extractive principles, and is diuretic, tonic, and alterative. It has mild alterative properties and is a good vehicle for potassium iodid. It is used somewhat in tertiary syphilis, scrofula, and similar diseases.

Preparations. Fluidextractum S.—Dose, 20 to 60 minims. **Fluidextractum S. Compositum** has of sarsaparilla 75, glycyrrhiza 12, sassafras 10, mezereum 3, glycerin 10, diluted alcohol to 100. Dose, 20 to 60 minims. **Syrupus S. Compositus** has of the fluidextract 20, fluidextract of glycyrrhiza 1 1/2, fluidextract of senna 1 1/2, sugar 65, oils of sassafras, anise and gaultheria, each 0.02, water to 100. Dose, 1 to 8 drams.

SASSAFRAS.—The root bark of *S. variifolium*. Its properties are due to a volatile oil. It is aromatic and a stimulant diaphoretic. **S. Oil,** the volatile oil. Dose, 1 to 4 minims. **Mucilago S. medullæ.** Dose, about 4 drams.

SATURNISM.—See Lead (Poisoning).

SAVINE (Sabina).—The tops of *Juniperus sabina*; its properties are mainly due to a volatile oil which resembles turpentine, but is more irritant. Dose, 5 to 10 grains. In large doses it produces violent purging and vomiting. It is used as an emmenagog. Externally, it is useful to prolong the discharge from blisters and to stimulate ulcers to cicatrization. **S., Fluidextract.** Dose, 2 to 10 minims. **S., Ol.,** the volatile oil. Dose, 1 to 2 minims.

In amenorrhea:

℞.	Oil of savine,	♏ viij
	Mucilage of acacia,	ʒ j
	Camphor water,	ʒ iij

Two tablespoonfuls 3 times daily.

SAW-PALMETTO.—See Sabal.

SCABIES (Itch).—A contagious, animal, parasitic disease due to the sarcoptes scabiei (acarus scabiei), characterized by burrows and a multiform eruption, and attended by severe itching.

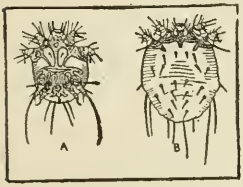
Symptoms.—The itch-mite in burrowing into the skin produces at the point of entrance a small papule, vesicle, or pustule. Later, a burrow or cuniculus is formed at this site. The burrow is a straight, tortuous or zigzag, grayish or blackish,

linear, epidermal elevation, varying in length from 1/8 to 1/2 inch.

In a well-marked case of itch there may be seen, in addition to the burrows, a multiform eruption consisting of papules, vesicles, pustules, crusts, excoriations (scratch marks), and thickening, occupying certain definite regions where the skin is thin; these are the interdigital spaces, the flexor surface of the wrist and arm, the anterior and posterior axillary folds, the breasts and nipples (in women), the umbilicus, the buttocks, the penis, the inner side of the thighs and legs, and the toes, (particularly in infants). The face is exempt except occasionally in infants.

The eruption is attended by intense itching, which is distinctly worse at night. The irresistible scratching leads to the production of the secondary inflammatory symptoms. In children and individuals with sensitive skin the eruption may reach a high grade of inflammation. In predisposed subjects an eczema may be superadded to the scabies. The disease develops rapidly in the course of from 1 to 2 weeks. It is progressive, exhibiting no tendency to spontaneous cure. In untreated cases it may last many months.

Etiology.—The disease is due to the invasion of the skin by the sarcoptes or acarus scabiei. It is highly contagious. The disease may be transmitted by direct bodily contact or through the intermediation of such articles as the bedclothes. It occurs at any age, and is particularly common among the lower classes.



SARCOPTES SCABIEI. *A*. Male. *B*. Female.—(*Braun*.)

Pathology.—The burrow consists of a narrow tract through the epidermis made by the penetration of the impregnated female acarus. The mite deposits a half dozen or more eggs and specks of excrement along the course of the tract, and, after reaching the mucous layer, perishes. The ova hatch out in 8 to 10 days, and, effecting their egress from the burrow, start cuniculi of their own. The itch-mite is a yellowish-white ovoid body, just visible to the eye. The female is twice the size of the male.

Diagnosis.—Scabies consists of the burrows plus an artificial inflammation of the skin, produced by the parasite and by the scratching. The characteristic features of the disease are the presence of the burrows, a multiform eruption distributed in a peculiar manner over the surface of the body, the intense itching—worse at night—and the history.

Scabies may be distinguished from vesicular or pustular eczema by the presence of the mite and the burrows, the peculiar distribution of the lesions, the progression of the eruption from day to day, and the history of contagion. From pediculosis corporis the disease may be differentiated by the character of the eruption and the regions affected.

Prognosis is favorable. The disease, no matter of what duration, is speedily durable.

Treatment.—The objects of treatment are twofold—to kill the parasite and to subdue the accompanying dermatitis. The itch-mite is easily destroyed by such remedies as sulphur, beta-naphthol, balsam of Peru, styrax, tar, staphisagria, etc.

Sulphur is one of the most reliable remedies, and is best applied in ointment form. It may be used in conjunction with balsam of Peru, as in the following formula:

For adults or those of nonirritable skin:

℞.	Precipitated sulphur,		℥ j
	Balsam of Peru,		℥ ss
	Beta-naphthol,		℥ ij
	Lard, Petrolatum,	each,	℥ iv.

Make into an ointment.

Beta-naphthol possesses the advantage of being free from odor and more cleanly. It may be used alone (1 dram to 1 ounce) or combined with sulphur.

Styrax is less irritating than suphur, and is useful in the itch of children:

℞.	Styrax,	℥ ss
	Lard,	℥ jss.

The treatment should be inaugurated by a protracted hot bath, with the vigorous use of soap. The body from neck to feet is then to be thoroughly smeared with the ointment. This may be rubbed in twice a day for 3 days, or nightly for 1 week. At the end of this time another bath should be taken, and the underclothing and bed-linen changed and sterilized. Ordinarily, such treatment will suffice to produce a cure; occasionally, it must be repeated.

Care should be exercised not to *overtreat* cases. The persistence of itching is not always an index of the continuance of the scabies, but is more likely to result from the dermatitis, which is, perhaps, aggravated by the parasiticide application. In such a case a sedative ointment or lotion should be substituted.

SCALDS.—See BURNS.

SCALP, DISEASES.—**Abscess** may occur above the aponeurosis, between the aponeurosis and the pericranium, or beneath the pericranium. It is generally the result of an injury, but may be due to the breaking down of a gumma, diseases of the bones, etc.

Cellulitis of the scalp is usually due to a wound, and is described under SCALP (Injuries) (*q. v.*).

Erysipelas of the scalp is common, and may occur idiopathically or as the result of a wound. In the so-called idiopathic cases, however, it is probable that there is generally some scratch or abrasion through which the specific micrococcus gains admission. The inflammation spreads with great rapidity, but is accompanied by very little redness and swelling on account of the tenseness of the parts. It is likely to be attended with headache, drowsiness, or delirium, consequent upon the hyperemia extending to the pia mater. See ERYSIPELAS.

Nævi are also common on the scalp. When large and situated over the anterior fontanel, they should

be dealt with cautiously, lest the membranes of the brain are injured and meningitis results.

Rodent ulcer and **epithelioma of the scalp** require no special mention here.

Sebaceous cysts are very common on the scalp, where they are at times hereditary. They are frequently multiple, and as they increase in size the hair covering them falls off, and they appear as bare, rounded tumors. The mass of granulations which sometimes protrudes from the walls of these cysts (*fungating ulcer of the scalp*) closely resembles epithelioma, from which, however, it may generally be distinguished by the absence of induration and glandular enlargement, and by the history of a sebaceous cyst having been previously present. Congenital and dermoid cysts are met with.

Seborrhea.—See ALOPECIA, SEBORRHEA.

SCALP, INJURIES.—The scalp presents certain anatomic features of considerable surgical importance. The skin in the first place is so closely bound down to the aponeurosis beneath that mere cutaneous wounds never gape, and superficial inflammation is never attended by much swelling or redness. For the same reason contusions often cause what apparently are incised wounds. Further, the chief vessels lie between the aponeurosis and the skin, and are embedded in such dense tissue that when they are cut they cannot retract, and can hardly be tied. On the other hand, beneath the aponeurosis the tissue is so loose that blood or pus may collect until the skin floats as on a water-bed, bounded by the zygoma, the eyebrows, and the superior curved line; and the scalp can be stripped off and hang in flaps. Sloughing, however, owing to the position of the vessels, is rarely caused in this way. Finally, the pericranium is easily separated from the bone, except at the sutures; it only supplies the outer table, not the diploe or the inner, so that when necrosis occurs from this cause, the sequestrum is usually superficial. It is peculiar also that it seldom produces any new bone to repair an injury.

Contusions.—The blood may be extravasated (1) in the scalp itself; (2) in the subaponeurotic layer, or (3) between the pericranium and the bone.

The first, owing to the denseness of the tissue, is always insignificant. The second may be either diffuse and of enormous extent, or circumscribed, and then very often it is curiously deceptive. The blood around the margin coagulates into a hard, dense ring, the niner edge of which is sharp and well defined, while the outer is beveled off; in the center it remains fluid, so that when the finger is pressed upon it the margin stands out as clearly as the edge of a depressed fracture, for which it may easily be mistaken. The ring, however, is distinctly raised above the level of the surrounding bone, and it can always be indented. Abscesses sometimes give rise to the same kind of impression, and it must be remembered that the presence of a hematoma does not exclude the existence of a fracture.

The third (**cephalhematoma**) only occurs in infants, and nearly always from injuries received at birth. It is most common on the parietal bone —though it has been seen on the occipital—and is easily recognized by the way in which it is limited to one bone; it never extends over the sutures. Like the former, the margin becomes hard, and a certain amount of organization, and even ossification, takes place; the center remains fluid, and for a long time gives rise to a sensation of parchment crackling when pressed upon. Absorption in all these cases is slow; but, unless inflammation sets in, they should never be incised, and aspiration is rarely necessary. The cephalhematoma of infants should not be operated upon; in other cases lead lotion may be applied at first, or, if the patient will lie down, an ice-bag, to check the extravasation and hyperemia; afterward, well-applied pressure is the most efficient remedy.

Wounds.—These, like contusions, may be superficial, involving the skin only; or extend into the subaponeurotic layer; or lay the bone bare. The first are rarely of any extent; in the second, if the hair is entangled in machinery, or the head caught under a cartwheel, the whole scalp may be detached and hang down in a flap, but it rarely sloughs; in the third, there is an additional danger, for the bone is exposed, and is often bruised or scratched. Hemorrhage from the torn vessels is often abundant, but neither ligation nor torsion is of any use. Pressure stops it at once. Acupressure may be used, but a bandage is nearly always sufficient; care, however, is necessary, as it may be applied so tightly as to cause a slough.

Treatment.—Scalp wounds require no special treatment: the same principles must be followed as elsewhere; the only peculiarities are the extraordinary vitality of the skin, and the ease with which inflammation, if it once occurs, spreads in all directions. Therefore no portion of the scalp should ever be sacrificed, no matter how bruised or dirty it is; and perfect cleanliness and perfect drainage must be insisted on. If this is carried out, they may be treated like other wounds, and with exceptional success.

The head must be shaved about the injury, the wound carefully explored, washed out thoroughly with an antiseptic, all oozing stopped, and any bagging or collecting of fluid prevented. Counter-openings may be made and drainage-tubes inserted, if there is a dependent pouch; but in most cases it is sufficient to support the skin well against the skull so as to keep it at rest and insure early adhesion. Then the edges of the wound may be dusted over with iodoform and covered with an absorbent dressing, such as wood-wool, or a sponge wrung out of carbolic solution. There is no objection to the use of sutures, if care is taken; but if the wound is tightly sewed up, and suppuration allowed to take place beneath, serious consequences must ensue. Even if half the scalp is stripped off and hangs down the back of the neck, or over the face, it may be treated in this way, and often will adhere at once. If it does not, the under surface throws out granulations and union takes place by the third intention. In all cases of severe injury the patient should be confined to bed, and kept perfectly quiet, on low diet; and care must be taken that the bowels do not become consti-

pated. It must never be forgotten that, in addition to the scalp wound, there may be very great injury to the brain.

So long as there is no pain nor fever, the wound should be left alone. If, however, one spot is tender, or if the temperature rises, or if there is any shivering, the wound must be exposed at once and carefully examined; it nearly always means that some of the secretion is pent up. As a rule, it is sufficient to introduce a probe or to loosen a suture—a drop or two of fluid escapes, and the symptoms are relieved at once (Moullin).

SCAMMONY.—A purgative gum-resin, the dried juice of the root of *Convolvulus scammonia*, a Southwestern Asiatic plant. It is generally given in combination with other drugs. Its properties are due to an active principle, jalapin. It is a drastic cathartic, and is contraindicated when there is a tendency to true inflammation of the bowels. It is anthelmintic against the tapeworm, and in overdoses produces a high degree of irritation. It is used as a drastic purgative for children with calomel or potassium sulphate. Treatment suitable for gastroenteritis may be necessary if poisonous doses have been administered. It is best given with colocynth or some similar drug. Dose, 1 to 10 grains. S., Resina. Dose, 1 to 5 grains.

SCAPULA, CONGENITAL ELEVATION OF.—See Sprengel's Shoulder.

SCAPULA, DISLOCATION.—The acromion may be dislocated from the scapula upward or downward. The conoid and the trapezoid ligaments are strong enough to make both injuries unusual, and the former very rare. A fall or blow is the most common cause; carrying heavy weights may be causative. This dislocation is easy to reduce, but very difficult to keep in place. Drawing the shoulder back and pressing the clavicle down will restore the joint, but the deformity recurs on removal of pressure. Velpeau's dextrin band and Holland plaster are the most successful methods of treating this dislocation. Sloughing of the skin is to be carefully looked for. A pad over the acromial end of the clavicle may be strapped down by means of a broad webbing band carried over it and under the point of the elbow. When the deformity is the first consideration, the patient should be placed perfectly flat on the back for a week or 10 days, the scapula fixed, the weight of the limb taken off, and the trapezius relaxed. See Shoulder (Dislocation).

SCAPULA, FRACTURES.—The scapula is so much covered with muscle, and its connections with the trunk allow so much yielding on the application of external force, that fractures of this bone are extremely uncommon

Varieties.—The injury may occur to its **body**, its **inferior angle**, its **neck**, to the **acromion process**, or to the **coracoid process**.

Symptoms.—In fracture of the **body** of the bone the shoulder will be depressed and forced forward, and there will be marked irregularity between the ends of the fragments. Fracture of the **inferior angle** is marked by preternatural mobility, by displacement of the smaller fragment, and by acute pain at the seat of injury. In **fracture of the neck** the acromion is unusually prominent, the head of the humerus is felt in the axilla, the shoulder is flattened, the limb is lengthened, the coracoid process is found below the clavicle, severe pain and numbness are experienced in the axilla, and distinct crepitation is perceived on rotating the arm upon the scapula. In fractures of the acromion and of the **coracoid** the symptoms are somewhat similar to those presented by the fracture of the neck.

Treatment.—When the **body** is broken, a broad roller must be passed around the trunk, over a large flat pad placed over the scapula, and a few turns made around the arm so as to fix it to the side and prevent motion. Rest and quietude are required. Or a broad strip of adhesive plaster should be applied across the scapula, extending from the spine to the sternum, care being taken to press it well down along the anterior and posterior borders of the bone before the portions in front and behind the chest have been attached. Then place the arm in a Fox apparatus, and allow it to hang vertically along the side of the body, at the same time lifting the elbow by securing the straps to the ring on the opposite shoulder.

In **fracture of the neck** the shoulder must be supported by the sling and bandage that are used for fracture of the clavicle; but the pad should not be so thick, nor so large, and in addition a short sling should be used, going from the axillary pad on the injured side to the opposite shoulder. Opium, rest, leeches, and purgatives may be necessary for the contusion with which this fracture is accompanied. At the end of 4 weeks passive motion must be made to establish the functions of the joint.

In fracture of the **acromion** the bandages are to be applied so as to raise the elbow thoroughly, so that the head of the humerus may be lifted up against the acromion and keep its place. A pad must *not* be placed in the axilla, otherwise the broken part will be pushed outward too much.

When the **coracoid process** is fractured, the humerus must be brought forward and inward, so as to relax the coracobrachialis, and must be confined to the trunk, with the forearm bent on the chest.

SCARIFICATION.—The operation of making superficial incisions or punctures to allow the escape of serum or blood or gases. According to circumstances they may be deep or penetrate through the skin alone. In conjunctival chemosis, in early acute tonsillitis, in edema or engorgement of the glottis, and in congestions and certain acute inflammations of the uterus, in inflamed ulcers, and those in danger of gangrene, and, indeed, in almost any condition of great tension, the procedure will give relief.

SCARLET FEVER (Scarlatina).—An acute infectious disease, characterized by sudden onset, with vomiting, high fever, sore throat, and an erythematous rash. Serious complications and sequels are not uncommon. It is contagious from the beginning of the attack until desquamation has ceased, and under certain conditions after this time. One attack is rarely followed by subsequent ones.

Etiology.—While believed to be due to a microorganism, none has as yet been demonstrated as

the specific one. Streptococci have been found in the blood by many observers, and less frequently the staphylococcus aureus and the influenza bacillus, but these are probably present as a result of mixed infection. Scarlet fever occurs epidemically, and occasionally sporadically, the epidemics being most common in the fall and winter. As it is most contagious late in the disease (during desquamation), epidemics spread slowly.

The skin seems to be the chief source of infection, but it may be conveyed by the discharges from the mucous membrane of the nose, mouth, or throat, and by the urine, feces, or perspiration, and later, even after desquamation has ceased, by purulent discharges from rhinitis, otitis, suppurating glands, etc. The carpet and furniture of the sick room, and toys, books, and clothing, which may have been in contact with the patient, are often a medium of contagion, as may also be the attendants or nurses. Air may convey the infection for a short distance, and the usual route of infection is the respiratory tract. It may, however, enter by way of the digestive tract. Domestic animals may transmit the disease, and it has, in a number of cases, been spready by food—particularly milk. Children are much more susceptible than adults, but in either the susceptibility to scarlatinal infection is much less than to that of measles.

Pathology.—The parts primarily affected are the throat and skin. Lesions of other organs are rare, but, when present, are due to the fever and septic condition. The principal pathologic lesions due to complications are of the ear and cervical glands; the chief ones from sequels are those of the kidneys and heart.

The scarlatinal throat consists of an erythematous condition of the mucous membrane with the usual changes of a catarrhal inflammation. The skin is hyperemic, inflamed, and swollen, causing death of the epidermis, which is cast off during desquamation.

Symptoms.—The period of incubation is short —1 to 5 days—during which time there are no symptoms to indicate the onset of a disease.

The invasion is sudden: the first symptom in the majority of cases being vomiting. The child complains of chilliness, headache, and sore throat. The temperature will be high from the first (103° to 104°F.) and the pulse rapid and wiry. Prostration is usually well marked, and there may be slight delirium, and, in young children, convulsions. The skin is hot and dry, the face flushed, and the eyes bright.

On inspecting the throat, the tonsils, pharynx, and fauces will be found red and congested, and there will be seen on the hard and the soft palate minute macules of a darker red color than the intervening mucous membrane. An exudate resembling follicular tonsillitis, or even the membrane of diphtheria, may appear upon the tonsils.

At the end of from 12 to 36 hours after the onset the efflorescence appears, and in most cases is first seen upon the front of the neck and the upper part of the chest, but rapidly extends all over the body and face, being fully developed in the course of from 12 to 24 hours. The rash is of a bright scarlet color, and when viewed at a short distance, the whole surface of the body appears to be uniformly covered; but examined closely, it consists of great numbers of red points corresponding with the hair follicles; these points are surrounded by zones of erythematous redness, which, joining one another, give the general diffuse red appearance to the skin.

In some cases the rash consists of the points only, without the erythema; in others it may appear in patches with normal skin between. Rather rarely the rash is hemorrhagic, small extravasations of blood taking place into the skin; this may occur in mild, but is much more common in malignant, cases. With the eruption at its height there is intense itching or burning of the skin, and often considerable swelling, which is most noticeable upon the hands and face. The eruption remains at its maximum intensity for about 3 days and then fades in the order in which it appeared.

The temperature, which has remained high from the first, gradually declines after about the fourth day, or as the rash begins to fade, reaching the normal in 5 or 6 days. The tongue, which for the first few days was covered with a thick white fur, as the disease progresses becomes reddened with enlarged and prominent papillæ, the appearance giving rise to the name "strawberry tongue." The lymphatic glands at the angle of the jaw are usually enlarged and tender.

The constitutional symptoms during the eruptive period are marked by loss of appetite, constant thirst, somnolence with delirium or restlessness, with more or less nervous manifestations. The bowels may be either constipated or loose; the urine scanty, high-colored, and often containing albumin. Not infrequently the urine and stools are passed involuntarily. The respiratory tract is not often affected, though there may be a mucous discharge from the nose and in some cases a dry cough, due to the irritation in the throat. With the fading of the rash and the decline in the temperature the tongue clears, the throat becomes less congested, and the appetite improves; and, by the end of the first week, convalescence should be established; feverishness after this time would suggest some complication, as suppurating glands, purulent otitis, etc.

Desquamation begins soon after the rash fades —about the seventh day—and continues for a period of 2 to 5 weeks. It is usually first seen upon the chest and neck, and is composed of very fine scales. Desquamation upon the face is usually slight, or it may not occur at all. That which follows on other parts of the body, especially where the skin is thick and hard—as upon the inside of the fingers and hands and the soles of the feet—is composed of large scales, and a cast of the part may be thrown off like the finger of a glove. The hair, nails, and teeth are usually also affected. The hair breaks off after scarlet fever; the nails show indentations, and sometimes are shed; and the forming teeth are more or less affected.

While the foregoing description is that of a typical form of scarlet fever, in practice many cases are seen which vary from the mild form—when the child may make no complaint of being ill, the rash, and that often not well marked, being the first symptom—to the malignant form, when the onset is severe, with marked nervous symptoms, high fever, very rapid pulse, diarrhea, and marked glandular swelling and cellulitis, the child dying during the first 24 hours, or lingering for 2 or 3 weeks, when death results from exhaustion or from septicemia.

Complications and Sequels.—The inflammation of the throat may be so severe as to constitute a serious complication. The soft palate may slough, and all the soft parts be destroyed. The inflammation may spread to the larynx, making, in some cases, tracheotomy necessary. Purulent **otitis media** is a common complication, and is caused by extension of infection through the eustachian tubes. It may occur either during or following the active stage, and it is the most frequent cause of continued fever after the rash has disappeared.

Following severe cases, **adenitis** may occur, often accompanied by suppuration and ulceration of the cervical lymph-glands; cellulitis of the neck may occur. Septic cases may be complicated by **bronchopneumonia** or **pleurisy,** and also by **endocarditis** and **myocarditis.**

Arthritis, septic, rheumatic, or tubercular, sometimes occurs with or following scarlet fever.

Rarely nervous affections may arise as complications, such as meningitis, cholera, hemiplegia, convulsions, progressive paralysis.

Nephritis is the most frequent complication, and may occur in an otherwise mild and favorable case. Besides the transient albuminuria, which is nearly always present during the febrile stage, two forms—septic and post-scarlatinal nephritis—occur. The septic form occurs in severe cases complicated by sloughing tonsils and soft palate and much glandular involvement. The urine contains large quantities of albumin, and, postmortem, a pyemic kidney may be found, but dropsy or other renal symptoms are seldom discovered.

Postscarlatinal nephritis occurs during the third or fourth week. The child, who had recovered from the fever, will again become feverish, restless, and thirsty, have a quick hard pulse, and pass small quantities of dark-colored urine containing albumin and casts. The face becomes pale and puffy, and there may be edema of the feet and scrotum or general dropsy.

In mild cases by the end of a week improvement will take place, and the child go on to recovery. In others, however, uremic symptoms may supervene, the pulse becomes slow, the temperature subnormal, and vomiting and marked nervous symptoms appear. Dilatation of the heart is a frequent result of the kidney affection. Recovery takes place in the great majority of the cases of nephritis following scarlet fever, but it may be prolonged for weeks or, rarely, for months.

Diagnosis.—The diagnosis of the usual type is not difficult—the symptoms mentioned above all occurring together in no other disease. In some cases, however, the rash may appear not unlike measles; in others, the throat symptoms being prominent may lead to a diagnosis of diphtheria; but in a great majority of cases a mistake is not probable. However, there may be no distinctive eruption, but close watching will sometimes detect signs of desquamation in the shape of branny scales beneath the underclothing or in the stockings. In other doubtful cases the development of nephritis settles the diagnosis.

The following table gives the principal points of difference between these diseases:

	Scarlet Fever.	Measles.	Diphtheria.
Onset	Sudden, with vomiting	Gradual, with coryza and photophobia.	Gradual.
Temperature	High (103° to 105° F.)	High, but drops with appearance of rash.	Low.
Cervical glands	Involved, usually	Not involved	Involved.
Appearance of throat	Mucous membrane of hard and soft palates much congested and red eruption first seen there.	Throat not involved	Dusky red color early.
False membrane	When present, resembles follicular tonsillitis.	None	Characteristic.
Bacteriologic test	Probably find streptococci	Negative	Klebs-Loeffler bacillus.
Pulse	Very rapid and wiry	Full and bounding	Increased, but weak.
Urine	Frequently slight albumin	No albumin	Albumin.
Rash	Scarlet color, first seen on neck and chest, appears within 36 hours after onset.	Darker color, first on face; appears fourth day.	None typical.
Desquamation	Marked, beginning furfuraceous, becomes lamellar, continues 3 or 4 weeks.	Slight, furfuraceous	None.

Certain drugs, as belladonna, quinin, and antipyrin, and digestive disturbances, especially in infants, are often accompanied by a rash, which closely resembles that of scarlet fever. It is, however, of short duration. In diphtheria, influenza, and varicella an erythematous rash is occasionally seen that may cause them to be mistaken for scarlet fever; but when the history of the case, the order of the appearance of the rash, etc., are considered, a correct diagnosis may in most cases be reached.

Prognosis.—The prognosis should be guarded in all cases of young children. The mortality varies greatly in different epidemics, and may be as low as 5 or 6 percent, or as high as 20 or 30 percent,

and in very young children as high as 50 percent. It depends generally upon, first, the severity of the epidemic; second, the age and resisting power of the individual; and, third, upon the nature of the complications. In no disease is the prognosis more uncertain than in scarlatina.

Treatment.—The patient should be isolated for a period of 5 or 6 weeks, or until desquamation is completed. Should there exist such complications as otitis, rhinitis, or suppurating glands, quarantine should be continued until these conditions are cured. Other children in the house who have not been exposed to the disease should be sent away.

After recovery, the patient should, before mingling with others, be thoroughly scrubbed with soap and warm water and washed with an antiseptic solution—*e. g.*, bichlorid of mercury, 1 : 5000—and dressed in clean clothing. The sick room should be on the upper floor; it should be well ventilated, and kept at a uniform temperature of about 68° F. The ideal method of heating is by an open-grate fire.

The room should be stripped of all hangings, carpets, and unnecessary furniture, and a sheet wet with a solution of carbolic acid, 1 : 100, or bichlorid of mercury, 1 : 1000, kept hung over the doorway, and the floor frequently sprinkled with the same solution. All excreta from the patient should be disinfected by carbolic acid, 1 : 20. The nurse should wear a cap covering the hair, and a washable dress, and should not mingle with other members of the family until her hands and face are thoroughly cleansed and her clothing changed.

The same care should be given to the disinfection of all bed-clothing, cloths, eating utensils, etc., as in diphtheria. The physician before entering the sick room should remove his coat and put on a long gown or rubber coat, and after the visit his hands, face, and hair should be washed and disinfected.

If it can be avoided, the physician attending a scarlet fever patient should not attend an obstetric case or other patients with open wounds. When this is impossible, however, he should use the greatest care in disinfecting himself.

Children should be kept in bed for at least a week after the fever has subsided, and on a liquid diet for 2 weeks longer, as this is important in preventing nephritis. Plenty of water should be given to drink, and the addition of 10 or 15 drops of dilute muriatic acid to the glass of water will often prove grateful to the patient.

Systematic bathing and inunctions should from the first be insisted upon, as this reduces the fever and restlessness, keeps the skin active, shortens the course, and prevents complications. The patient should be thoroughly sponged all over daily or when the temperature is high every few hours, with carbolized water (1:100) or bichlorid of mercury (1:8000), or, if preferred, salt water, or alcohol and water. The temperature of the water should be from 70° to 100° F., according to the amount of fever present, using the cooler baths when the temperature is high. Following the sponging there should be applied all over the body cacao-butter, lanolin, or cosmolin, to which may be added 10 grains to the ounce of menthol, or the following:

℞. Carbolic acid, gr. v
Menthol, Thymol, each, gr. x
Lanolin, ʒ j.

The inunctions are agreeable to the patient, relieve the itching and burning, prevent the scales from becoming disseminated through the air, and at the same time protect the surface and render joint involvement less likely to occur. The bathing and inunctions should be continued as long as desquamation exists.

The hygiene and proper treatment of the nose and mouth is also very important, tending to prevent ear complications. The throat should be sprayed or gargled with an alkaline or antiseptic solution 3 or 4 times a day. For this purpose may be used a solution of bicarbonate of sodium (20 grains to the ounce), a solution of listerine, one of the various modifications of Dobell's solution, or—

℞. Hydrogen dioxid, Glycerin, each, ʒ j
Water, ʒ iij.

To a young child who cannot gargle the following may be given:

℞. Boric acid, gr. xx
Salicylic acid, gr. xxx
Peppermint water, ʒ j
Water, ʒ iij.

One teaspoonful every 2 hours until the throat symptoms are relieved.

Or—

℞. Tincture of iron chlorid, ʒ ij
Glycerin, ʒ j
Water, ʒ iij.

One teaspoonful every 3 or 4 hours.

The nose should be sprayed 2 or 3 times a day with a mild alkaline solution, and an oily substance applied to the anterior and posterior nares by means of cotton on a match-stick or probe. For this purpose may be used 5 or 10 grains of menthol in an ounce of liquid albolin. Cold compresses or ice applied to the throat externally is very soothing. If the throat symptoms are severe, adrenalin chlorid sprays may be used as well as inhalations of steam impregnated with oil of eucalyptus or compound tincture of benzoin.

When there is constipation, small doses of calomel should be given to act upon the bowels, and when, as sometimes occurs, diarrhea is troublesome, one of the bismuth mixtures mentioned under diarrhea of infants and children should be given.

The vomiting that was present at the onset seldom persists after the first 24 hours; should it

do so, however, small bits of ice should be given to swallow every 5 or 10 minutes, and camphorated tincture of opium, in 1- to 5-drop doses every 2 or 3 hours, or cocain, 1/20 grain. Food should be withheld while there is any vomiting.

For the nervous symptoms may be given phenacetin or acetanilid (1/2 grain for each year of a child's age), repeated in 3 or 4 hours if necessary. To this should be added 1/2 to 1 grain of quinin to each dose, if the child will take a capsule.

A very weak or irregular pulse or cyanosis calls for stimulants: aromatic spirit of ammonia, 10 drops in water, or brandy or whisky, 10 drops to a teaspoonful according to the child's age; as soon as the urgent symptoms are relieved, discontinue the use of the alcohol, however, owing to its action upon the kidneys.

A useful heart stimulant for these cases is the following:

℞. Camphor water, Tincture of musk, } each, ℥ j.

From 1/2 to 1 teaspoonful in water every 2 hours.

Strychnin (in doses of 1/100 to 1/30 grain according to the age of the patient) or nitroglycerin (in doses of 1/500 to 1/100 grain) are also very useful.

The prevention of complications is of paramount importance. The drum membrane should be watched for signs of bulging and if found, paracentesis should not be delayed. The urine should be examined daily for the onset of nephritis; in order to prevent this complication the patient should be shielded from drafts and kept on liquid diet in bed at least a week after the cessation of febrile symptoms. Urotropin is recommended as a prophylactic remedy.

By the careful hygienic treatment of the nose and throat, and by the baths and inunctions, complications will be much less frequent, but when they do arise, the treatment is the same as for similar conditions when occurring independently of scarlet-fever.

During convalescence iron, cod-liver oil, and general tonic treatment are indicated.

Serum Therapy.—Injections of antistreptococcic serum instituted early in the disease in doses of 20 c.c. have proved markedly valuable for the relief of the complications that occur so frequently as a result of streptococcic infection.

SCHICK REACTION.—See Diphtheria.

SCHISTOSOMIASIS (Bilharziosis).—A chronic parasitic, tropical disease, characterized by hematuria, cystitis, proctitis, due to the eggs of the blood fluke, distomum or schistosomum hematobium. Lesions due to the parasites are found in the kidneys, urethra, bladder, liver, rectum. The ova of the worm are easily detected by microscopic examination of the urine and feces. The parasite probably gains entrance to man through drinking or bathing in or working with infected water, or with some mollusc, fish or vegetable. Treatment is merely prophylactic and palliative.

Schistosomum Japonicum resembles the S. hematobium, but is smaller and the eggs have no spines. This infection is characterized by enlargement of liver, spleen and mesenteric lymph glands, anemia, diarrhea, enteritis. The eggs, which resemble those of ankylostomum duodenale, are found not in the urine but in the feces.

SCHLEICH'S INFILTRATION ANESTHESIA.—See Infiltration Anesthesia.

SCHLEICH'S MIXTURE (for General Anesthesia).—See Anesthetics.

SCHOTT TREATMENT.—The Schott method may be stated briefly as consisting of the systematic use of saline baths of definite strength and temperature, and the coincident or alternative employment of a certain series of resisted movements. The treatment originated in Nauheim, Germany, where the natural springs are strongly saline and heavily charged with carbonic acid gas, their varying temperature and strength making them admirably adapted to therapeutic use. The most important chemic constituents of these baths are sodium chlorid (1 to 3 percent), calcium chlorid (0.1 to 0.3 percent), with a considerable quantity of iron, and a large amount of free carbonic acid gas. Their temperature varies from 81.7° to 95.5° F. In practice the higher temperature and weaker waters are first used, the waters being freed from the carbonic acid gas; a lower temperature, effervescent bath, and greater strength in saline constituents being gradually attained as the treatment progresses. Baths are given daily, rarely more than 3 being taken consecutively, that of the third or fourth day being omitted. While the natural baths are better adapted to treatment, perfectly satisfactory results may be obtained from artificial baths made after the following:

Formulas.—To 40 gallons of water (usual amount required) add sea-salt, 3 to 10 pints (approximate strength 1 to 3 percent); calcium chlorid, pure, 11 to 15 ounces. It is important to note that this latter ingredient is not the commercial chlorid of lime, which, by giving off chlorin, would become a source of discomfort and danger. To introduce or generate carbonic acid gas we may use a soda siphon with conducting tube or the following formulas of Bezley Thorne:

Mild.—$NaHCO_3$, 1/2 pound; HCl (25 percent), 3/4 pound.

Medium.—$NaHCO_3$, 1 pound; HCl (25 percent), 1 1/2 pounds.

Strong.—$NaHCO_2$, 2 pounds; HCl (25 percent), 3 pounds.

The salts are first dissolved; the hydrochloric acid is then added and thoroughly distributed. It has been found that the best agent for adding the acid is a douche bottle and tube, the acid being thus evenly distributed throughout the mixture.

Immersion.—The patient remains immersed from 5 to 20 minutes, the first bath being brief and the period gradually lengthened. If the patient is very ill, he should be carried to and from the bath and spared any exertion. While in the bath he should remain absolutely quiet, breathe

regularly, and refrain even from speaking. Upon leaving the bath he may be rolled in warm blankets, to rest for at least one hour.

Temperature.—The temperature is at first about 93° F., and may be considerably reduced after the 6 or 8 baths have been taken and the use of carbonated baths begun, provided such reduction is considered necessary. Usually, the patient's sensation is a safe guide to the regulation of temperature. The bath should feel pleasant and quite definitely warm throughout the period of immersion, and the patient should be cautioned and told to report at once any tendency to chill.

The movements are very simple Swedish movements, and, as recommended by Schott, comprise 19 exercises, so planned as to bring into action every muscle group in the body. The movements are intended to produce without fatigue the beneficial result of exercises, and are of decided value in the treatment of almost all cases to which the baths are applicable.

Effects of Baths.—(1) There is a fleeting sense of oppression and dyspnea; (2) a feeling of exhilaration and well-being; (3) slowing of the pulse, and, coincidently, a fuller and stronger beat; (4) brightening of skin, nails, and mucous membrane, indicating relief of cyanosis, freer capillary circulation; (5) secondary reduction of pulse tension with maintenance of lower rate; (6) marked reduction in cardiac area, most marked primarily in the right heart, but involving both lateral and vertical dimensions. See HEART-DISEASE (Organic).

SCIATICA.—Pain in the course of the sciatic nerve. This may be confined to the proximal half of the thigh, or may follow the entire course of the nerve and its branches. The pain is constant and gnawing, subject to exacerbations, and occurs most commonly in adults of middle age. Double sciatica is rare.

Causes.—As a rule, neuritis of the sciatic nerve or of its cords of origin exists. Rheumatism or gout, exposure to cold, heavy muscular exertion, or a thorough wetting, cause primary sciaticas, while compression by ovarian or uterine tumors, by lymphadenoma, the fetal head, or occasional lesions of the hip-joint induce secondary sciaticas.

The duration and course are variable, but chronic sciatica usually lasts for months, or, with remissions, for years.

Diagnosis requires a distinction between primary sciatica and the secondary affection due to diseases of the pelvis or spinal cord. Pelvic tumors and lumbago should be excluded. Hip-joint affections cause no tenderness along the course of the nerve, and sacroiliac disease has usually radiating pain. When the nerve-trunks of the cauda equina are pressed upon, there are bilateral pain and disturbances of sensation. The severe lightning pains of tabes are easily distinguished.

Treatment requires that careful and systematic pelvic examination be made, and that constitutional conditions should receive appropriate attention. Salicylates are useful in rheumatic cases, when the onset has been acute and accompanied by fever. Potassium iodid will remove a suspicion of syphilis, and salines improve gouty cases. Rest in bed with fixation of the limb on a long splint will relieve obstinate and protracted cases. Warm or mud-baths are sometimes satisfactory.

Quinin, antifebrin, and antipyrin are of doubtful use. Local applications of a hot iron, thermocautery, or blisters may temporarily relieve pain. Cocain, in doses of 1/8 to 1/4 of a grain, may be used by deep injection into the nerve. An acupuncture needle may be thrust into the painful spot for a distance of 2 inches, and left there for from 15 to 20 minutes. Injections of distilled water or normal saline solution into the nerve may relieve the pain. Electricity is uncertain, and morphin should be withheld as long as possible or until the pain is unbearable.

Nerve stretching, in very obstinate cases, is sometimes successful, but often the condition recurs. The incision is begun at the gluteal fold and carried down the back of the thigh for 4 inches. The nerve is exposed, properly cleaned from the surrounding tissues, and then raised with a blunt hook on the forefinger. It should be stretched both centrifugally and centripetally, maintaining the traction for about 5 minutes. The surgeon must decide the amount of force to use in each case by the size of the nerve. Experiments show that the breaking strain of a healthy sciatic nerve is never under 80 pounds.

SCILLA.—See SQUILL.

SCLEREMA NEONATORUM.—Sclerema is a rare disease, which occurs in the early days of life, and affects those, chiefly, who are weak and feeble, born in cold weather and in poor hygienic surroundings. It is characterized by hardening of the skin and subcutaneous tissues.

The causes of sclerema are generally not local, the most important etiologic factors being great feebleness, with lowering of the body temperature, and, in consequence, hardening of the subcutaneous fat.

Symptoms.—Soon after birth spots of circumscribed hardness appear on the skin. These are often first seen on the feet or calves of the legs, but soon spread over the greater part of the body. The skin has a waxy and glistening appearance, and is hard and cold; the limbs becoming thick, stiff, and misshapen. The temperature is subnormal—reaching in some cases 83° to 86° F. in the rectum. The infant soon grows weak, somnolent, and refuses to take its food. The breathing becomes rapid and superficial, and no pulse can be felt.

The duration of the disease is 3 or 4 days, and death occurs slowly and quietly. If recovery takes place, there is gradual improvement in the circulation and nutrition, and later a disappearance of the areas of induration.

The treatment should consist of artificial heat—the child should be placed in an incubator. Inunctions of hot oil with massage should be given, and the nutrition kept up by stimulants and careful feeding.

SCLERITIS (Episcleritis).—Inflammation of the scleral tissue characterized by a purplish injection

of the ciliary, deep pericorneal, and conjunctival vessels.

Symptoms and Diagnosis.—If the conjunctival vessels are kept empty by gentle pressure, the bluish scleral vessels are seen more clearly. There is considerable pain on pressure and some local swelling. Carefully examined, a flat nodule made up of minute vesicles is seen lying about 3 mm. from the edge of the cornea (episcleritis). The disease is intimately connected with rheumatic disorders, syphilis and tuberculosis. The diagnosis is easily made, and depends upon the characteristic local condition and rheumatic, gouty, syphilitic or tuberculous history. Most cases are rheumatic in origin. The course of the disease is protracted, sometimes one nodule after another being formed until a large portion of the sclera is occupied by blotches. Relapses are frequent, and are closely connected with general rheumatic paroxysms. The pain is more or less severe, and for the time the eye is practically useless for near work.

Treatment is general. Salicylates and the ordinary rheumatic treatment should be instituted; or if syphilis or tuberculosis is defined, the respective treatment should be inaugurated. Ordinarily, local treatment should be avoided, but in chronic cases massage with yellow ointment may be tried. For the relief of the pain, moist heat and pressure are advised. If the choroid is involved, atropin is indicated. See Tuberculosis (Ocular).

SCLERODERMA (Hide-bound Disease).—A disease characterized by circumscribed or diffuse induration, rigidity and stiffening of the integument, terminating in atrophy.

Symptoms.—The disease is exceedingly rare. The skin manifestations may be preceded or accompanied by disturbance of cutaneous sensibility, such as pain, prickling, tingling, formication, etc., and muscular cramps. The disease begins as a pronounced stiffening or hardening of the skin, which progresses gradually, or more rarely rapidly, until marked induration results. In some cases an edematous stage may precede the induration. When the disease is typically developed, the skin is thickened, tense, hard, and immovable, acquiring in an advanced stage the feel of frozen skin, leather, or even wood. It is bound down to the structures beneath, and is incapable of being lifted. There is usually pigmentation of a yellowish or brownish hue.

After a variable duration the stage of induration passes on to the stage of atrophy. The skin then becomes thinned, shiny, and tensely stretched over the bony prominences. The phalangeal joints are apt to become ankylosed in a semiflexed position (sclerodactylia).

The course of the disease is chronic, although in rare cases it may be acute. The general health is, as a rule, not compromised. The parts most affected are the neck, face, forearms, chest, and lower extremities.

Etiology.—Scleroderma occurs chiefly in early adult and middle age, and is far more common in women than in men. Exposure to cold and wet, rheumatism, and nerve shocks have been causal in many cases. The disease is brought about through the implication of the nervous system.

Pathology.—The chief changes noted in scleroderma are an increase and condensation of the connective tissue in the corium and subcutaneous tissue, an increase in the elastic tissue, and a diminution in the caliber of the blood-vessels. Later there is atrophy of the subcutaneous tissues.

Diagnosis.—The peculiar immobile, indurated, tightly adherent condition of the skin is highly characteristic of the disease. Morphea is looked upon by most writers as a circumscribed form of scleroderma.

Prognosis should be guarded; in some cases the disease undergoes spontaneous involution; in many it persists throughout life.

Treatment.—Internal treatment is to be based upon general principles, arsenic, quinin, and cod-liver oil being frequently of value. Locally, baths, massage with oily substances, and electricity may be employed with benefit.

SCLEROSIS, CEREBROSPINAL.—See Disseminated Sclerosis.

SCLEROSIS, SPINAL.—See Amyotrophic Lateral Sclerosis, Lateral Sclerosis, Paraplegia.

SCLEROTOMY.—See Glaucoma.

SCOLIOSIS.—See Spine (Curvature).

SCOPARIUS (Broom).—The dried tops of the common broom plant, *Cytisus scoparius*. Its properties are due to a neutral principle, scoparin, and an alkaloid, spartein. It is diuretic and laxative; in large doses it is cathartic and emetic. It is a favorite remedy in cardiac dropsy and kidney complaints. Dose, 5 to 30 grains. There are no official preparations.See Spartein.

SCOPOLA.—See Hyoscyamus.

SCOPOLAMIN.—See Hyoscyamus.

SCOPOLAMIN-MORPHIN ANESTHESIA.—See Anesthetics (Anesthetic Mixtures).

SCORBUTUS.—See Scurvy.

SCORPION BITES.—See Bites and Stings.

SCOTOMA.—See Field of Vision.

SCREAMING, NIGHT.—See Nightmare.

SCROFULA (Tuberculous Adenitis; Lymphadenitis; King's Evil).—A morbid condition, usually constitutional, and frequently hereditary, characterized by glandular tumors having a tendency to suppuration, and leaving indolent ulcers very stubborn to treatment. It is now generally accepted as a manifestation of tuberculosis. The term is gradually falling into disuse.

Etiology.—It is most generally seen in children and young adults, especially those who suffer from nasopharyngeal catarrh. It is very common in the negro race. The bacillus of tuberculosis is the specific cause of the disease.

Pathology.—The cervical glands are those most frequently enlarged. The tubercles form first in the lymphoid follicles, finally breaking through the capsule. Generally, caseation ensues with subsequent liquefaction, and suppuration begins, with the establishment of a sinus.

Symptoms.—There is usually a history of tuberculosis in the father or mother, or a neglected

nasopharyngeal catarrh. One gland may be first affected, becoming enlarged and painful. Usually the gland is hard, the color of the skin overlying being unaltered. Soon the lymph-channels convey the virus to neighboring glands, which become diseased, break down, and suppurate. Often the process of liquefaction does not come on until late, and the gland may seem to remain of one size indefinitely. The temperature is variable—from normal to 102° F.; the child seems peevish, and endeavors to protect the affected side by inclining the head in the opposite direction. The body is often greatly emaciated, and signs of grave anemia are very prominent.

Diagnosis.—

Scrofula.	Hodgkin's Disease.	Lymphatic Leukemia.	Lymphoma.
1. Most common in children and young adults; cervical glands most frequently enlarged.	1. Not common in children; principally cervical or submaxillary glands.	1. Middle life.	1. Early life; all glands involved.
2. Glands often painful.	2. Glands not tender.	2. Glands not tender.	2. Glands freely movable, not especially tender.
3. Glands suppurate.	3. Glands rarely suppurate.	3. Glands rarely suppurate.	3. Glands rarely suppurate.
4. Blood may show evidence of anemia.	4. Blood shows signs of moderate anemia.	4. Marked persistent increase of white blood-corpuscles. See Leukemia.	4. Blood shows signs of simple anemia.

Prognosis.—If the disease is located in the cervical region or near the external surface in any portion of the body, prognosis is favorable.

Treatment.—The best of hygienic surroundings, with good and nutritious food, are demanded. Tonics are valuable, such as the iron iodid (5 to 15 minims) 3 times a day. The elixir of the phosphates of iron, quinin, and strychnin (5 to 30 minims), according to age.

An emulsion of cod-liver oil is also very valuable:

℞.	Syrup of the iodid of iron,	℥ vj
	Cod-liver oil,	℥ iv
	Whisky,	℥ j
	Bitter-almond water,	ʒ ij
	Cinnamon water,	℥ ij
	Yolks of two eggs,	
	Water, enough to make	℥ x.

Beat up the eggs in a mortar for 15 minutes and gradually add the oil; then the other ingredients, the whisky being added last.

Two teaspoonfuls 3 times a day.

If suppuration ensues, the glands must be excised.

Tabes Mesenterica.—This is an involvement of the retroperitoneal lymph-glands, and is common in young children. The limbs and trunk are greatly wasted, and the belly becomes very prominent from tympanites. There is often diarrhea, with offensive stools, yet the bowels are not generally the seat of tuberculosis. There may be infection of the peritoneum, also giving rise to an uneven, nodular, tender, and painful enlargement, easily detected on palpation.

SCROTUM, DISEASES.—Edema may occur in nephritic subjects, causing great swelling; and a similar affection, generally inflammatory, is occasionally seen in infants.

Inflammation is quite common, but unless associated with extravasation of urine, or unless the nutrition is much enfeebled, as in specific fevers, sloughing and gangrene rarely occur. Inflammation of the scrotum may arise from injury, eczema, irritation of urine, retained perspiration, or may spread from neighboring tissues. The swelling is much greater proportionately than the pain, heat, and redness. See Testicle (Inflammation).

Elephantiasis.—Enormous hypertrophy of the tissues of the scrotum may be caused by lymphatic obstruction or by repeated attacks of inflammation, as in cases of urinary fistula. The skin and subcutaneous tissues only are affected, the cellular elements and the fibrous tissue being immensely increased, while all the interstices are filled with lymph, or, in rarer cases, with a mixture of lymph and chyle. Hydrocele is usually associated with elephantiasis, and the skin of the penis may become involved, but the testes are never affected.

Epithelioma is of interest from the fact that its origin can nearly always be traced to local irritation; it formerly was often called chimney-sweeps' cancer, from the frequency with which it occurred in chimney-sweepers as the result of irritation of soot. It begins as a wart or nodule, which slowly spreads at the margin as it decays and ulcerates in the center. Induration is its chief feature. The edges are raised, hard, and ill defined; the base is covered with decaying epidermis and florid granulations which discharge a thin, offensive fluid, and the tissues around are swollen and edematous. At first it can be pinched up from the structures beneath, and merely feels like an induration in the skin; soon it infects the lymphatic glands in the groin, spreads to the rest of the scrotum and the penis, and involves the testicles as well. Fortunately, its character is so well known among those liable to it (soot may cause it in other parts of the body, and there is reason to believe that tar may do the same), and its progress (for epithelioma) is so slow, that removal in time is usually possible. Even if the inguinal glands are enlarged and broken down, the whole of the disease may sometimes be successfully eradicated.

Examination of Scrotal Swellings.—Swellings of the scrotum are divided into those that occupy the canal as well as the scrotum, and those that are confined to the latter situation. The distinction is made by feeling the cord immediately below the pubes; whether it is the natural size, with all its

components distinct, or whether it is thickened or concealed in any way.

Swellings that Occupy the Canal as well as the Scrotum.—Those that are *reducible* are:

Bubonocele and *scrotal hernia*, which may be recognized by the way in which they disappear whether they consist of intestine or omentum.

Varicocele, diagnosed by its characteristic feel, the way in which it disappears when the patient lies down and the scrotum is raised, and refills in spite of the pressure of the finger on the ring.

Congenital hydrocele, known by its translucency. As the neck of the canal is often long and narrow, reduction is not always easy.

Those that are *irreducible* are:

Hernia, which cannot be returned because it is *strangulated* (in which case there is no impulse on coughing), or because it is *irreducible—i. e.*, so altered in shape or so tied down by adhesions that it cannot pass back. In strangulation constitutional symptoms are also present.

Infantile Hydrocele.—The neck of the tunica vaginalis is obliterated only at the internal abdominal ring, and a collection of fluid extends from the bottom of the scrotum along the inguinal canal. The slow formation, commencing below and extending upward, the translucency, and the absence of true impulse (if it extends really into the canal, there may be a kind of shock transmitted) are distinctive.

Inflammatory Affections of the Cord.—In urethral epididymitis this is sometimes swollen to a considerable size; in tubercular disease the vas only is thickened, and all the structures of the cord can be isolated.

Growths on the Cord.—The most common is *encysted hydrocele*, a small, round, and tense fluid swelling, due to incomplete obliteration of the funicular portion of the tunica vaginalis. It is movable in the canal, but cannot really be reduced, and it is adherent to the cord, forming part of it and moving with it.

Lipoma, *sarcoma*, and other growths may occur, but they are very rare. Secondary infiltration is always present in malignant disease of the testis, if the gland is not speedily removed. *Hematocele* of the cord has been described. See Hematocele.

Swellings Confined to the Scrotum.—*Of those connected with the scrotum itself* are:

Edema.—In Bright's disease the whole scrotum sometimes becomes enormously distended without the legs being much affected.

Elephantiasis.—In the tropical variety there can be no hesitation, but occasionally a greatly thickened and hardened condition, not so plainly recognized, occurs as a result of neglected stricture.

Lipoma, *epithelioma*, and other varieties of new growths may occur.

Those connected with the testis and its coverings may be solid or fluid. The former include inflammatory diseases and tumors of the testis. The chief difficulty occurs with hematocele and old hydrocele, the walls of which may be so thick that they are practically solid. The latter may be connected with the tunica vaginalis (hydrocele or hematocele), the testis or epididymis (encysted hydrocele), or the lower end of the cord (hydrocele of the cord); or they may be independent cysts—dermoid, for example, or hydatid. Some difficulty may arise from what is known as hydrosarcocele, a collection of fluid in the tunica vaginalis surrounding and concealing an enlargement of the testis, and the diagnosis may remain uncertain until the fluid is drawn off (Moullin). See Testicle (Diseases).

SCURVY. (**Scorbutus**).—A constitutional disease, characterized by a spongy condition of the gums and by a tendency to hemorrhages into the gums, muscles, joints, and internal organs. The blood shows the same characteristics as seen in the secondary anemias.

Etiology.—It is principally due to eating too much salt meats or corned meats, and not enough of fruits and vegetables. It is most often observed in sailors, soldiers, miners, and in remote habitations, where there is a limited amount of proper food.

Pathology.—The gums are soft and spongy, often being ulcerated to such a degree that the teeth drop out. There may be hemorrhages into the mucous surfaces, as into the gums. Often ecchymotic spots are seen on the external surfaces, and occasionally in the serous membranes.

Symptoms are usually of slow development and in early stages they are manifested by fatigue, by a craving for acid foods, and by constipation. There is an anemic appearance of the skin, or it may have a yellowish appearance. The gums are congested, and bleed on the slightest touch, and hemorrhagic spots are found dotted over the mucous membrane of the mouth, principally of the gums.

Prognosis is good.

Treatment.—Prophylactic treatment consists in a diet including onions, limes, lemons, oranges, canned vegetables, etc. Fractional doses of calomel (1/4 of a grain) should be given every hour until 6 doses have been taken, followed by a saline purge, if necessary. Subsequently, the diet should be principally composed of fruits and vegetables.

When convalescence is established, a tonic containing iron may be given:

℞.	Arsenous acid,	gr. j
	Strychnin,	gr. ss
	Mass of carbonate of iron,	ʒ iij.

Divide into 30 pills. One pill after meals.

Or—

℞.	Tincture of ferric chlorid,	ʒ iv
	Aromatic elixir,	ʒ iv
	Water, enough to make	ʒ iij.

One teaspoonful after meals.

SCURVY, INFANTILE.—Infantile scorbutus is a constitutional disease associated with imperfect nutrition due to some prolonged error in diet. It is manifested by rapid and progressive cachexia, profound anemia, etc.

Etiology.—The cause of scorbutus is probably of chemic origin, due to the continued use of food that either lacks some elements required for the child's

nutrition or which furnishes them in such a form that the child cannot assimilate them.

Scurvy occurs nearly always between the sixth and twenty-fourth months, and in nearly all cases in babies who are artificially fed. It occurs in the well-to-do as well as in the poor and neglected—more frequently in the former, as in the latter class the diet is, as a rule, more varied, and although not in every respect suited to proper nutrition, it contains the antiscorbutic elements. A large majority of the cases reported have occurred in babies exclusively fed on condensed milk, sterilized milk, or on the various proprietary foods combined with sterilized milk, or on these foods prepared without the addition of the proper proportions of milk and cream.

Pathology.—Hemorrhages occur frequently in the skin, mucous membranes, muscles, viscera, and subperiosteal tissues of the bones. Extensive ulceration of the gums, with exuberant granulations often overlapping the teeth, are common in advanced cases. The blood presents all the characteristics of anemia, such as a diminution of the red blood-corpuscles and a decrease in the percentage of hemoglobin.

Symptoms.—The onset is gradual; the child becomes anemic, and suffers with more or less severe attacks of gastrointestinal disturbances. The appetite is diminished or irregular; the stools may be normal, but are often irregular, pasty, and gray in color; sweating of the head, as in rickets, has been noticed, and the child is often feverish. These are simply symptoms of indigestion, which generally, but not always, precede for a variable length of time the symptoms of scurvy.

The first symptom which suggests the true nature of the disease is a sensitive condition of the bones, the infant crying when the affected parts are touched. It will also be noticed that the gums are congested and bleed readily. As the disease progresses, the limbs become swollen. Only the legs are usually affected, but the forearm may also become swollen and tender. The enlargement of the limbs may continue until they become double their natural size. The swelling is not usually accompanied by any local heat or discoloration, but the skin has a white, transparent appearance. When the child is not disturbed, it will often lie for hours in one position, the legs being kept extended or slightly flexed, but absolutely motionless; but when it is disturbed or handled, there is apparently intense pain, which is indicated by piercing screams.

Ecchymoses may occur upon the skin over the swelling or upon other parts of the body, especially about the eyes. Intraorbital hemorrhage may give rise to exophthalmos. The gums are not affected when the teeth have not appeared; but when any of the teeth have been erupted, the gums about them become swollen, spongy, and bleeding, and may ulcerate; the teeth may become loosened and fall out, and the mouth may be filled with a bloody and foul-smelling secretion.

Diagnosis.—In certain cases rickets may resemble scurvy, but in rickets there occur curvatures of the bones and enlargement of the epiphyses, while the swelling of the shaft of the bones, the gingivitis, and the purpura are absent. The immobility of the limbs has led to a diagnosis of paralysis; the swelling and the pain to diagnosis of rheumatism, hip-joint disease, fracture, osteosarcoma, etc.; but errors in diagnosis may be avoided by attention to the associated symptoms of swelling and tenderness of the extremities, to the fungous and bleeding condition of the gums, and to the cachexia and anemia. Whenever any doubt exists as to the nature of the affection, the results of treatment will speedily establish the diagnosis.

Prognosis.—The course is slow and progressive, and when left untreated, the child may finally die of exhaustion. On the other hand, cases which receive proper treatment early never develop the graver forms of the disease, and in them the prognosis is invariably favorable.

Treatment.—The treatment of infantile scorbutus consists of substituting for the improper diet one of fresh milk modified according to the child's age. See INFANT FEEDING, MILK (Modified). The juice of one orange, or even more, should be given in the 24 hours. Children usually take this readily; but should they refuse to do so, they should be forced to take it. Beef-juice, a teaspoonful added to the milk, or given alone, should be given 3 times a day, and 1 to 3 grains of the ammoniated citrate of iron in the orange-juice 3 times a day. The child should receive a warm salt bath daily, and should be in the fresh air and sunlight as much as possible.

SCUTELLARIA.—Skullcap. The dried plant *S. lateriflora;* with reputed properties as a tonic nervine in tremors, chorea, hysteria, etc. Dose, of the fluidextract, 10 to 30 minims.

SEA-BATHING.—Sea-bathing may be regarded as a powerfully stimulating cold-water bath, from which it differs only in the action of its ingredients. A question often asked is: Does sea-bathing differ from a salt-water bath taken elsewhere? It differs in the admixture of organic and inorganic mechanic particles in the water; in its varying degree of wave-motion; and in producing an effect, otherwise unattainable, by the alternation in exposure of the body to water and to air. Sea-water is more equable in temperature than the surrounding air, and is, as a rule, warmer in winter and cooler in summer than other water. Its temperature varies during the day and from day to day, but in a less degree than air. Sea-water holds in solution an amount of salts varying according to locality. Mediterranean water is richest in salt. The waters of the Baltic Sea are less salty, containing about 0.5 percent. Five-sixths of the salts in sea-water consist of sodium and magnesium chlorids. The sulphates and carbonates of calcium, magnesium, and potassium constitute the principal other salts. Artificial salt baths cannot give the motion of sea-water, which varies constantly and according to the size and force of the waves; and the effect of sea-bathing is to a great degree dependent upon this point. Waves in any degree powerful expose the upper part of the body to their coming, and the lower part to

their receding; and cutaneous nerves are not only influenced by the temperature, but also by the force of the water and of other substances, such as sand, mixed with it. The alternate exposure to air and water occasioned by waves is peculiar to sea-bathing, and produces its impression on the cutaneous nerves.

The time of day for sea-bathing depends on the weather, the season, the individual, and the tide. As a rule, it is inadvisable to bathe when the stomach is empty, and never after a full meal. Delicate persons particularly should be warned on these points. The duration of a bath is to be measured by the constitution of the bather, the force of the waves, and the temperature of the water. Five minutes are sufficient for weakly persons, while immersion for 1 or 2 minutes may suffice. A good rule is to leave the water as soon as reaction manifests itself.

The warm sea-bath is to be recommended with advantage when the cold sea-bath is unattainable. Such baths are analogous to warm, common-salt baths. The tepid swimming bath of sea-water is sometimes appropriate, can be used in winter, and offers the advantage of combination with muscular exercise. The physiologic effect of sea-baths is similar to that of sea-air. The usual effects are increased appetite and increased weight of body. When loss of appetite, headache, digestive disturbances, and loss of weight ensue from sea-bathing, the shock of the bathing is too great, or the baths are too long continued or too frequently taken, or possibly the increased demand upon the system is too great.

There are cases unsuited for sea-bathing. Persons affected with certain diseases of the heart (see SCHOTT TREATMENT, HEART-DISEASE (Organic)), diseases of the blood-vessels and lungs, angina pectoris, epilepsy, organic diseases of the nervous system, enlargement of the liver, or other organic disease of the abdominal viscera should avoid bathing in the open sea. Violent palpitation and dyspnea extending over many months may ensue, as well as general sleeplessness, loss of appetite, and emaciation. Except on warm days and in quiet water, old persons, especially those with feeble circulation, should avoid bathing in the open sea. Recent rheumatic joint affections are injured by sea-bathing, and it is hazardous in cases of chronic pneumonia, with pleuritic effusion, and in tuberculosis of the lungs.

Cases benefited by sea-bathing are those with weakness or atony of the skin—*e. g.*, with a tendency to profuse perspiration, and who take cold easily on exposure to winds or drafts. In scrofulous complaints there is often more advantage in sea-bathing than in climatic treatment. In muscular rheumatism sea air, combined with the moderate use of sea-bathing, is most useful. So-called nervous rheumatism is often benefited by the use of gentle sea-bathing. Functional diseases of the nervous system are much benefited by sea-baths adapted to the individual case. Persons with a tendency to neuralgia, to nervous asthma, or to certain forms of hysteria are often unable to stand sea air for a long period of time.

According to Kruse, the prevalent objections to sea-bathing in anemia are not justified. The untoward results are attributable to the injudicious employment of the baths. Lack of care in cold bathing is accountable for acute cardiac dilatation, additional weakening of the heart-muscle, which in anemia is less vigorous than normally, and which explains the faintings, weaknesses, etc., after prolonged baths.

Cold sea-baths are contraindicated in anemia complicated with diseases of important organs, such as ulcer of the stomach, chronic inflammatory processes in the uterus and its appendages, etc., or in anemia which has led to great debility and anorexia. The latter is soon relieved by sea air.

The following rules are recommended:

1. Anemic patients should not bathe for two days after arrival at the seashore.
2. They should never bathe when fasting.
3. They should not take baths every day.
4. The first baths must not last over 1 minute; later on they may be extended to 3 or 4 minutes, but never longer.
5. The bather should undress rapidly and dip into the waves immediately, without waiting for the body to cool.
6. The patient should not move about, but remain as passive as possible while in the water.
7. No baths are to be taken in stormy weather, to avoid overexertion.
8. After each bath the skin must be carefully dried and rubbed.
9. The patient should not exercise, but should rest in bed for an hour after each bath.
10. As a rule, anemic patients should not bathe oftener than every second day.
11. No object is attained by beginning the sea-bath treatment with warm baths. They may do harm. An exception to this rule is in parametric exudations; in these warm sea-baths may be used, with warm wet packs on the abdomen during the night, associated with abdominal massage. These, together with prolonged stay in the sea air, prove efficacious.
12. The patient should not exercise much at the seashore; even sitting there for an occasional hour proves sufficiently tiring.
13. Patients with profound anemia should limit walking to the absolutely necessary; they should sit or lie, well wrapped, in the open air for the greater part of the day.
14. The insomnia that often sets in while at the seashore is most frequently due to overexertion.
15. Preparations of iron assist, especially in the beginning, and are in most instances well borne at the seashore. The most desirable form in saccharated ferric carbonate; but the use of ferruginous waters at the seashore is not appropriate in anemias.
16. The patient should not yield to the extreme appetite which often sets in at the seashore, lest the stomach soon become unable to perform its functions.
17. Alcoholic stimulants should be used most sparingly; patients should be warned against brandy and heavy wines. Alcohol promotes fatty degen-

eration of the muscles, and particularly of the heart.

Three hundred cases treated by Kruse with the above precautions proved the efficacy of sea-baths in anemia.

Many states of weakness manifesting themselves in various ways unsuitable for classification, such as inability to sustain mental or bodily efforts, tendency to abortion, leukorrhea, etc., are greatly benefited by judicious and well-timed sea-bathing.

The fear of sea-bathing during menstruation is a teaching handed down to us from by-gone generations. However, any healthy woman may bathe in moderately warm water during menstruation, if she takes proper precautions against subsequent cold. Mirouiff states that alkaline baths at 27° or 28° C. during menstruation by patients suffering from gynecologic troubles act as excellent sedatives. Moreover, the quantity of blood lost is not increased or affected, save possibly to be slightly diminished. In addition, pain is soothed and any accompanying inflammation of the genitals mitigated. Salt baths are, therefore, of real benefit during the flow. Sea-baths, far from deranging, favor menstruation. Unless there is grave uterine disease, sea-baths prolong the period of sexual activity and increase fruitfulness.

SEA-SICKNESS.—The nausea and vomiting affecting certain persons at sea, or those who are subjected to any undulating motion, like that of a vessel.

Etiology.—The exact cause of the condition has never been definitely settled. Very likely no one cause is active in every case. Cases seem divisible into those primarily of nervous origin and those of gastric origin. Imagination alone may cause mal de mer. Disturbances of equilibrium and exaggerated conceptions of the relationship of space, may result in nausea and vomiting. Eye-strain may be provocative of an attack. Some believe that sea-sickness is due to hyperemia of the semicircular canals; others that it results from disturbance of the endolymph. Congestion of the cord and medulla is also regarded in the etiology. The same phenomena may be caused by swinging or by traveling, and even by landing after voyaging. An important point to bear in mind is that the mere fact of a patient's being on a vessel does not preclude the possibility of volvulus, appendicitis, intestinal obstruction, or other complication requiring prompt and urgent attention.

Treatment.—In genuine sea-sickness the bromids furnish a means of prophylaxis. From 5 to 10 grains should be given 3 times daily for several days before sailing. After sea-sickness has begun, they are best given in an effervescing mixture—*e. g.*:

℞. Citric acid, ʒ ij
Distilled water, ʒ iv.
Mix and add:

℞. Potassium or sodium bromid, ʒ j
Potassium bicarbonate, ʒ j
Distilled water, ʒ iv.
Take a tablespoonful of each and drink while effervescing.

Bromural is highly recommended as a prophylactic.

For an hour before embarking strychnin sulphate, arsenate, or hypophosphite, 1/120 grain, may be taken every quarter of an hour; or the combination of 1/120 grain of each of above compounds of strychnin may be taken for 3 days, 3 times daily, with 1/2 grain of podophyllum each night.

For 3 days before sailing, and for 3 days thereafter take:

℞. Extract of taraxacum, } each, gr. xx
Compound extract of colocynth, }
Extract of hyoscyamus, gr. iij
Extract of nux vomica, gr. v
Mass of mercury, gr. xv.
Divide into 20 pills. Take 1 or 2 each night.

The diet must be simple and fluids must be avoided. The recumbent posture should be kept upon deck.

For the vomiting of sea-sickness 5 drops of a 4 percent solution of cocain may be given 3 times daily; or—

℞. Chloroform, } each, gtt. x
Tincture of nux vomica, }
Compound tincture of lavender, ʒ j
Water, ʒ x.
A teaspoonful every hour until the vomiting and nausea cease, the bottle to be shaken each time a dose is given.

Chloral, amyl nitrite, nitroglycerin, and antipyrin may also be mentioned as useful. A spinal ice-bag may relieve the headache.

From many years' experience, P. K. Taylor makes the following summary of the treatment: Rely chiefly, in nervous cases, on morphin and atropin, given by preference hypodermically; and on calomel and Rochelle salt for disturbed digestions. Bromocaffein will often relieve the headache, and cocain will sometimes be of great benefit in overcoming nausea, if given by the mouth. Avoid the bromids of potassium and sodium, as they do more harm than good, by upsetting the digestion. A belladonna plaster over the nape of the neck and a large capsicum plaster over the epigastrium will often be all that is needed to secure immunity from headache and nausea. If, when the ship is pitching much, a person instinctively holds his breath as he sinks to the hollow of each wave, insist on his "breaking step," so to speak. A determined effort to breathe regularly, and not in rhythm with the motion of the vessel, will quickly be successful in overcoming a muscular contraction of the diaphragm which, unchecked, would speedily lead to emesis. As regards diet, it is best to let patients choose for themselves to a great extent; that suited to one patient may not be tolerated by another. Liquids should be restricted in amount. Solids, like toast or dry unsweetened biscuit, with a little iced champagne or brandy

and ginger ale, are less likely to be rejected by the stomach than are the usually administered beef-tea and chicken broth. Do not insist too much on the value of fresh air on the deck. A day or two in bed with restricted diet is sometimes of more benefit than fresh air secured at the expense of one's reserve fund of energy. When there is an opportunity to advise prospective voyagers, always insist on careful diet for several days before going to sea; and upon a liberal calomel and saline purge about 48 hours before sailing. See CALAGE.

SEA-WATER INJECTIONS.—Sea-water especially collected and prepared carefully with aseptic precautions is injected preferably behind the great trochanter in adults, in infants over the scapula. Marked and rapid tonic effects are reported by the French advocates of this treatment as regards the bodily functions and general condition. This treatment is said to be valuable in gastro-intestinal disorders, especially in infants, in skin diseases, in varicose ulcers, anemia, chlorosis and tuberculosis, etc. The initial doses are generally 20 to 50 c.c., depending on the disorder. The results obtained are discredited by American observers who have found this treatment of no greater value than simple injections of normal saline solution.

SEBACEOUS CYSTS.—These are most common during middle life, and occur on any portion of the body, though most generally upon the scalp, back, shoulders, and face. They are mostly movable, superficially situated, and adherent to the skin. The contents are usually of yellowish, curdy material. They probably are formed by dilatation of a hair follicle, with sebaceous secretion. If untreated, they frequently become inflamed, suppurate, and occasionally calcify. Papillomata, horns, and epitheliomata may arise from their internal surfaces. Sebaceous cysts are to be differentiated from dermoid cysts, which lie under the deep fascia, the skin being freely movable over them; a sebaceous cyst lies in the corium, and moves with it or is adherent to it.

Treatment.—Sebaceous cysts should be removed before they become inflamed, by a linear incision through the skin down to, but not into, the tumor, separating the cyst with the scalpel-handle from the connective tissue surrounding, and removing without evacuating the contents. In any case, the cyst-wall must be removed. Fatty tumors are sometimes mistaken for sebaceous cysts or wens, but the treatment is the same in either case, and a distinction is immaterial.

SEBORRHEA (Dandruff; Pityriasis).—A disorder of the fat-producing glands characterized by an increased and altered secretion of sebum, producing an oily or scaly condition upon the skin.

Symptoms.—There are two forms—*seborrhœa oleosa* and *seborrhœa sicca*.

Seborrhœa Oleosa.—This form manifests itself as an inordinate oiliness of the skin. The parts usually affected are the forehead, cheeks, and nose. The mouths of the follicles are dilated, and there is often an enlargement of the superficial blood-vessels. The face is dirty and begrimed owing to the adhesion of particles of dust to the skin.

Seborrhœa sicca (dandruff) manifests itself as an accumulation of yellow or grayish scales, occurring upon the scalp or nonhairy regions. When the face is involved, the eyebrows and beard are usually affected first.

Upon the scalp this condition is generally associated with falling of the hair (*defluvium capillorum*).

The *vernix caseosa* is an intrauterine seborrhea, physiologic in character. The *smegma præputii* is also a seborrhea. As a result of the decomposition of the secretion, balanitis sometimes develops.

Etiology.—The causation is obscure. The disease occurs most frequently at the age of puberty. It is more common in women than in men, and in dark-complexioned persons than in blonds. It may be idiopathic, but is frequently met with in persons affected with tuberculosis, chlorosis, general debility, and gastrointestinal disorders.

Diagnosis.—Oily seborrhea can scarcely be confounded with any other affection. Seborrhœa sicca is to be distinguished from psoriasis, eczema, erythematous lupus, and ringworm. These are all characterized by redness and by more or less thickening.

Pathology.—There is overaction of the sebaceous glands and of the sweat-glands, at times accompanied by a slight degree of inflammation. Some observers consider the affection as microorganismal in character.

Prognosis.—Favorable. Long-standing cases affecting the scalp lead to baldness.

Treatment. Constitutional.—Tonics, such as arsenic, iron, strychnin, and quinin are often indicated. Duhring recommends calcium chlorid in doses of 1/10 to 1/5 grain. Gastrointestinal disorders should receive appropriate treatment.

Local.—The indications are first to remove the crusts and scales, and then to use stimulating and astringent applications, with a view to favorably influencing the glandular secretions. Resorcin, sulphur, and salicylic acid are the three sovereign remedies.

To soften adherent crusts upon the scalp:

℞.	Salicylic acid,	gr. xx
	Olive oil,	ʒ iv.

This may be followed by the use of the tincture of green soap to remove the epithelial débris. One of the following preparations may then be employed:

℞.	Resorcin,	ʒ jss
	Castor oil,	♏ xx
	Alcohol,	ʒ iv.

(If an aqueous lotion is required, the castor oil and the alcohol may be replaced by glycerin and water.)

℞.	Fluidextract of pilocarpin	ʒ j
	Tincture of cantharides,	ʒ ss
	Soap liniment,	ʒ ijss.

Rub the scalp well with this lotion daily.

℞. Sulphate of quinin, ℥ jss
Rectified spirit of wine, ℥ iv
Tincture of capsicum, Tincture of cantharides, Aromatic spirit of ammonia, each ℥ ss
Glycerin, ℥ iv
Water, enough to make O j.
Apply locally.

Upon nonhairy regions, or when there is but little hair upon the scalp, salves may be used:

℞. Precipitated sulphur, gr. xx to xxx
Petrolatum, ℥ ss
Oil of bergamot, ♏ xx.

Or—

℞. Salicylic acid, gr. x
Petrolatum, ℥ ss.

Ammoniated mercury, calomel, carbolic acid, and other remedies are also employed, but the foregoing will be found to give the best results.

For oily seborrhea use equal parts of alcohol and ether.

Or—

℞. Boric acid, gr. xxx to ℥j
Alcohol, ℥ ij.

Or—

℞. Tannic acid, gr. xxx to ℥j
Alcohol, Water, each, ℥ j

SECALE.—See Ergot.

SECTION.—See Abdominal Section, Cesarean Section.

SECUNDINES.—The placenta, cord, and membranes expelled from the uterus after the birth of the child. For their management, see Labor.

SEDATIVES.—Agents that exert a soothing influence on the system (or upon a part) by lessening functional activity, depressing motility, and diminishing pain. *General sedatives* include the narcotics and anesthetics, while *local sedatives* include aconite, opium, ice, etc. *Pulmonary sedatives* are hydrocyanic acid, veratrin, the nauseants, and the emetics. *Spinal sedatives* are physostigma, gelsemium, and potassium and sodium bromids. *Stomachic sedatives* include arsenic, bismuth, silver nitrate, and sodium bicarbonate. *Vascular sedatives* are digitalis, tobacco, aconite, veratrum, and the emetics. Among *nervous sedatives* are potassium and sodium bromids, tobacco, lobelia, and the group of spinal depressants. *Constitutional sedatives* overlap therapeutic divisions. The type is distinctly narcotic and anesthetic. Of *local sedatives*, cold, in the form of ice or ether spray, deadens the sensibility of the skin. Aconite, opium, cocain, belladonna, veratrin, and blisters soothe the sensory nerves and influence the circulation of the parts. The local sedatives are useful in rheumatic or neuralgic pain, in superficial inflammation, and to allay itching in prurigo, eczema, and skin affections. Diluted hydrocyanic acid, carbolic acid, chloroform, borax, and chloral hydrate are examples.

SELF-ABUSE.—See Masturbation.

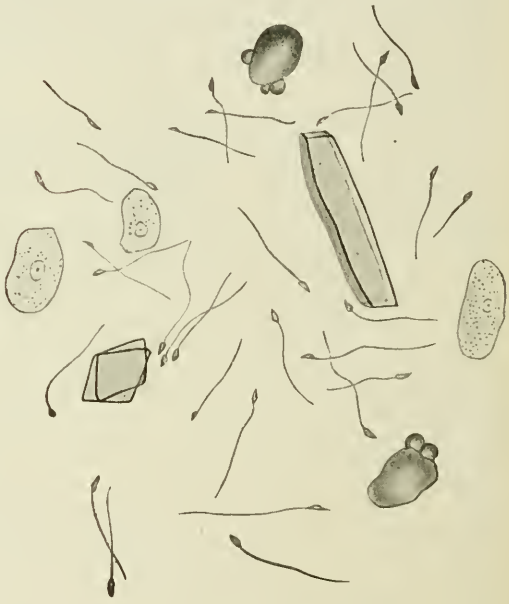
SEMINAL EMISSIONS.—See Nocturnal Emissions.

SEMINAL STAINS.—In all cases of alleged rape the underclothing of the victim should be carefully examined for seminal stains, which stiffen the fabric on which they are deposited in the same way that gum or albumin does. Moistened with warm water, seminal stains give off a characteristic odor.

Lassaigne's test for semen is as follows: The seminal stain is moistened with a solution of lead oxid in liquor potassæ and dried at 68° F. There is no yellow color developed, as would occur in albuminous fluids. However, semen diluted with an albuminous secretion develops a yellow color.

The only positive proof, however, of semen is the discovery of spermatozoa by microscopic examination. A drop of mucus from within the vagina may be placed upon the slide, or the stains may be dissolved and mounted.

The old method of soaking and washing a fabric for seminal discharges often gives unreliable results. The following rules for the



Normal Semen.—(*Webster.*)

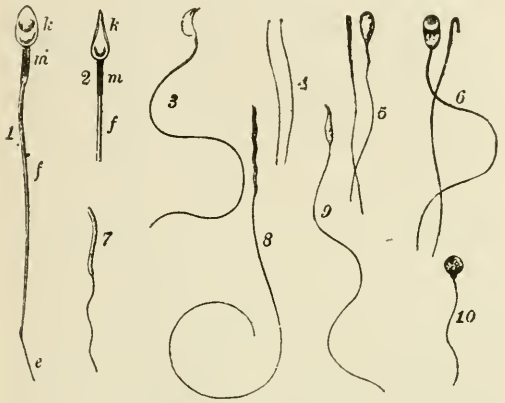
microscopic examination of supposed seminal stains are offered by Hamlin:

If the stain is upon any thin cotton, linen, silk, or woolen fabric, cut a piece about 1/8 inch square, lay it upon a slide previously moistened with a drop of water and let it soak for half an hour or so, renewing the water from time to time as it evaporates; then, with two needles, unravel, or fray out the threads at the corners, put on the glass cover, press it down firmly, and submit to the microscope. If the fabric is of such thickness or nature that it cannot be examined in this way, fold it through the center of the stain, and with a sharp knife shave off the projecting edge thus made, catching upon a slide moistened with water

the particles removed. After soaking from 5 to 10 minutes, the powdery mass will sink down through the water and rest upon the slide. The cover-glass may now be put on and the preparation examined. This latter method will serve well for semen on hairs. A circle of marine liquid glue run around the cover-glass will temporarily preserve the specimen. Carbolic acid or chloral hydrate may be added to the water, as a preservative.

A spermatozoon resembles somewhat the flagellate infusoria. It consists of an ovoid head tapering into a filamentary appendage, or tail, about 10 times as long as the head that, in fresh specimens, vibrates with astonishing rapidity. Spermatozoa vary in number and size, measuring, on an average, between 1/600 and 1/500 inch. The only living animalcule that might be mistaken for a spermatozoon is the trichomonas vaginalis, occasionally found in the vaginal mucus of unclean females. It, however, has a large ciliated head and a shorter tail.

The remarkable vitality of human spermatozoa is a well-recognized fact. The movements of the



SPERMATOZOA.—(*Landois.*)

1. Human (× 400), the head seen from the side. 2. On edge. *k.* Head. *m.* Middle piece. *f.* Tail. *e.* Terminal filament. 3. From the mouse. 4. From bothriocephalus latus. 5. From the deer. 6. From the mole. 7. From the green woodpecker. 8. From the black swan. 9. From a cross between a goldfinch and a canary. 10. From cobitis.

spermatozoa may be observed for as long as 72 hours at a suitable temperature. Piersol remarks that at a temperature of 8.5° C. a few of the elements showed movement after being kept for 9 days. These facts have certain medicolegal bearings.

SENEGA.—The dried root of *Polygala senega* (called also Seneca snakeroot), with properties due to a glucosid, senegin, which is identical with saponin, and closely allied to digitonin. Dose, 10 to 30 grains. It is expectorant and diuretic; in large doses a gastrointestinal irritant, and is useful in bronchitis, asthenic pneumonia, asthma, etc.

Preparations.—**S. Fluidextractum.** Dose, 10 to 30 minims. **S. Syrupus.** Dose, 1 to 2 drams. **Syrupus Scillæ Compositus,** contains 8 percent of senega.

SENNA.—The dried leaflets of *Cassia acutifolia* and *C. angustifolia.* Senna contains an amorphous glucosid, cathartic acid; other constituents are sennapicrin, sennacrol, cathartomannit, and chrysophanic acid. It is an excellent cathartic for children and infants. Senna acts chiefly on the small intestine, is not irritant in medicinal doses, and leaves no after-effect. However, it may cause hemorrhoids and hemorrhagia, if long continued. Its odor and taste are disagreeable, particularly in infusion. The least disagreeable of its preparations are confection of senna and compound licorice powder.

Preparations.—**Fluidextractum S.** Dose, 10 to 60 minims. **Syrupus S.,** has of the fluidextract 25, oil of coriander 1/2, syrup to 100. Dose, 1/2 to 2 drams. **Confectio S.,** has of senna 10, cassia fistula 16, tamarind 10, prune 7, fig 12, sugar 55 1/2, oil of coriander 1/2, water to 100; is sold under the trade names *Tamar Indien,* and *tropical fruit laxative.* Dose, 1/2 to 2 drams. **Infusum S. Compositum,** *black draught,* has of senna 6, manna 12, magnesium sulphate 12, fennel 2, boiling water 80, cold water to 100. Dose, 2 to 6 ounces. **Pulvis Glycyrrhizæ Compositus,** *compound licorice powder,* contains 18 percent of senna. Dose, 1/2 to 1 1/2 drams. See GLYCYRRHIZA. **Syrupus Sarsaparillæ Compositus,** *compound syrup of sarsaparilla,* contains 1 1/2 percent of the fluidextract of senna. Dose, 1 to 8 drams. See SARSAPARILLA.

SENSATION, DISORDERS.—These affect nerves of special or common sensibility, the lesion being either in the end-organ, in the afferent or efferent nerve, or in the ganglionic nerve-center. These sense of touch comprises the sensations of contact, pain, temperature. and muscular activity.

Hyperesthesia, as commonly understood, expresses increased sensibility only to painful impressions, and is better called hyperalgesia. The affected skin is sometimes so tender that a light touch will produce more or less exquisite pain, and the hyperesthesia is usually associated with excess of sensibility to heat and cold and a diminution of the sensibility to touch proper. In gunshot wounds of the nerves it is seen in its most severe form. Hyperesthesia is observed in connection with peripheral and central diseases of the nervous system, and is an accompaniment of neuritis; it is usually expressed in heightened sensibility to temperature.

Treatment.—The lesions causing the expression of perverted function must be discovered and treated. Local moist heat, as by fomentations or poultice; cold, by means of ice; dilute veratin ointment, atropin ointment, or hypodermic injections of morphin, may mitigate the condition. Spongiopilin sprinkled with a liniment of chloroform and belladonna (1:3), or equal parts of either, volatile salt, laudanum, and cologne water, may be applied. Lint soaked in chloroform and covered with oiled silk, or rubbing the part with camphor-chloral and vaselin in equal parts, may suffice.

Anesthesia may result from local abstraction of heat or from exposure to cold. Handling soda used in laundries and the various chemicals used in the

arts may induce anesthesia. In herpes zoster the skin between the groups of vesicles is often anesthetic. In leprosy the senses of temperature and of pain are often abolished. Pressure upon sensory or mixed nerves, as by syphilitic tumors or other growths, may produce anesthesia. Simple mechanic pressure will often excite an inflammation that is followed by anesthesia of the distributive area. Trauma may cause pain followed by anesthesia. Severe nervous trophic disorder is usually associated with anesthesia. Before attacks of neuralgia the skin of the part surrounding is anesthetic; and during attacks of sciatica, and in cervicobrachial neuralgia, there is much diminution of tactile sensibility.

Approaching hemorrhage is often heralded by cutaneous anesthesia. Sudden and increasing numbness in one side of the face or in the limbs of one side may be shortly followed by apoplexy or coma. This anesthesia remains as a subjective feeling of numbness, but the extent bears no relation to the amount of motor paralysis. Recovery proceeds downward, the fingers retaining slight anesthesia for some time after the arm is restored to normal sensation. Cerebral tumors, abscesses, or lesions of the spinal cord or of its membranes may give rise to cutaneous anesthesia. Cutaneous anesthesia affecting the soles of the feet occurs in tabes dorsalis.

It is extremely important to remember that cutaneous anesthesia connected with spinal disease is likely to result in bed sores and in trophic and vasomotor nerve affections. In peripheral neuritis anesthesia is of frequent occurrence. Auræ are often manifested by spots of local anesthesia.

Loss of the sense of muscular activity is especially noticeable in locomotor ataxia. It also occurs in general paresis, in hemiplegia, and in hysteria. As to diagnosis, the most important consideration is whether the causative lesion or disease is central or peripheral.

Treatment.—This is bound up with the treatment of the underlying cause. When the sensory nerves fail to conduct impressions for some time after the lesions that caused the anesthesia have healed, electricity, derived from an induction machine or the negative pole of a continuous-current battery may be employed. Static electricity is a valuable means of combating anesthesia of this kind.

Paresthesia.—The varieties of this disorder are very numerous. Heat may be felt as cold; a faradic current (intolerable to the healthy) may be felt as cold; pricks or pinches may be felt only as touches; feelings of burning, numbness, tingling, creeping of ants, or actual numbness are other manifestations. The senses of contact, pain, and temperature may be in abeyance. Movements may be guided by the muscular sense aided slightly by sight, etc.

SEPSIS.—Sepsis, or "blood poisoning," is a term used to designate sapremia, septic intoxication, septicemia, and pyemia. The former two are due to the presence of toxins alone in the blood (*toxemia*), and the latter two to the presence of toxins and bacteria (*bacteremia*). These toxins and organisms may be of any variety, but in the following paragraphs the terms septic intoxication and septicemia are defined in their restricted sense as referring to pyogenic toxins and pyogenic bacteria.

Sapremia is due to the absorption of the products of putrefaction; hence, properly speaking, autointoxication from decomposing intestinal contents is sapremia. Saprophytic organisms are rarely found alone in surgical affections, consequently a pure form of sapremia is rarely seen. The best example is that due to the absorption of ptomains from a decomposing placenta after childbirth, although a more or less pure form may be seen as the result of putrefaction of blood clots, wound secretions, or large tumors. Since sapremia is so frequently linked with other septic processes, and is clinically indistinguishable from septic intoxication, the term should be discarded.

Septic intoxication (*pyogenic toxemia*) is due to the absorption of pyogenic toxins. The usual cause is pus under pressure, *e. g.*, an unopened abscess or a badly drained, suppurating wound. As granulation tissue blocks lymphatic spaces, toxins are not readily absorbed from its surface, unless pressure be added; thus in a completely drained abscess there are no constitutional symptoms; if the drainage be defective, however, or if the lymph spaces be opened by curettage, absorption takes place. *Chronic septic intoxication* is hectic fever.

The **symptoms** appear usually in from one to three days, and vary in degree according to the character and virulence of the toxin, the amount of absorption, and the resistance of the individual. They manifest themselves as *fever*, or *pyrexia*, which is a syndrome characterized by a rise in temperature (often preceded by a chill), quickening of the pulse and respirations, headache, backache, diffuse muscular soreness, general weakness; by disordered secretions, causing dryness of the mouth, coating of the tongue, thirst, impaired appetite (sometimes vomiting), constipation or diarrhea, scanty high colored urine containing an excess of urea and urates, dryness of the skin or sweating; and by nervous disturbances varying from delirium to coma. There is a leukocytosis unless the intoxication is slight or overwhelming, but no organism in the blood. In the young and robust the symptoms are apt to be active (*sthenic fever*); in the debilitated, in the old, and even in the young (when protracted), they are apt to be of a low type and associated with marked exhaustion (*typhoid state, asthenic or adynamic fever*). The *local symptoms* are those of inflammation, and, if there be a wound, usually a copious and foul smelling discharge.

Septicemia (*pyogenic bacteremia*) is septic intoxication plus the presence of living pyogenic bacteria in the blood stream, and differs from pyemia only by the absence of secondary abscesses. The organisms gain entrance to the blood by the lymph vessels as the result of pressure in an abscess (*secondary septicemia*), or possibly in some cases pass directly into the open capillaries without the existence of suppuration (*primary septicemia*).

Cryptogenic septicemia presents no wound or focus of suppuration; a forgotten needle puncture, or an abrasion on the skin or one of the mucous membranes may be responsible for these cases, which become fewer as the surgeon increases in experience and investigates with more care. Bacteria in the circulating blood are devoured by the leukocytes, or dissolved by the bacteriolytic action of the blood serum, thus terminating the process; or, if sufficiently numerous or virulent, and especially if the individual has not sufficient resistance to manufacture antibacterial serums or opsonins, they multiply, continue to elaborate toxins, and are distributed to various parts of the body, where they may cause secondary or metastatic abscesses (pyemia); some are eliminated by the excretory organs, and some are destroyed by the tissue cells. There is no specific microorganism of septicemia, any one of the pyogenic bacteria seemingly being capable of producing the condition, although the streptococcus bears the worst reputation in this respect.

The symptoms may be noticed a few hours after a wound, or not for several days. There is usually a chill, with a rapid rise in temperature to 104° or 105° F.; the fever persists, being less in the morning and greater in the evening; in many cases there are violent chills at irregular periods, followed by high temperature and drenching sweats. The pulse increases in rapidity and decreases in tension. In severe cases the pulse rate reaches 150 or more, finally becoming so rapid and weak that it cannot be counted. There is often marked depression of the nervous system, the patient being stupid and quiet (typhoid state); or delirium, restlessness, picking at the bed clothes and twitching of the tendons; in either case coma precedes death. Although the respirations are quickened, signs of imperfect oxygenation of the blood are often seen in the face, which may be cyanotic. The tongue is dry, coated, red at the edges, pointed at the tip, and sordes are present upon its dorsum and upon the lips. There are loss of appetite, occasionally vomiting, often diarrhea. Petechiæ may appear in the skin and mucous membranes, and, owing to the disintegration of red blood cells, hematogenous jaundice may develop. The skin may present eruptions also in the form of vesicles or pustules, or simulating urticaria, measles, or scarlet fever. The urine is scanty, high colored, and contains albumin, toxins, and frequently bacteria; the spleen and often the liver are enlarged, and there may be leukocytosis. Bacteria may be discovered in the blood by cultural methods.

The local manifestations vary from slight inflammation to the graver forms of cellulitis and are not always characteristic, although in many cases the wound discharges a thin pus, while the activity of the lymphatic vessels is shown by red lines of lymphangitis running to the nearest lymph glands, which are swollen and tender, or even suppurating. The veins about a suppurating wound may become inflamed, and blocked with coagulated blood (thrombophlebitis). Bacteria may invade and soften this thrombus, portions of which may be washed into the blood stream as emboli.

Pyemia is septicemia plus secondary or metastatic abscesses, due to the bacteria lodging in various parts of the body, or to septic emboli the result of a thrombophlebitis; these abscesses may be found in any part of the body, but are most frequent in the bones, where bacteria are readily deposited from the capillaries owing to the slowly moving blood current, and in those organs which have terminal arteries, such as the brain, spleen, kidney, and lung. Emboli arising in the area drained by the portal vein lodge in the liver. Compared with preantiseptic days, pyemia is comparatively rare at the present time, but is especially prone to follow thrombophlebitis of the facial veins in infections in this neighborhood, thrombophlebitis of the lateral sinus the result of middle-ear disease, and pylephlebitis the result of inflammations about the rectum, appendix, etc.

The symptoms are those of septicemia, plus the secondary abscesses, which usually appear during the second week; they are generally announced by an additional chill, but may develop insidiously, sometimes without even pain or tenderness, and they are commonly small and multiple. Pyemia may run its course in a few days (*acute pyemia*), or it may last a number of months (*chronic pyemia*). It is usually fatal, although recovery has occurred despite the presence of secondary abscesses in the internal organs. In pyemia there is said to be a characteristic sweet odor not unlike that of hay.

Surgical scarlatina is the name given to the scarlet rash, probably the result of vasomotor disturbance, seen in cases of sepsis. True scarlatina may, however, occur after operations and accidental wounds, especially in children. Since the period of incubation is shorter than in the nonsurgical form, it may be that the microorganism of scarlet fever enters through the wound. Scarlet rashes may occur likewise from the absorption of ether, bichlorid of mercury, carbolic acid, and iodoform.

The diagnosis of sepsis is made by finding the causative lesion and excluding other febrile maladies. The *causative lesion* is sometimes difficult to locate, particularly in the so-called cryptogenic or spontaneous form, in which it may be necessary to review the entire body before finding the source of infection. Regions especially liable to be overlooked are the ear, teeth, throat, urethra, rectum, in women the pelvic organs, and in children the bones, particularly the tibia. An insignificant wound that has healed may be the starting point of even the gravest forms of sepsis, and, on the other hand, a wound, even if suppurating, may be complicated by other forms of fever. Here it should be noted that tonsillitis may be the cause, and pneumonia, endocarditis, etc., the result of sepsis. The *exclusion* of aseptic fever is made by the healthy appearance of the wound and the brief duration of the fever, of autointoxication by stimulating the excretory organs. When there is marked depression of the nervous system and general exhaustion, typhoid fever (Widal reaction, leukopenia) and miliary tuberculosis may be

simulated, while the occurrence of chills is often wrongly interpreted as malaria; in the last a blood examination will reveal the presence of malarial parasites. The occurrence of skin rashes, particularly in children, will bring up the question of the acute exanthemata, especially measles and scarlet fever. The *form of sepsis* is toxemia (sapremia or septic intoxication) if, in the presence of an inflamed or suppurating wound, the symptoms promptly subside after thorough drainage and disinfection. If the wound does not show evidences of irritation, the constitutional disturbance may be due to septicemia, but is more probably the result of some medical complication. The continuation of fever after the opening of an abscess or wound, excluding medical complications, usually means inefficient drainage, that is, a continuation of the septic intoxication, or, if the wound is perfectly drained, septicemia. In the latter instance, the absorption of bacteria may be evidenced by red and tender lymph vessels coursing along the surface and ending in inflamed lymph glands; the constitutional symptoms are more severe than in septic intoxication, and chills are more likely to occur. A positive diagnosis can be made only by recovery of the organisms from the blood stream, or from the excretions, particularly the urine. Leukocytosis occurs in all forms of sepsis, as does also iodophilia. The diagnosis of pyemia is made by the metastatic abscesses, which, when superficially situated, are easily detected; but when deeply seated in the viscera, they are apt to be small and numerous, and often their presence can only be suspected.

The treatment of sepsis is first *prophylaxis*. All wounds accidentally received should be carefully disinfected and the most scrupulous antiseptic or aseptic precautions taken during operations and the delivery of pregnant women. After labor the placenta should be carefully inspected to make sure that none of it has been left behind, after miscarriage curettage of the uterus is often done with the same end in view. It is important before operations also to increase the resistance of the patient by suitable treatment.

The local treatment is that of the causative lesion, viz., inflammation, suppuration, gangrene, etc. Uncomplicated sapremia or septic intoxication rapidly subsides if the local cause be found and removed. If the symptoms continue, all the putrefying material has not been removed, drainage is not efficient, or bacteria are elaborating toxins in the blood stream (septicemia). In the last the outlook is always grave, although, as has already been indicated, destruction of bacteria and recovery may follow. In pyemia secondary abscesses should be incised and drained, but unfortunately, in the viscera, this is often impracticable owing to their multiplicity. An accessible vein, the subject of thrombophlebitis, should be excised, or (*e. g.*, lateral sinus) opened, the clot removed, and the cavity packed with gauze; in order to prevent the further dissemination of septic emboli, the vein may be tied between the thrombus and the heart; in the extremities amputation may be required.

The general treatment is (1) specific, (2) eliminative, (3) symptomatic. (1) *Specific treatment* aims to destroy bacteria in the blood stream or to neutralize their toxins. Unfortunately, pyogenic bacteria in the blood stream are inaccessible. The *injection of antiseptics* into the circulation, in sufficient strength to be of value, is dangerous. *Antistreptococcic* serum, which at first seemed to give much promise, has been found to be ineffectual; it may, however, be employed in 10 c.c. doses repeated every 3 or 4 hours, particularly if bacteriological examinations prove the infection to be due to streptococci; like diphtheria antitoxin, which, too, has been used in septic conditions without success, it may produce erythematous or urticarial eruptions and pains in the joints, and several cases have been reported in which sudden death followed the injection of the serum. *Vaccine* treatment is still on trial. Quinin, iron, and large doses of alcohol (whisky or brandy) are regarded by many as almost specific in septic processes. (2) The most efficient means of combatting sepsis is by *elimination* of the microorganisms and their products. *Purgation*, especially by calomel and salines, lowers the blood pressure, drains off toxins through the bowel, and clears the intestinal tract of material which may be absorbed and aggravate the symptoms. If nature has anticipated the physician by the production of a diarrhea, such should not be checked unless excessive. *Diuretics*, such as calomel, caffeine, squill, sweet spirit of niter, acetate of potassium, and large quantitites of water by mouth or rectum, are of great value in removing toxins from the blood, in lowering temperature, and in reducing blood pressure. When both the stomach and rectum are irritable, the same principle may be utilized by injecting salt solution into the subcutaneous tissues, or, exceptionally, directly into a vein. *Diaphoretics* are not often used, as when they are indicated in septic conditions profuse sweats are generally present. *Venesection* is occasionally employed to lessen the amount of toxin in the circulating blood, especially when followed by the intravenous injection of salt solution. It should never be used in infancy, old age, or in the debilitated. (3) *Symptomatic treatment* depends upon the indications. Rest in bed, predigested liquid food, and proper nursing are always required in severe cases of sepsis. The best *anodyne*, if the condition is to last but a short time, is opium or one of its derivatives. In most surgical inflammations pain severe enough to prevent sleep calls for incision and drainage of the affected part. Nervousness is best met by the bromids, and sleeplessness not caused by pain, by sulphonal or trional. The cold-tar products and choral, because of their depressing effects, are usually to be avoided. The best *antipyretic* is an ice cap on the head, and general sponging with ice water, or equal parts of alcohol and water; drugs should be rarely employed. Persistent fever usually means that further search for the source of infection, with proper incisions, disinfection, and drainage, should be carried out. In many cases *stimulants*, such as alcohol, strychnin, ammonium carbonate, and

digitalis will be needed. (Stewart.) See Suppuration; Colon Bacillus Infection.

SEPTICEMIA.—See Sepsis.

SEPTIC INTOXICATION.—See Sepsis.

SEPTUM, NASAL.—See Nose (Deformities), Rhinitis (Chronic).

SEQUESTROTOMY.—See Bone (Disease).

SERPENTARIA (Snakeroot).—The roots of *Aristolochia serpentaria* and A. *reticulata*. Its properties are due to a volatile oil, a camphor-resin, and a bitter extractive. Serpentaria is a stimulant expectorant and a tonic; also a cardiac stimulant, a diaphoretic, diuretic, emmenagog, aphrodisiac, and somewhat of an antiperiodic. Its taste is warm and pungent, its odor characteristic. Dose, 10 to 30 grains. Large doses are irritant, causing nausea and vomiting, vertigo and headache, colic, borborygmi, rectal tenesmus, flatulent distention, and frequent but not watery stools. The irritant action seems to produce gas rather than fluid. Pruritus ani and hemorrhoids are occasionally caused by its use. Serpentaria is chiefly employed as a vehicle for other stimulant drugs.

Preparations.—S., Fluidextract. Dose, 10 to 30 minims. **S., Tinct.,** 20 percent in strength. Dose, 1/2 to 2 drams. **Compound Tincture of Cinchona** has 2 percent of serpentaria.

SERPENT VENOM.—The active principle of serpent venom is a toxalbumin analogous in character to the bacterial toxins. When taken by the mouth it is harmless. Venomous serpents are almost immune to serpent venom, non-venomous ones share this immunity in a less degree, and the mongoose and some other animals possess it in marked degree, probably by inheritance from many generations of bitten ancestors. Sewall in 1887 showed that pigeons can be immunized against crotalus venom by successive and increasing inoculations of the poison. Calmette discovered that the blood-serum of an animal so immunized is protective against the effects of the bite of a venomous serpent, and Fraser found that when immunization is performed with cobra venom the resulting serum is protective against the virus of several other serpent species.

Calmette's Antivenene is the recognized serum for serpent bites, and has been used successfully in many cases. While particularly effective against cobra venom it is less efficient against that of the crotalus and other vipers. Martin has shown that it is of no service for Australian serpents and McFarland for American snakes. The dose is 20 to 40 mils repeated frequently, but other recognized measures should not be neglected. A ligature should be applied above the wound, which should be laid open, well sucked, and surrounded by injections of an aqueous solution of calcium chlorid.

SERUM DISEASE.—See Serum Therapy and Vaccine Therapy.

SERUM THERAPY AND VACCINE THERAPY.—Serum therapy proper is the prophylactic and curative treatment of certain infectious diseases by the subcutaneous or intravenous administration of a blood-serum containing an antibody (antitoxic, bactericidal, etc.) which is specific to the particular disease. As generally used, however, the term includes also the treatment of some of these affections by vaccines and by the toxic products (toxins) of attenuated cultures of their respective microbes; but these toxins, though sometimes grown on blood-serum, may be produced on other media, and are never administered in a blood-serum, as the antibodies invariably are.

Antigens are substances which, when introduced into the organism, cause it to produce *antibodies*, which confer active immunity on the subjects against that particular antigen for a varying period of time; and in the case of the antitoxins, this blood-serum introduced into another individual, confers passive immunity on the latter. The antibodies now recognized are the antitoxins, bacteriolysins, opsonins, agglutinins and precipitins, the last two having no immunizing or therapeutic action, though of great value for diagnostic purposes.

Toxins are specific poisons produced by bacterial growth in suitable media, and when circulating in the organism they are the immediate causes of many of the symptoms of the acute infectious diseases. After the discovery of the bacillus tuberculosis other micro-organisms were found constantly associated with certain infectious diseases, notably tetanus, diphtheria, cholera, pneumonia, erysipelas and typhoid fever. The specific microbes of these affections were at first believed to be the immediate cause of their respective disorders, but later researches have shown that such diseases are due to the action of chemical poisons (toxins) produced by their specific bacteria growing on suitable soils either within the animal organism or outside it. The toxin produced by any particular bacterium varies greatly in power through very slight circumstances. It may be weakened or increased in virulence by the cultivation of its bacteria on different culture media or on the same media with different surroundings as to oxygen, temperature, etc.; also by passing successive generations of these organisms through a definite series of animals, chosen for their natural insusceptibility or susceptibility thereto. The pathogenic microbes of several diseases may be cultivated in test-tubes, forced to acquire an increased or lessened degree of virulence or toxin-producing power as required, separated from the poisonous products of their metabolic life-work, and by the inoculation of either their progeny or their chemical products (toxins) the corresponding diseases may be reproduced upon healthy animals in almost any desired degree of intensity.

The treatment of infectious diseases by their toxins is based upon the theory that the latter cause the organism to produce substances which are inimical to the bacteria producing them. The treatment of tuberculosis by Koch's tuberculin and the inoculations of Haffkine against cholera are examples of true toxin treatment. The vaccinations of Jenner for variola and of Pasteur for rabies are of the same nature when employed as remedial methods, the material being obtained from a morbid product of the disease in the one case and from the diseased tissue itself in the other,

the culture medium in both being the blood and tissues of the infected animal organism. Bacterial vaccines (Bacterins), contain some toxins, modified by heat, in addition to the killed bacteria. It has been frequently observed that patients afflicted with malignant disease have been greatly benefited by an intercurrent attack of erysipelas, in consequence of which the tumors seemed to undergo retrogressive changes. This has suggested the employment of the toxins of streptococcus erysipelatis and bacillus prodigiosus (Coley's fluid) in inoperable sarcoma, and may lead to the treatment of other diseases by the toxins of bacteria hitherto unassociated with them.

The injection of a toxin, in gradually increasing doses at proper intervals, will confer active immunity upon the animal so treated against the corresponding disease and its particular bacteria. This immunity may be passively transferred to another animal by injecting into its cellular tissue the blood-serum of the immunized one, and this serum will also act remedially on a subject of the disease if administered early in its course (Behring). The immunizing and curative action of the serum is believed to be due to the existence of an antibody in the blood of the inoculated animal, elaborated by the living cells of its tissues as a defence against the action of the toxin. These facts and hypotheses form the basis of the treatment of certain diseases by antitoxic and bactericidal sera.

Antitoxins are produced in the blood by the cells of the organism when certain bacterial toxins are injected into it at definite intervals and in increasing quantity. They are highly specific, *i. e.*, effective only against the particular toxin producing them, which they neutralize *in vitro* as well as in the organism, by combining therewith according to the law of multiples. This action is best explained by Ehrlich's side-chain theory, which is briefly as follows: Every toxin molecule consists of a *toxophore* or poisonous part, and a *haptophore* or combining one. The latter unites with the albumin molecule (receptor) of the cell, with which it has the greatest affinity, forming a side-chain thereof. By the frequent repetition of this process the cell is stimulated to excess production of receptors, which, uncombined with toxin, are thrown off into the blood and tissues. These excess receptors constitute the antitoxin, which circulate in the blood and are ready to combine with fresh toxin on its introduction or formation in the body, before it is able to damage the cells of the organism.

The discovery that the blood-serum of an immunized animal may be successfully employed for curative as well as prophylactic purposes against its particular disease upon other animals of the same or different species, was made by Behring in 1891. This was no chance discovery but was the legitimate result of logical reasoning and hard work, and is formulated under the title *Behring's Law*, as follows: The blood-serum of an animal which has been artificially rendered immune against a certain infectious disease, when injected into the body of another animal, has power to protect the latter individual against the same disease and to cure the disease after infection has occurred.

The chief representatives of the antitoxic sera are those of diphtheria and tetanus, though antitoxins for other disease are recognized, and have been used with varying effect. Among the latter are antitoxins for hay fever, tuberculosis, symptomatic anthrax, snake venom, spider and scorpion poisons, and certain poisons in fish and plants. The only antitoxins official in the U. S. P. are those of diphtheria and tetanus.

An antitoxic serum is prepared as follows: A highly virulent culture of the specific micro-organism of the particular disease, or still better, a strong toxin of tested strength prepared therefrom, is injected into the cellular tissue of a suitable animal, generally a horse, at first in very small quantity. The effect is soon shown by the onset of fever and other symptoms of acute disease, which are known as the "reaction." After an interval of time sufficient for recovery from these symptoms, the injection is repeated with a stronger toxin or with a culture of greater virulence, or with a larger quantity of the original toxin. This process is continued for several months, or until the animal no longer "reacts" to the poison, and then sufficient antitoxin is presumed to exist in its blood to render it immune to the toxin and to the disease. After each inoculation the animal's blood-serum is tested as to its value by experiment on guinea-pigs of definite weights. When the desired degree of immunity is reached the animal is bled from the jugular vein under strict aseptic precautions, from 6 to 12 pints being taken from a horse, according to his size and general condition. The blood is received in sterilized flasks, which are carefully stoppered and stored on ice until the clot has separated from the serum. The latter is tested to determine its value in antitoxin, has phenol added to it in the proportion of 0.5 percent, and is bottled in vials which contain in each the dose for one patient. The vials are labeled with a statement of the number of normal antitoxin units per c.c. of the contents, expressed in multiples of a standard normal serum.

Serum Intoxication.—The use of therapeutic serum is sometimes attended by certain unpleasant and even alarming symptoms, due probably to the introduction of a foreign serum and not to any specific action of the antibodies contained. It is probable, therefore, that the magnitude of the dose injected bears no relation to the occurrence or severity of such by-effects. In about 20 percent of all the cases in man the injection of serum produces a temporary intoxication in which any or all of the following symptoms may be present: fever, itching, urticaria and other skin eruptions, glandular enlargements, pains in the joints, edema and albuminuria. These symptoms develop in from 8 to 12 days after the injection. They occur after the first injection, whereas anaphylaxis (in animals) manifests itself only after the second injection. Previous injections, however, predispose an individual to "*serum intoxication*" or "*serum disease*," as it is called, in direct proportion to the number of previous injections. The symptoms of serum disease subside in a short time and leave no bad effects.

Anaphylaxis.—Serum disease is not to be con-

founded with the condition called *"anaphylaxis"* or *"allergie."* If a guinea-pig is injected with a small quantity of horse serum and, after the expiration of a certain interval, is again injected with horse serum, the result will probably be fatal. The first injection has sensitized the animal in such a way as to render it abnormally susceptible to the second injection. Other proteid substances, such as egg albumen, have the same effect as normal serum. Anaphylaxis may be defined as a hypersensitive condition induced by the injection of normal, foreign horse serum or other proteid substance. The hypersensitive condition is manifested after the second injection, separated from the first injection by a certain interval which may be called the period of incubation, and death may sometimes result. The first injection itself produces no symptoms, and, as stated, the condition is not identical with serum intoxication, which develops after a first injection of serum. The very rare instances of sudden death following a single injection of diphtheria antitoxin are sometimes attributed to anaphylaxis, but no sufficient proof in support of this explanation has been furnished. The extreme rarity of the accident—about one case in 400,000 injected with diphtheria antitoxin —would appear to indicate that death is due to some extrinsic cause, such as fright or congenital hypersensitiveness to the trauma of the injection, rather than to any toxic property of the serum, or else to some as yet undiscovered biologic reaction. Diphtheria antitoxin, even in massive doses, is in itself absolutely harmless.

Bacteriolysins form one division of the Cytolysins, antibodies which possess the property of dissolving cellular elements under particular conditions, and occur in the blood as a result of the reaction following the injection of cellular elements as antigens. The dissolving action of the bacteriolysin depends on the presence of two bodies, the *complement* (alexin, cytase), also present in normal blood-serum, and the *amboceptor* (immune body), which is present in the immunized serum, and acts to prepare the bacteria so that the complement can act dissolvingly upon them. Usually there is not enough complement present in the immunized serum to effect bacteriolysis, and more is added by mixing normal serum with the immunized serum before administration.

Opsonins (Bacteriotropins) are chemical substances existing in the blood-serum of animals immunized against streptococci, pneumococci, etc., which have neither an antitoxic nor a bacteriolytic action, yet confer immunity against the same infection when introduced into the blood of other animals. Denys (1895) showed that bacteria treated with sera containing these substances are taken up and digested by the leucocytes. Wright (1903) found similar substances in normal blood-serum, and called them *Opsonins*, because they prepare the bacteria for the devouring action of the phagocytes. He devised a method of ascertaining the opsonic value of any particular blood-serum, which, when compared with that of normal serum, gives the *Opsonic Index* of the individual for any particular infectious disease. He also made the important discovery that the opsonic power of the blood in infectious disease may be raised and maintained at a high level by injecting a killed (sterilized) culture of the same bacteria that are doing the mischief. This is the basis of the modern vaccine-therapy, the so-called *Bacterial Vaccines* of today being suspensions in salt solution of the same bacteria which have caused the patient's infection, and have been killed (sterilized) and accurately measured as to the number present in the vaccine. The determination of the opsonic index is technically very difficult for the general practitioner, and is subject to such variations that it is not available usually as a diagnostic or prognostic guide, and even among trained bacteriologists there is considerable skepticism as to its practical value, though it undoubtedly gives a clue to the probable infecting agent in obscure cases.

Bacterial Vaccines (Bacterins).—The term *vaccine* was originally applied to the infective virus or antigen of vaccinia (cow-pox), but in modern usage has been extended to include the antigens of all infectious diseases. In the preparation of stock vaccines the pathogenic bacteria are grown in pure culture, then killed by heat, suspended with their toxin in sterile physiological salt solution, protected from contamination by an antiseptic, and standardized to contain a definite number of bacteria in each milliliter. They are used by injection, subcutaneously or intravenously, to develop in the patient's body a condition of active immunity against the corresponding pathogenic germs or their toxins, by raising the opsonic value of his blood, and thereby promoting the phagocytosis of invading bacteria. The advantage of this active immunization for prophylactic purposes depends on the facts that these vaccines are incomparably cheaper and simpler to prepare than the sera, and that the active immunity conferred by them is more durable than the passive immunity produced by the latter. On the other hand their immunity does not set in immediately as is the case with the passive form, but only after 8 to 14 days of treatment.

This method of immunization was first tried by Ferran in 1884, who attempted protective vaccination with artificial cholera cultures during a great epidemic of cholera in Spain, but with poor results. Haffkine, using pure cultures attenuated by warmth, conferred immunity against cholera on many thousands of persons in India. Pfeiffer and Kolle placed the method of vaccination with killed bacteria on a scientific basis and put it to practical test against cholera in Japan in 1902.

The prophylactic use of bacterial vaccines has been most successfully applied against anthrax (in domestic animals), symptomatic anthrax (rauschbrand), and the infections of typhoid fever, cholera and plague. Its therapeutic employment is applied to those diseases which are combated by phagocytosis and not by bacteriolytic or antitoxic action, including the infections caused by the staphylococcus, streptococcus, pneumococcus, gonococcus, and the bacilli of tuberculosis, influenza, and the colon bacillus. Vaccine therapy has met with success in gonorrheal arthritis, also in pneu-

mococcic and staphylococcic infections, especially the latter, and is of value in pulmonary tuberculosis with mixed infection.

Stock vaccines must be used in cases of tuberculous and gonorrheal infection, because of the technical difficulties encountered in growing their germs; and stock vaccines of the staphylococci will, in most cases, give about as good results as personal (autogenous) ones. For all other germs the latter are superior to the stock vaccines.

Recently an improved type of vaccine has been brought forth and spoken of as a sensitized vaccine. In its preparation the bacteria are treated with the serum from animals immunized against the same organism. Sensitized bacterial vaccines are claimed to be more efficient in producing active immunity which occurs more quickly and lasts longer and the local and general reactions are greatly reduced or eliminated (Besredka).

The blood, then, has three principal methods of resisting bacterial invasion: (1) an antitoxic action, (2) a bacteria dissolving (bacteriolytic) action, (3) a phagocytic action; so that it opposes the pathogenic germs by neutralizing the toxins generated by some varieties, by dissolving others, and by destroying other bacteria by the devouring action of the white blood-cells. The Antitoxins effect the first method, the Bacteriolysins accomplish the second, and the Opsonins promote the third. The principal affections which have been found eligible to the prophylactic or therapeutic influence of these agents are considered under the titles of these diseases. See Diphtheria, Tetanus, Tuberculosis, Sarcoma, Streptococcus Infections, Staphylococcus Infections, Gonococcus Infections, Pneumococcus Infections, Cerebrospinal Meningitis, Typhoid Fever, Cholera Asiatica, Plague, Rabies, Syphilis, Serpent Venom, and Mallein.

Normal Serum.—The injection of normal horse serum will check hemorrhage when other methods have failed, supplying in hemophilia the principle which promotes coagulation. Its use in hemorrhagic conditions is not based upon any specific immunity content but rather upon the supplying of some material necessary to promote coagulation. Its injection is followed, in some instances, by urticaria, subnormal temperature, rapid pulse, rapid breathing, and in some instances cyanosis and collapse. It may cause a fatality, although this event is rare. It is more common for a slight urticarial rash with joint pains to occur from a few days to two weeks after the injection. Dose, 10 to 50 mils subcutaneously. And see Immunity.

SEWAGE DISPOSAL.—Sewage consists of human excreta, solid and liquid, together with house, factory and street waters and impurities. The mixture of feces and urine undergoes rapid putrefaction, resulting in gas formation (marsh-gas, ammonium sulphid, sulphuretted hydrogen, etc.). The urea of the urine is rapidly transformed into ammonium carbonate and then into ammonia. The bacteria present are chiefly the spirillum rugula, spirillum amyliferum; bacillus butyricus, bacillus putrificus coli, bacillus proteus sulphureus, bacillus proteus vulgaris, bacillus sulphureus, bacillus lactis aërogenes; and the micrococcus ureæ. Pathogenic microorganisms, such as the bacillus typhosus, choleræ, dysenteriæ (Shiga) and streptococci and staphylococci, may be present.

No crude sewage should be discharged into a stream or river. Though in time such sewage would be purified if largely diluted, the water would be rendered unfit for drinking purposes. In towns on the sea coast sewage may be discharged directly into the sea, provided precautions are taken to prevent its being cast up by the tide or carried by currents along the coast. To obviate such dangers the outfall should be so placed that the currents may carry the sewage away from the town, the mouth of the outfall sewer being guarded by a valve and opening below the level of the water. In low-lying towns where any fall for sewage is impossible, one of the pneumatic methods of removing sewage is advisable. The Shone system acts by means of compressed air sent out from a central station. The sewage is received into ejectors into which, when full, the compressed air is admitted by a valve and forces out the sewage. In the Liernur and Berlier systems the motive power is suction; a vacuum is produced at the central station and the sewage is sucked through an air-tight system of sewers to the central reservoir.

Methods of Application to Land

(1) **Broad Irrigation.**—This consists in the distribution of sewage over a large area of soil and is applicable to towns which can procure land of adequate size (one acre to every 100 to 200 people) and of suitable quality. Percolation of the sewage through the soil is provided for and stagnation is prevented by subsoil drains, unless the land is very porous. The sewage must be applied intermittently so as not to interfere with aeration of the soil. Large crops of Italian rye grass, roots (mangold) and cabbage may be obtained from a sewage farm.

(2) **Filtration.**—The increasing cost of land has led to the use of an equally effective but cheaper method—that of intermittent downward filtration on a small surface of especially porous land called a bacterial bed. The best soil is one rich in lime or alumina or hydrated iron oxid. The land is underdrained with porous tile drains and divided into sections, each of which receives screened sewage for 6 hours and rests the other 18 hours of each day. The process is that of oxidation and nitrification by microorganisms through the mechanical filter of the soil. This method is applicable to the sewage of considerably less than 1000 persons per acre. Usually the land is divided into ridges, upon which vegetables are grown, and furrows, down which the sewage flows.

If there is not sufficient land available to provide one acre for the sewage of each 1000 persons, preliminary treatment is necessary before the disposal on land:

Sedimentation and Chemical Precipitation.—The sewage is treated with lime (about 12 grains to the

gallon of sewage), or protosulphate of iron (2 to 5 grains per gallon), or sulphate of aluminum (about 5 grains per gallon) in settling tanks, having preferably a conical bottom, in order to remove suspended matters. The supernatant liquid is then applied to the land, or passed intermittently through special filters of sand, coke, coke-breeze, etc., or discharged into a large river or the sea. The sludge is generally partly rid of moisture by hydraulic filter presses and drying machines and used as manure. By this treatment the sewage of 2000 to 5000 persons can be disposed of on one acre of land. In London before the sewage is discharged into the sea it is treated with lime and sulphate of iron. Combinations of iron and alum, or alum and lime are also in use.

Biologic Purification.—Depending on the principle that the decomposition and purification of sewage, which is chiefly organic matter, is essentially due to the action of microorganisms, newer methods than chemical treatment and land application have been adopted. These have the advantages of greater efficiency and marked reduction in the amount of sludge and in the expense and labor involved.

In the changes occurring in sewage there are mainly two stages. The first is a process of digestion in which the anaerobes (microorganisms living without oxygen) play the chief rôle—the solid organic matter becomes liquefied, nonnitrogenous matter is reduced, albuminoid substances are peptonized; the second stage is one of oxidation, mineralization and nitrification, the ultimate result being mineral matters and gases—in this stage the work is done largely by the aerobes (oxygen-requiring microorganisms). The various types of installation in use at present are based upon the principle of separating these stages, with a view to placing the two main groups of microorganisms in the most favorable conditions for work. The first stage is allowed to take place in a digestive tank under strictly anaerobic conditions, while the second stage is effected during the passage through one or more aerating contact or filter-beds. Aerating filter-beds known as "streaming filters" are preferably constructed of coke, clinkers, flint, burnt ballast, coal, refuse pottery, and, less effectively, of sand or gravel. They have open outlets and afford the best means of securing efficient oxygenation of the effluent.

Before entering the installation the sewage must always be passed through a "grit chamber" to be freed from all large mineral particles. When the crude sewage is highly offensive as a result of wastes from breweries, preliminary treatment in slate beds is advisable.

The Scott-Moncrieff installation includes two or more "cultivation tanks" filled with large stones at the bottom and small above. The sewage passes to a false bottom on the floor of the tanks and escapes at the top. The effluent flows into a series of nitrification channels filled with large stones and exposed to the air. A modification of this system has a series of perforated trays containing filtering media over which the effluent slowly falls.

The Sutton System advocated by Mr. Dibdin consists of straining, then downward filtration through coarse beds of burnt ballast 4 feet deep. The effluent passes into five filters 4 feet deep where it rests for 2 hours. These contact beds are emptied slowly and then allowed to rest several hours. By this intermittent application aeration is provided for. In a modification of this system the sewage rests 4 hours in the coarse beds and 2 hours in the fine beds (treatment in a series of which is more effective to that in merely one).

The Septic Tank Method.—The sewage enters a covered tank where it remains for a day under anaerobic conditions (rest and absence of air and light) and becomes liquefied. The effluent passes through the outlet and along a trough or aerator over the edge of which it falls in a thin film, combining with air to a certain degree, upon a series of coke-breeze filter-beds 4 1/2 feet deep. Each filter is filled in 6 hours, then after 6 hours of rest it is emptied in a half hour and then left empty for aeration the remainder of the 24 hours. Small septic tank disposal plants have been installed effectively for the sewage of large houses.

Antiseptic Methods.—A purified effluent should be inodorous and not liable to undergo putrefaction. It is always potentially dangerous, however, for pathogenic organisms may still be present. Therefore prior to being thrown into a running stream, it is generally passed from the installation through a special sand filter or applied to land. Even then if discharged into waters where watercress is grown or oysters or other shell fish are laid, there is danger of contamination. The question of sterilization of the effluent has given rise to considerable study. Antiseptics and deodorants are advised and may be used to advantage if they do not interfere with the work of the microorganisms. In the A B C process alum, blood, clay and charcoal are used. Manganate of sodium and sulphuric acid are advocated. The Amines process consists of the addition of milk of lime and herring brine. Chlorin, either as chlorid of lime or gas, seems to be the most practical antiseptic. In the oxychlorid method, sea water or salt solution is decomposed electrically. In one hour 3 1/4 gallons are said to partially sterilize 1000 gallons of effluent from a biologic instillation. This treatment is claimed to render sewage effluent practically free from intestinal organisms.

SHINGLES.—See HERPES ZOSTER.

SHOCK.—Shock is a general prostration of the vital powers the result of injury or emotion. *Local shock* is numbness or anesthesia of a part which has been injured, and is seen most frequently in gunshot wounds. *Collapse* is the final stage of shock, or sudden profound shock coming on acutely. *Exhaustion* presents similar symptoms to shock, but comes on gradually, often following some exhaustive disease, such as carcinoma or tuberculosis.

The causes of shock are afferent impulses transmitted along the sensory or sympathetic nerves, or

in emotional shock along the nerves of special sense, to the vital centers, especially the vasomotor centers, which are thus weakened or exhausted (shock), or paralyzed (collapse); consequently there are marked lowering of the blood pressure, weakening of the propelling force of the heart and arteries, collection of the blood in the veins, especially the large abdominal veins, and anemia of the brain, lungs, and superficial parts of the body.

The **symptoms** vary in intensity according to the severity and situation of the injury, the psychical condition, age, sex (women are more susceptible) and previous general condition of the patient, and according to various other factors, such as hemorrhage, exposure to cold, etc. In *torpid* or *apathetic shock* there are marked pallor of the skin and mucous membranes, cold clammy perspiration, elongated, pinched, expressionless face, half open mouth, half closed shrunken eyes, lusterless cornea, dilated pupils reacting slowly to light, weak and rapid pulse, accelerated (occasionally slow) shallow and irregular respirations, mental apathy, subnormal temperature, impaired sensation of the skin, retention of urine, and sometimes incontinence of feces. If the shock is due to or aggravated by hemorrhage, there may be great restlessness and other symptoms commonly associated with the loss of a large quantity of blood. During the period of reaction there may be vomiting, great restlessness or excitement, and even delirium (*erethistic shock*), particularly in conditions like extensive burns, in which a toxic factor is added. Shock which does not appear for several hours (*delayed* or *secondary shock*) is most frequently seen after railway accidents, alcoholic intoxication, and severe emotional storms. After operation *delayed shock* is almost always due to hemorrhage.

The symptoms of hemorrhage are practically identical with those of shock, in fact the condition after hemorrhage is shock due to loss of blood. In concealed hemorrhage one does not see the blood, and the question arises whether the symptoms are due to shock alone, or to shock the result of hemorrhage. In hemorrhage there is apt to be greater restlessness, and instead of torpidity, great anxiety and foreboding on the part of the patient who complains of loss of sight, asks for water, and gasps for air; the skin and mucous membranes are excessively pale, and the pulse, although very frequent, is likely to be larger and more compressible than that of shock. The hemoglobin is greatly lessened in hemorrhage (but not for a number of hours) and unreduced in shock. The most reliable signs are those of fluid in a cavity, *i. e.*, in the chest or abdomen. In case of doubt, especially after an abdominal operation or injury, an exploratory incision should be made.

The **prophylaxis** of shock is possible in surgical operation. In addition to reassuring a nervous patient, the physical condition may be improved. With the patient in poor condition, shock may be anticipated by the application of warm water bags, the hypodermatic injection of strychnin and atropin, the careful covering of the patient during operation, the avoidance of excessive purgation and prolonged abstention from food before operation, and by celerity, gentleness, and careful hemostasis during the operation. The part to be operated upon may be placed in a slightly higher position than the rest of the body in order to lessen hemorrhage. The use of a local anesthetic for the prevention of shock in extensive operations is of doubtful value, as the fright of the patient, and the increased time necessary for the performance of the operation, owing to the struggles of the patient more than counter-balance any depressing influence of a general anesthetic. In head operations Crile applies a temporary clamp to the carotid, places the patient in a pneumatic rubber suit, and elevates the upper part of the body 45°. In operations on the dangerous area of the larynx, in which sudden collapse may follow from reflex inhibition of the heart and respiration as the result of stimulation of the superior laryngeal nerve, he advises a preliminary dose of atropin, or the application of cocain to the nerve endings in the pharynx; in the extremities he blocks the nerve trunks by injecting into them cocain.

The **treatment** of shock consists in raising the feet and lowering the head; the application of carefully protected warm-water bags; the hypodermatic injection of ether 1 dram, brandy 1 dram, strychnin grain 1/20, digitalin grain 1/10, atropin grain 1/100, ergotin 10 minims, or camphorated oil 1 dram, inhalations of ammonia, alcohol, or oxygen; the rectal injection (enteroclysis) of hot coffee 1 pint, whisky 1 ounce, or turpentine 1/2 ounce with salt solution; and autotransfusion, hypodermoclysis, or intravenous infusion of adrenalin chlorid in the strength of from 1 to 50,000 to 1 to 100,000 in salt solution. As a rule from 10 minims to a half dram of a 1 to 1000 solution is dropped into two quarts of salt solution, which is slowly injected into a vein. *Autotransfusion* is the application of bandages to the extremities for the purpose of driving the blood to the vital centers. Crile uses the same principle by the application of a rubber suit, which is blown up with a bicycle pump. Mustard plasters may be put over the heart and on the extremities, and stretching the sphincter ani has been recommended. If the respirations fail despite stimulation, artificial respiration should be performed. Transfusion of blood and massage of the heart have been employed in a few cases. Operations are not, as a rule, performed during the presence of shock, unless it is known that the shock is being increased by the condition for which the operation would be performed, *e. g.*, hemorrhage, perforation of a hollow viscus, and some cases of crushed extremities (Stewart). See COLLAPSE; EXHAUSTION; and INFUSION OF SALINE SOLUTIONS.

SHOULDER, AMPUTATION. The Flap Method.—The patient is placed on a firm table, with the arm well raised and projecting beyond its edge; the subclavian artery being compressed, the operator enters a long, narrow, straight bistoury at the anterior margin of the deltoid muscle, if it is the right arm, an inch below the acromion. From this point he thrusts it through the muscle, across

the outside of the joint, and brings it out at the posterior margin of the axilla. If the left arm is operated on, the knife must be entered at the posterior margin of the axilla and brought out at the anterior margin of the deltoid. Then, by cutting downward and outward the external flap is made. The arm is then brought down to the side and forcibly adducted; the origins of the biceps and triceps and the insertions of the infraspinatus and supraspinatus are cut through and the joint laid open. Finally, the blade of the knife, being passed through the joint and placed on the inner side of the head of the bone, is made to cut an inner flap of the same shape, but rather shorter than the outer one.

Oval Method.—In order to control hemorrhage, pins similar to those already described for amputation of the HIP-JOINT (*q. v.*) are now employed: one to be passed through the pectoralis major muscle and brought out in front of the acromion process; the other passed through the latissimus dorsi muscle and brought out back of the acromion. The points are to be protected by cork. The rubber band is to be put on above the line of operation, and is to be removed as soon as the limb is amputated and the vessels secured. Make a straight incision immediately beneath the acromion process, and a little toward the anterior border of the axilla, with a moderate-sized amputating knife, which should reach down to the bone, and should be between 2 1/2 and 3 inches in length; from the lower end of this incision two others are prolonged, the first passing in a curved direction downward and backward, and the second forward toward the folds of the axilla, the blood-vessels and the inner or axillary aspect of the arm remaining untouched. The flaps are then dissected back, including the muscles and exposing the joint. The head of the bone is then disarticulated by cutting upon the tuberosities, the arm being rotated inward and outward The arm is then adducted, throwing the head of the humerus outward, and the knife is passed to the inner side and carried downward close to the bone, an assistant at the same time compressing the artery. Then the tissues between the axillary folds are divided by an oblique cut from within outward so as to form part of the internal incision.

The axillary artery and branches of the anterior and posterior circumflex and of the suprascapular arteries are to be tied.

SHOULDER, DISLOCATION.—Shoulder-joint dislocations are quite frequent, and are usually readily diagnosed, but sometimes evade recognition.

Forward luxation of the humerus is the most frequent of the shoulder dislocations, and, according to the degree of displacement, is described as **preglenoid, subcoracoid,** and **subclavian;** the degree termed subcoracoid is most common. Sometimes the dislocation is somewhat forward and downward (infraglenoid) primarily, and becomes subcoracoid by a secondary displacement.

Forward displacement may result from direct violence, as a sharp blow on the shoulder from the side and behind; but generally results from indirect violence, as pushing the elevated arm powerfully backward. Occasionally, muscular action (hurling a stone) may produce it.

The symptoms of subcoracoid dislocation are characteristic: the head of the bone is absent from the glenoid fossa and presents beneath the coracoid process; the rounded outline of the shoulder has disappeared, the acromion hanging over and forming an angular projection; the long axis of the arm passes under the coracoid process instead of beneath the acromion; as a result, the arm is held abducted; the elbow can be pressed against the body, but on being released springs back immediately to its abducted position (elastic fixation). The outer contour of the arm is no longer almost straight, but forms an angle opening outward, with its apex at the humeral insertion of the deltoid. Voluntary movements are much restricted and passive movements are limited and painful.

Injuries to the blood-vessels are rare; the nerves are put on the stretch, and are sometimes injured, especially the circumflex nerve, resulting in serious injury to, and sometimes atrophy of, the deltoid muscle.

In making the **diagnosis** the following conditions must be differentiated:

Paralysis of the deltoid, with descent of the arm; fracture of the acromion; upward dislocation of the acromial end of the clavicle; fracture of the neck of the scapula; and fracture of the neck of the humerus.

Treatment.—Kocher's method is always to be attempted: first, without an anesthetic; and, if unsuccessful, then with an anesthetic. It is uniformly successful except in cases of very extensive laceration of the capsule. This procedure is as follows: The elbow, fixed at a right angle, is pressed closely against the side; the forearm is next turned as far as possible away from the trunk, causing external rotation of the bone-head; the elbow is next carried across the chest, forward and upward, the external rotation of the bone-head being meanwhile maintained; and, finally, the hand is placed on the opposite shoulder, producing inward rotation. It may be useful to have an assistant press the head outward with the fingers during the latter manipulation. The classic method of Sir Astley Cooper is also of service in some cases (traction upon the arm in the longitudinal direction, with simultaneous pressure of the foot—unshod—in the axilla, making direct pressure on the head).

After reduction, the arm should be fixed by slings or bandages (Velpeau's) so that the head of the injured side rests on the opposite shoulder.

Upward (supracoracoid) dislocation is extremely rare, and is always associated with fracture of the coracoid process.

Downward (subglenoid or axillary) dislocation is usually the result of a fall upon the hand or elbow with the arm raised. The appearance is characteristic: the bone-head can be felt in the axilla, and

when the arm is raised at right angles, the change in axial line, together with the empty socket and the overhanging and prominent acromion, make the condition evident.

A subvariety of this injury is the *luxatio erecta*, in which the arm is directed upward, with the forearm held behind the head to avoid pain. Reduction is easily effected by traction on the arm, together with direct outward pressure against the bone-head.

The following useful table (Pick) will aid in diagnosing the various forms of dislocation of the shoulder:

	Direction of the Axis of the Limb.	Alteration in the Length of the Limb.	Presence of the Head of the Bone in New Situation.
Subcoracoid.	The elbow is carried backward and slightly away from the side.	Very slight lengthening.	The head of the bone cannot easily be felt; if it can, it is found at the upper and inner part of the axilla.
Subglenoid..	The elbow is carried away from the trunk and slightly backward.	Very considerable lengthening.	The head of the bone can easily be felt in the axilla.
Subspinous..	The elbow is raised from the side and carried forward.	Lengthening intermediate in degree between the subglenoid and the subcoracoid.	The head of the bone can be felt and be grasped beneath the spine of the scapual.
Subclavicular.	The elbow is carried outward and backward.	Shortening....	The head of the bone can readily be seen and be felt beneath the clavicle.

Backward (retroglenoid, subacromial, subspinous) dislocation is very rare, and is usually the result of direct force. The prominence of the bone-head in its new position and the projection of the coracoid process make the diagnosis easy. Traction, together with adduction and direct pressure, effects reduction.

Irreducible Dislocations.—When dislocation is accompanied by fracture of the humeral shaft or fracture below the anatomic neck—as by the separation of the tuberosities, or by a dislocation of the long head of the biceps, with its twining about the humeral head—primary reduction may be accompanied by insurmountable difficulties. Under these circumstances there can hardly be a question about the propriety of immediate operation. The very brilliant result obtained by McBurney and others by the use of a bone hook inserted into the upper fragment through an open incision, thereby making reduction of the dislocated head feasible, will in the future justify like procedures in all similar cases. In unreduced dislocations of older date the question of operative interference must be entirely determined by the degree of disability entailed. When this is slight, and the patient is able to gain a livelihood, and when pressure-symptoms produced by the dislocated head are absent, the advisability of operative interference must be questioned, particularly if the dislocation is one of more than two or three months standing. Positive indications for operative interference are pressure upon the vascular or nerve-trunks with which the head of the humerus has formed new relations.

The present status of the question of operative interference in shoulder luxations may be summarized as follows (Ransohoff):

1. Immediate operative interference is indicated when the ordinary methods by manipulation under anesthesia have failed.

2. In irreducible dislocations operations should not be delayed until irremediable changes have taken place in the capsule and about the humeral head. In comparatively recent cases arthrotomy offers the best results.

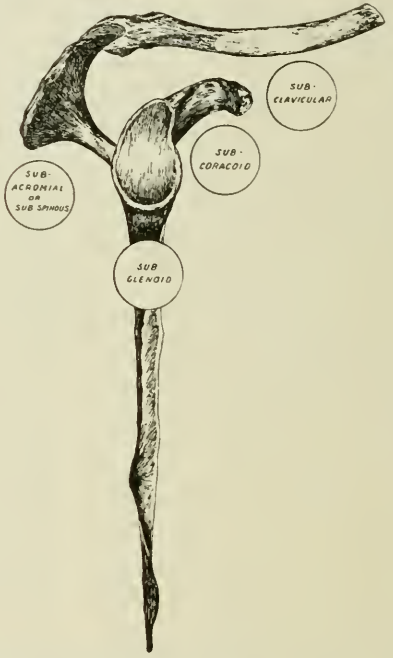


Diagram of Most Common Varieties of Dislocation of the Shoulder.—(*Thomson and Miles' Manual of Surgery*).

3. In long standing cases the conditions found must determine the choice between arthrotomy and resection.

4. In unrecognized dislocations of long standing—one year or over—only grave compression symptoms must be recognized as indications for interference.

5. Special attention must be given to the prevention of sepsis, since, in a very large proportion

of cases recorded, sepsis has been either the cause of death, or, by the destruction of the humeral head or obliteration of the joint cavity, has frustrated the very object of the operation.

SHOULDER, EXCISION.—This may be required for injury or disease. Ankylosis is compensated for so thoroughly by the mobility of the scapula that it is a question whether operation is advisable. It has also been performed for unreduced dislocation in which the head of the bone was resting upon the brachial plexus, and for tumors in connection with the upper extremity of the humerus.

The usual incision is vertical, between 3 and 4 inches in length, beginning just outside the coracoid process, on a level with it, and carried through the skin, fascia, and deltoid, down to the bone. If the arm is rotated outward and the soft part drawn to the sides, the tendon of the biceps is exposed at the bottom. This should be preserved, if possible; sometimes it is in a pulpy condition, or has already been eroded, and occasionally it is fixed firmly to the bone in its groove, and the upper end of it is lost. The capsule is then freely opened and the condition of the parts examined before determining how much it is necessary to take away.

So far as the subsequent utility of the limb is concerned, there is no doubt that the more of the bone that is left, the better. Partial resections (in which some of the head is left, the rest being gouged away) give better results than when the anatomic neck is divided; and this is to be preferred to the surgical neck. The entire diseased process must be removed (in cases of tumors springing from the head of the bone, one-third, and in some cases even more, of the shaft has been excised, preserving the elbow and the hand); but consistently with this, as little as possible of the healthy bone. The question of subperiosteal excision is still open, but there is ground for believing that when it is practicable, the results are superior to the other method. If the surgical neck requires division, the arm must be strongly rotated outward by the assistant as soon as the capsule is opened, in order that the tendon of the subscapularis may be cut; and then inward for the short external rotators. As soon as this is done the head of the bone rises well up into the wound, and may be either sawed off with a narrow-bladed saw *in situ*, the soft parts being protected and held aside by retractors, or thrust bodily out. The glenoid fossa very rarely requires more than the application of a gouge.

A counteropening at the back of the joint is usually advisable for drainage. The wound is thoroughly cleansed; the margins drawn together with sutures; a large tube placed across it; and the cavity of the axilla, the space behind the shoulder, and the outer side and front of the arm thoroughly packed with wood-wool. Stromeyer's elbow cushion should be used as long as the patient is in bed, and passive motion commenced as soon as the condition of the wound allows it, the fingers and wrist being exercised from the first (Moullin).

SIALAGOGS (Ptyalagogs).—Agents which increase the secretion and flow of saliva and buccal mucus, either by reflex action from local irritation produced when anything is taken into the mouth, or by stimulating the glands during their elimination. The principal sialagogs are divided into two groups: (1) *topical sialagogs* acting by reflex stimulation; the chief of which are: Acids and alkalies, ether, chloroform, mustard, ginger, pyrethrum, mezereon, tobacco, cubebs, capsicum, rhubarb, horse-radish; (2) *general sialagogs*, acting through their systemic influence on the glands or their secretory nerves; the chief of which are: Pilocarpus (jaborandi), muscarin, physostigma, mercurials, iodin compounds, antimonials, tobacco, ipecacuanha.

Agents which diminish salivary secretion are called Antisialagogs (*q. v.*).

SICK-ROOM.—Every home of any pretensions should contain a room especially arranged and kept ready for the use of sick members of the family. Such a room should be on the upper floor, and preferably in the southeast corner, so as to have the best sunny exposure; or still better, should be itself the upper floor of a two-story annex, separate from the main building, but joined thereto by a light, latticed bridge. It should have no upholstered furniture, a bare but painted floor, and rough-plastered and painted walls and ceiling, without pictures or paper, curtains or hangings. It should contain a bath room nearby and should communicate with the kitchen by a dumb-waiter, or preferably have connected with it a smaller room, furnished with a gas-stove and the other requirements of a diet-kitchen. It should contain everything requisite for nursing a case of typhoid fever, scarlatina, diphtheria, measles or small-pox; and all its arrangements should be supervised by the family physician. The possession of such an adjunct to the home would enable the owner to defy the mandate of a Health Officer, in regard to removing an inmate thereof to a public pest-house, as it could be shown to the satisfaction of any reasonable court, that a case of infectious disease could be better isolated and more humanely treated in such a room than in any "pest-hospital" yet erected by our political administrators of health laws (Potter).

SIDEROSIS.—Pigmentation of the lung tissue due to inhalation of metallic particles.

SIDONAL.—Quinate of piperazin. It is used in uricacidemia, gout, rheumatism in doses of 5 to 20 grains in the form of powder or solution, 75 grains being given in 24 hours.

SIGHT.—See Vision.

SILK AND SILKWORM-GUT.—See Ligature.

SILVER (Argentum).—Ag = 108; quantivalence 1. A malleable and ductile metal of brilliant white luster. It tarnishes only in the presence of free sulphur, sulphur gases, and phosphorus. It is an excellent substance for vessels used in pharmacy and for sutures used in surgery.

Therapeutics.—Internally, the silver salts are used in dyspepsia with vomiting of yeasty fluid; chronic gastritis and gastric ulcer; dysentery of chronic type, especially if rectal ulcer (the nitrate

internally and by enema); the diarrhea of phthisis and typhoid fever (nitrate with opium); chronic spinal inflammations causing locomotor ataxia or paraplegia; and epilepsy (in the latter affection the nitrate has occasionally given good results).

The **oxid** has been used internally for gastric neuralgia, irritative dyspepsia, pyrosis, gastric and pulmonary hemorrhages, and menorrhagia.

Used locally, the **nitrate** of silver is caustic, excitant, astrigent, and hemostatic. Strengths of nitrate of silver sufficient to prove astringent are also apt to be irritative. Thus, when used on mucous surfaces, the agent is liable to excite the mucous glands, if not to increase the inflammation. Under other conditions the irritating quality of the drug acts to advantage, and it is often selected when an excitant, and at the same time astringent, effect is desired. Nitrate of silver is a weak caustic on the most delicate tissues, but is a futile one on tough, resistant tissues. It is an astringent and hemostatic through the direct constricting effect it exerts on the caliber of the smaller vessels, and in the pressure exerted on them by the hygroscopic albuminate created by the salt.

In gastric catarrh:

℞. Silver nitrate, gr. v
Extract of hyoscyamus, gr. x.
Mix and make into 20 pills. Take one 3 times daily, a half-hour before meals.

In typhoid fever:

℞. Silver nitrate, gr. vj
Extract of opium, } each, gr. ij.
Extract of belladonna, }
Divide into 24 pills. One pill 3 times daily after taking food.

Poisoning.—Given internally in small doses, silver salts increase secretion, stimulate the heart, promote nutrition, and act as a nerve tonic. Their continued use produces symptoms which are collectively termed *argyria*, and are as follows: Gastrointestinal catarrh; tissue waste; uremia; albuminuria; fatty degeneration of the heart, liver, and kidneys; hemorrhages; fluidity of the blood; a slate-colored line along the margin of the gums and a similar discoloration of the skin and mucous membranes, with centric impairment of the nervous system, producing extensive paralysis, loss of coordinative power, convulsions, and, finally, death by paralysis of respiration. Large doses produce violent gastroenteritis; also ulcer of the stomach from thrombosis of its veins and destruction of the gastrointestinal mucous membrane.

Common salt freely used in the antidote, precipitating the silver as the insoluble chlorid and acting as an emetic. The nitrate is exceedingly sensitive to organic material and light, which decompose it readily. Incompatibles are all the soluble chlorids (hence it should be used in distilled water), most of the mineral acids and their salts, alkalies and their carbonates, lime-water, and astringent infusions. A course of silver medication should be regulated by suspending the remedy after 5 or 6 weeks' use, and then promoting elimination by purgatives, diuretics, and baths. To prevent the general discoloration, potassium iodid should be given conjointly with the silver, and baths of sodium thiosulphate should be used frequently.

Preparations.—There are three official salts, the nitrate, cyanid, and oxid.

Argenti Nitras, $AgNO_3$, occurs in colorless rhombic crystals, of bitter caustic taste and neutral reaction, soluble in 0.6 of water and in 26 of alcohol. Is best given in pill with kaolin, or in distilled water; never with tannin or a vegetable extract, lest an explosive compound result. Dose, 1/6 to 1/2 grain; if watched, up to 1 grain may be given. When melted with 4 percent of hydrochloric acid, it makes: **A. Nitras Fusus,** *Lunar Caustic*, for local use as a mild caustic and astringent. **A. Nitras Mitigatus** is the same salt melted with twice its weight of potassium nitrate. It is used locally by opthalmologists. **A. Cyanidum,** AgCN, has no medicinal use except for the extemporaneous preparation of hydrocyanic acid. **A. Oxidum,** Ag_2O, a brownish-black powder, nearly insoluble in water and insoluble in alcohol. It is liable to decompose with violence when mixed or triturated with readily oxidizable or combustible substances as creosote, phenol, potassium permanganate and many others. It should not be brought into contact with ammonia. Dose, 1/2 to 2 grains in pill with kaolin. It is not a dangerous internal remedy. **A. Citras,** called also antiseptic Credé. See Itrol. **A. Lactas,** see Actol. See also Argonin; Argyrol.

SINAPIS.—See Mustard.

SINAPISM.—See Poultice.

SINGULTUS.—See Hiccup.

SINUSES, ACCESSORY, DISEASES.—See Nose (Accessory Sinuses).

SIX HUNDRED AND SIX.—See Syphilis.

SKIAGRAPHY.—See Roentgen Rays.

SKIASCOPY.—See Retinoscopy.

SKIN-DISEASES, DIAGNOSIS.—Skill in the diagnosis of diseases of the skin requires not only a sound knowledge of the principles of medicines, but also an acquaintance with the pathology of cutaneous disorders; it is, besides, necessary to be familiar with the physiology and minute anatomy of the integument.

It should be remembered that the same pathologic conditions that are found acting elsewhere on the economy are also present in the skin; and that, therefore, this organ is equally subject to such processes as anemia and hyperemia, atrophy and hypertrophy, inflammation, new growth, and infection from animal and vegetable parasites; but it should also be recalled that while many, perhaps the majority, of these alterations are local in character, some of them are the result of general states, although not to the extent, and not even in the manner, that our humoralistic predecessors imagined.

With so much premised, it is but just to say that the difficulties of diagnosis in this branch of medicine have been considerably exaggerated—the result in part, perhaps, of undue refinement in classification and unnecessary pedantry in nomenclature. Experience has shown that many of these difficulties may be minimized, and the way made smoother, if some systematic method of examination is followed.

However, before entering into details, attention may be directed to the importance of endeavoring, first, to establish the diagnosis from the objective symptoms present in a given case. Until he has made the diagnosis as far as it is possible to make it by these visible and tangible signs of disease, the physician should keep himself as free as may be from preconceptions arising from the patient's statements or his own interpretations of past events. For example, it is seen often enough that, when the examiner presumes, rightly or wrongly, that a patient has had syphilis, his whole investigation is tinctured by that presumption. This mental attitude is all the more pronounced in those with but scant experience in dermatology. Of course, it is not always possible to draw a sharp line in these matters, and the scheme to be presented is to be regarded merely as suggestive.

Light.—In examining the skin for evidences of disease, artificial light should be avoided, and the first examination, at any rate, should be made in the daytime. Only in this way can slight differences in shades of color be detected—a matter at times of no slight importance: as, for example, in syphilis, tinea versicolor, and certain pigment anomalies.

Temperature of the Room.—If a patient is undressed in a cold apartment, upon exposure the skin will become mottled from congestion, and will take on an appearance simulating closely certain erythematous disorders, especially the early erythematous syphilid, or other like conditions. Consequently, an examination should always be conducted in a pleasantly warmed room. Having thus arranged the surroundings of the patient, attention may next be turned to the patient himself.

General Inspection.—The physician should never rest contented with the patient's statement in regard to the character and location of an eruption: as, for instance, that a certain patch on the abdomen is exactly like one on the face, etc. On the contrary, the examination should be thorough, and as much of the surface of the body inspected as possible; and even in the case of women, this may readily be effected by examining different portions of the skin successively. As a matter of course, this practice may be neglected in conditions obviously localized; but in generalized eruptions or in doubtful cases it is an absolute necessity to satisfactory diagnosis. By way of illustration, the fact may be cited that the nature of an ill-defined lesion of psoriasis on the face may be fully established by more characteristic types of the same disease if the elbows and knees are inspected. Again, the differential diagnosis between eczema and scabies may be made, both affections having certain features in common, if, upon a general survey of the body surface, the eruption in the latter disorder is found to occupy the classic sites of scabies: viz., between the fingers, at the wrists, the axillæ, the pubic region, especially the penis in the male, under the breasts in women, the buttocks, the inner sides of the thighs, and, in fact, wherever there are heat and moisture.

Extent of Surface Involved.—In making the general inspection just recommended, attention must also be paid to the amount of surface involved and to the localities occupied by the eruption. In addition to the illustration just given, it should be recalled that the exanthems usually cover the whole body; that the early syphilids are widely distributed; that acne is seated upon the face and shoulders; that psoriasis is likely to be symmetrically disposed; and that tinea versicolor is found on the trunk, xanthoma on the lids, lupus and epithelioma generally on the face, and lupus erythematosus on the nose and cheeks.

Arrangement of Lesions.—It is important to know whether the lesions occupy one or both sides of the body, and whether they possess any special arrangement. For example, in zoster the eruption is unilateral and the eruptive elements follow the course of cutaneous nerves, displaying clusters of vesicles on a red base. In ringworm the lesions affect a ringed arrangement, and extend at the periphery while clearing in the center. This disposition is also to be noted in psoriasis and in some syphilids; herpes iris is annular. Moreover, the eruption in syphilis is often grouped—a feature also to be observed in dermatitis herpetiformis; but the first-mentioned affection presents no marked subjective symptoms, whereas in the latter there are intolerable itching and burning.

Color.—The color of an eruption is often at least an auxiliary aid to diagnosis. The brownish-red or ham color of some syphilids differs from the underlying brighter red of psoriasis, and it also may be said that the thick greenish crusts of syphilis are fairly characteristic. The favus cups are sulphur-yellow; the patches of tinea versicolor are of a fawn tint; keloidal tumors are pinkish; and the new growths of xanthoma are buff-colored. In the same way the shade of color presented by an inflammation of the skin will measurably indicate its acute or chronic character.

Touch.—The affected skin should also be pinched up between the fingers, in order to get as accurate an idea as possible of the amount of infiltration present, the special tissues involved, the temperature, the presence or absence of fluctuation, etc. An account of the symptoms revealed by the educated touch will often determine whether a disease is superficial or deep-seated, and thus eliminate whole groups of disorders from the field of discussion.

Odor.—The odors arising from certain diseases of the skin are at times helps to their diagnosis. Favus has a peculiar mouse-nest smell; syphilitic ulceration emits a nauseating stench that is suggestive; while the smell of gangrene is well recognized.

Acute or Chronic.—The objective aspect of the disease is indicated by these terms rather than the time occupied in its development, the latter point receiving notice more particularly when the previous history of the case is under inquiry. For example, an eczema may have an acute appearance although a long time in existence, while a syphilid may be of recent origin yet lack all evidence of acuteness. Any changes that may have occurred, such as crusting, scarring, and the like, should be carefully noted, and the extending or outer margin of a patch should be especially observed, as often in this way we may detect the primary lesions (*e. g.*, in lupus) of an eruption that has been disguised by complications or treatment.

Individual Lesions.—It so happens that diseases of the skin, whatever may be their cause or nature, impress themselves upon the integument by certain elementary forms called primary lesions, which have been justly termed the alphabet of dermatology; and there are also to be observed certain other manifestations that are partly the sequels of the initial processes or are the effect upon them of traumatism—these are termed secondary lesions.

The primary lesions consist of macules, papules, vesicles, blebs, pustules, tubercles, wheals, and tumors.

Macules are discolored patches of skin, of variable shape and size, without elevation or depression.

Papules are circumscribed solid elevations of the skin, varying in size from that of a pinhead to that of a pea.

Vesicles are pinhead-sized to pea-sized circumscribed elevations of the epidermis, containing clear or opaque fluid.

Blebs are round or irregularly shaped pea-sized to egg-sized elevations of the epidermis, containing clear or opaque fluid.

Pustules are circumscribed, flat, or acuminate elevations of the epidermis, containing pus.

Wheals are edematous, circumscribed, irregular, pinkish elevations of the skin, transitory in character.

Tubercles are circumscribed, solid, deep-seated elevations of the skin attaining or exceeding the size of a pea.

Tumors are variously sized and shaped prominences, having their seat in the corium or subcutaneous tissue.

The secondary lesions comprise scales, crusts, excoriations, fissures, ulcers, scars, and stains.

Scales are dry epidermal exfoliations shed from the surface of the skin.

Crusts are brownish or yellowish masses of dried exudation.

Excoriations are epidermal denudations, usually the result of local traumatism.

Fissures are linear cracks or wounds in the epidermis or corium due to disease or injury.

Ulcers are round or irregular losses of tissue involving the skin and subcutaneous tissue.

Scars are connective-tissue new formations occupying the region of former losses of tissue.

Stains are discolorations of the skin left after the disappearance of cutaneous lesions.

While it is absolutely necessary for one desiring a knowledge of dermatology to know thoroughly these pathologic processes, it is not claimed that the recognition of a primary or secondary lesion will immediately give a clue to the diagnosis; for it is well known that these lesions are due to the most varied morbid states, and that the same kinds of lesions will often be found in very dissimilar diseases. If, however, the type of the lesion has been determined, at least the field of investigation has been considerably narrowed. For instance, it is of decided advantage to be aware that in herpes zoster there are vesicles and not tubercles; that in a disorder presenting macules we have not to deal with pemphigus or acne or urticaria, for these affections are characterized by an entirely different order of lesions. The same reasoning holds good, in a measure, for secondary lesions, such as crusts, ulcers, scars, scales, etc.

Macules occur in chloasma, eczema, erysipelas, roseola, rubeola, scarlatina, rötheln, erythema, ephelis, leukoderma, melanoderma, tinea versicolor, syphilis, xanthoma, purpura, nævus pigmentosus, and morphea. When a large portion or the entire skin is involved by change of color, it is known as a discoloration: such, for example, as is seen in Addison's disease, leprosy, and argyria.

Papules are observed in acne, milium, comedo, eczema, lichen, prurigo, in certain kinds of purpura and urticaria, and in variola, keratosis pilaris, ichthyosis, and miliaria papulosa. The eruptions of measles and rötheln are really maculopapular in character. In syphilis the papule is often surmounted by a scale.

Tubercles are found in connection with syphilis, leprosy, parasitic sycosis, acne, molluscum epitheliale, and lupus.

Tumors exist in carcinoma, sarcoma, syphilis, elephantiasis, angioma, keloid, lipoma, fibroma, and erythema nodosum.

Vesicles are present in eczema, herpes, vaccinia, sudamina, miliaria, varicella, dermatitis, dysidrosis, scabies; vesicopustules are observed in impetigo contagiosa, the vesicular syphilid, etc.

Blebs occur in pemphigus, hydroa, erysipelas, herpes iris, leprosy, syphilis, and dermatitis.

Pustules are encountered in acne, variola, ecthyma, equinia, impetigo, scabies, syphilis, sycosis, dermatitis, and pustula maligna.

Wheals are found in connection with irritable states of the skin, such as occur from the bites of insects, and most typically in urticaria, and also in some degree with purpura and erythema multiforme.

Scales are observed in psoriasis, eczema, pityriasis rubra, exfoliative dermatitis, scarlet fever, measles, seborrhea, the vegetable parasitic affections, and ichthyosis.

Crusts are to be found in eczema, syphilis, scabies, ecthyma, scrofuloderma, leprosy, syphilis, impetigo, carcinoma, seborrhea, herpes zoster, and sycosis.

Fissures occur in eczema, psoriasis, syphilis, ichthyosis, verruca.

Excoriations are to be seen in pruriginous disorders, such as eczema, pruritus, pediculosis, scabies, etc.

Ulcers appear as sequels to the lesions of syphilis, lupus, boils, carbuncles, eczema, herpes zoster, scrofuloderma, epithelioma, sarcoma.

Scars come in the wake of ulcerative skin-diseases: *e. g.*, lupus vulgaris, syphilis, and lupus erythematosus.

Having now closely observed all that the eye, the touch, the sense of smell, etc., can reveal—in other words, having made, free from preconceived notions, a thorough study of the objective symptoms present—we are better prepared to ascertain the general history of the case, to obtain an account of the patient's own sensations, and, finally, to make use of the various collateral methods of diagnosis that science has placed at our disposal.

Locality.—Many diseases have distinct predilections for special localities. Psoriasis elects the scalp and the extensor surfaces of the elbows and knees. Eczema may occur anywhere, but prefers the flexor surfaces. The excoriations of pediculosis corporis are seen across the shoulder-blades and around the waist. Acne attacks the face and chest. The lesions of scabies are quite constantly present on the webs and sides of the fingers, the flexor surfaces of the wrists, the anterior and posterior axillary folds, the nipples, the umbilicus, the penis, the buttocks, the insides of the thighs and legs, and the toes (in infants). The face is always exempt, except in infants. Erythema multiforme attacks the face, the neck, and the backs of the hands and feet. Erythemá nodosum is usually situated on the anterior surfaces of the tibias.

The proneness of common affections to attack special localities is indicated in the following list:

Scalp.—Eczema, ringworm, pediculosis capitis, favus, seborrhea, alopecia areata.

Face.—Acne, eczema, lupus vulgaris, lupus erythematosus, syphilis, impetigo, sycosis.

Chest.—Tinea versicolor, seborrheic eczema, macular syphiloderm, acne.

Shoulders and Back.—Acne, carbuncle, pediculosis corporis.

Buttocks.—Furuncles, scabies, congenital syphilis, eczema intertrigo.

Genitals.—Eczema, pruritus, herpes simplex, scabies, syphilis.

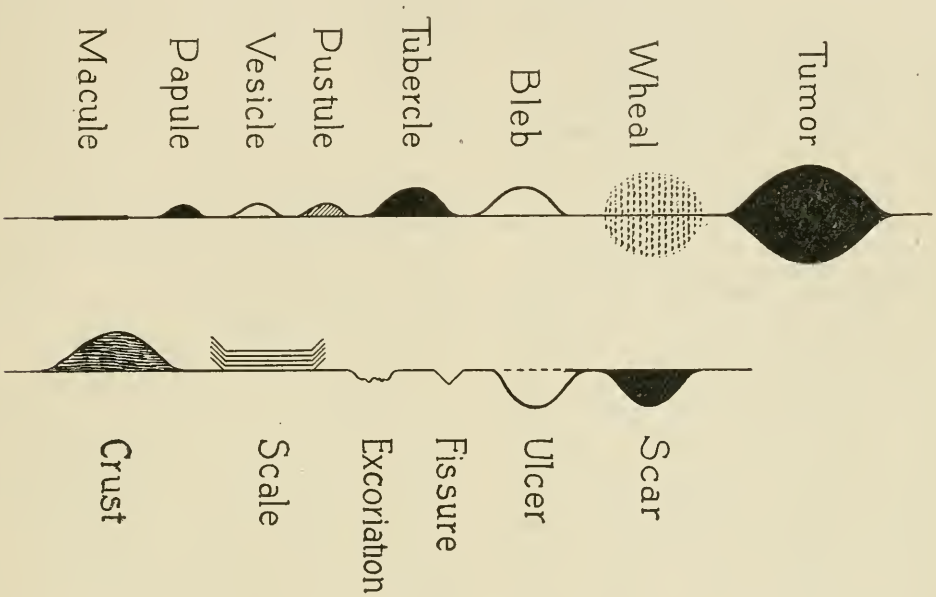


Diagram of Skin-lesions.

Lower Extremities.—Purpura, ecthyma, eczema rubrum, erythema nodosum.

Age, Sex, and Social Condition.—Some diseases of the skin are more prone to attack children than adults, and vice versa. Epithelioma usually appears first in middle or advanced life, while lupus vulgaris nearly always dates from childhood. Neither acne nor tinea versicolor is common in children, but ringworm of the scalp shows a predilection for that age and usually spares the adult. Ichthyosis is practically congenital. Lupus erythematosus is more frequent in women, and epithelioma of the lower lip is generally an affection of the male.

A knowledge of the occupation is sometimes a help in diagnosis. Bakers, grocers, bricklayers, plasterers, and barkeepers suffer from eczema, and artisans who handle chemicals and other irritants exhibit various grades of dermatitis. Hostlers may contract glanders, and wool-sorters become

infected with anthrax. Pediculosis is more common in the poor and unclean than in the upper classes of society.

Antecedent History.—The past history of the case will inform us as to former attacks of cutaneous or other diseases; and if the information is judiciously elicited, may throw much light on the present condition. This is of prime importance, especially in syphilis.

General Symptoms.—The general symptoms of the patient must not be neglected. His facial expression, his gait, the color of his skin and conjunctivæ, the state of the tongue, stomach, and bowels, etc., must be thoroughly investigated. The thermometer will show the body temperature, and microscopic and chemic investigation will determine the condition of the blood and urinary secretion, thus proving or disproving the existence of diabetes, nephritis, and malaria, each of which may be potent factors in the etiology.

Microscope.—Aside from the employment of the microscope in the conditions just mentioned, this instrument is an invaluable aid in dermatologic practice. With it the character of tumors may be determined and information furnished as to the nature of obscure pathologic processes. It is of especial utility in recognizing the presence of fungi or of animal parasites, and in the investigation of the rapidly extending class of bacillary diseases.

Drug and Feigned Eruptions.—The ingestion of various drugs produces in many persons diverse lesions of the skin, and a careful inquiry should always be made in that direction. The same observation may be applied in regard to certain foods: *e. g.*, urticarial and erythematous rashes are often due to the eating of strawberries or buckwheat, and eczemas are sometimes at least indirectly connected with the free eating of oatmeal. Many plants set up severe dermatitis, and heat and cold and the X-rays are also responsible for similar conditions. The physician should also be fully aware that feigned or artificial eruptions are not infrequently produced upon themselves by hysterics and malingerers. See Drug Eruptions.

Subjective Symptoms.—The merely subjective symptoms of a patient are not of paramount importance in diagnosis; still, one must not put aside as of no importance the statements of intelligent persons in matters relating to their own experiences of pain, itching, burning, or other sensations. Very often such statements may be verified by the condition of the integument itself; for example, if itching is severe, the presence of scratch marks will testify to its existence.

SKIN-GRAFTING.—See Plastic Surgery.

SKULL, DISEASES. Hypertrophy.—In ostitis deformans the vault of the cranium is usually immensely thickened. The inner surface becomes irregular, and is marked all over by arborescent grooves; the outer surface remains smooth and even; the diploe disappears, and on section the bone is hard and dense, like ivory. Beyond a gradual increase in the circumference of the head, it does not appear to give rise to any symptoms; no treatment is of any avail. Other forms of enlargement are described under Bones (Diseases).

Craniotabes.—A peculiar form of atrophy of the inner table, known as craniotabes, is occasionally met in infants suffering from rickets. It affects especially the posterior inferior angles of the parietal bones and the tabular part of the occipital bone, probably because of the recumbent position of the child, for a certain flattening of that part of the head is not infrequently noticed at the same time; and in one or two instances in which the disease existed before birth, a similar change has been found on the inner surface of the vertex. The sulci for the cerebral convolutions are unusually distinct, and here and there are marked in their course by little conic pits, which in some places are so deep that nothing but a parchment-like layer of dura mater and pericranium is left; the whole thickness of the bone is absorbed. Sometimes, in addition, there is a granular deposit of new bone under the pericranium on the outer surface, and occasionally a very considerable amount around the fontanels and along the sutures—enough to be felt plainly through the scalp. In all probability it is due to the effect of continued pressure acting on softened hypervascular bone. It certainly may occur independent of hereditary syphilis, although it is often associated with it (*e. g.*, Parrot's nodes), and a few instances are recorded in which other evidence of rickets was unusually slight. The diagnosis can only be made in well-marked cases by the peculiar parchment-like yielding on pressure with the fingers. No special treatment is required.

Caries and necrosis of the bones of the cranium are not uncommon. They are generally the result of syphilitic periostitis or injury, or, very rarely, of tubercle or fevers. The external table is the most often affected; but whether the external or the internal table is involved, the disease seldom extends beyond the diploe, as the two tables have a distinct blood supply. At times, however, complete perforation of the skull occurs. Caries and necrosis in this situation are likely to be followed by septic or infective inflammation of the diploe and its consequences; by suppuration between the bone and dura mater; by meningitis and abscess of the brain; or by thickening of the dura mater, resulting in persistent headache or even in epilepsy. When the skull is completely perforated, the hole is not filled up by bone; and when necrosis occurs, the sequestrum is not invaginated.

Treatment.—Beyond keeping the parts aseptic, providing free exit for the discharges, and removing loose sequestra, little, as a rule, is required. Should pus collect between the bone and dura mater, it must be released by the trephine; and a portion of necrosed inner table may also require the trephine for its removal. Appropriate constitutional remedies for syphilis or tubercle will, of course, also be necessary.

Meningocele and encephalocele are rare congenital tumors, formed by a protusion of the membranes of the brain through an unossified part of the skull. They are believed to be dependent upon hydrocephalus, the excess of fluid in the subarachnoid space or in the ventricles of the brain

leading respectively to a protrusion of the membranes alone (*meningocele*), or of the brain also (*encephalocele*). In the latter instance the dilated ventricle may extend into the protruding portion of the brain, a condition further distinguished as *hydrencephalocele*. The protrusion is most common in the occipital region, just behind the foramen magnum, between the four centers from which this part of the occipital bone is ossified; next, at the root of the nose, between the frontal and nasal bones; but it may occur in any situation in the course of the sutures, and may even project into the nasal fossæ or into the pharynx.

Symptoms.—In the occipital region these tumors are generally pedunculated and of large size—sometimes nearly as large as the child's head; at the root of the nose they are usually small and sessile. The skin covering them is generally normal. They swell up when the child cries, and can be completely or partially reduced on pressure, the reduction sometimes producing convulsions or other brain symptoms. When they contain fluid only (*meningocele*), they are soft, fluctuating, translucent, and completely reducible on pressure; they rarely pulsate, and are generally pedunculated. When they contain brain matter (*encephalocele*), they are doughy, nonfluctuating, opaque, and only partially reducible; they pulsate, and are usually sessile. They may be mistaken for other tumors of the scalp, but especially for congenital dermoid cysts and degenerative nævi. However, their intimate connection with the bone, their situation in the course of the sutures, and their partial or complete reducibility, together with the facts that they swell up on expiratory efforts and occasionally pulsate synchronously with the brain, will usually serve for their diagnosis. Further, the hole in the skull may at times be detected and brain symptoms may be produced by pressure.

Treatment.—As a rule, they should be let alone, or merely supported by a pad or bandage. A meningocele, when pedunculated, and apparently communicating with the interior of the cranium by a small aperture only, may be injected with Morton's fluid, or, under exceptional circumstances excised.

Fungous tumors, generally of a sarcomatous nature, and springing either from the tissues of the scalp or pericranium, or from the diploe or dura mater and then penetrating the bone, are occasionally met, and may be mistaken for inflammatory affections of the pericranium or bone, or for syphilitic gummata. Their rapid growth, resistance to syphilitic remedies, the escape of blood only on puncture, and the concomitant loss of weight and strength of the patient, will usually serve to distinguish them; but an exploratory incision may in some cases be necessary to clear up the diagnosis. Secondary tumors which pulsate and have the structure of thyroid gland tissue are also occasionally met in cases of malignant goiter.

Treatment.—When there is no evidence of dissemination, and the tumor is small and fairly circumscribed, it may be removed. When growing from the scalp, this can usually be done without much difficulty; but when the growth arises from the bone or dura mater, a much more serious operation will, of course, be required, since a considerable portion of the skull will have to be cut away and the dura mater probably opened. It need hardly be said that the strictest antiseptic precautions must be observed (Walsham).

Osteomata.—Those tumors growing from the outer table are sometimes called exostoses; those from the inner table and the diploe, enostoses. Most of the latter are, however, inflammatory, and probably syphilitic. Cancellous exostoses upon the cranium are rare; ivory exostoses are more common, growing chiefly from the frontal bone and in the external auditory meatus. Sometimes they are multiple and symmetric. As a rule, they are of very slow growth, and require no treatment; but when they grow in the frontal sinus, they may cause the most fearful disfigurement from displacement of the eyeball, or even more serious symptoms from pressure upon the brain; while in the ear they may lead to deafness, and ultimately to complete obstruction of the meatus, with its consequences (acute suppurative ostitis and meningitis), if the secretion collects behind and decomposes. Fortunately, it frequently happens that the necks of these growths are much more slender than would be imagined from their size, so that they have even been known to break off. As a rule, they can be detached with a drill fitted to a surgical engine; but very great care is required in the selection of proper instruments. In one or two instances the growths have detached themselves, like the antlers of a stag, the vascular canals in the neck gradually becoming smaller and smaller until at length the blood supply is altogether cut off.

SKULL, FRACTURES.—Fractures of the skull are usually due to direct violence. The vault of the cranium generally receives the blow, and hence is most often fractured. If, however, the force is diffused over a wide area, the skull is compressed, the most inelastic and unyielding part gives way, and a fissure is produced which generally runs across the base as well as the vault.

Simple Fractures of the Vault.—Of themselves, simple fractures of the vault are of little or no consequence: contusions, fissures, and fractures without displacement do not admit of proof, and even when the bone is comminuted and the depression considerable, the diagnosis is often only a conjecture, owing to the amount of blood extravasated. Their gravity arises from the fact that serious injury to important structures is so often associated with them. Concussion or contusion of the brain, hemorrhage between the membranes, or, especially if the course of the fissure traverses the middle meningeal artery, between the dura mater and the bone, rupture of the venous sinuses, and laceration of the membranes are of frequent occurrence after simple fractures; more rarely the contents of the cranium (the cerebrospinal fluid at least) find their way out, and form a soft, fluctuating, and pulsating swelling underneath the aponeurosis—cephalhydrocele. Later, especially in cases in which the bone is severely contused,

inflammation may set in, although it is very rare in comparison with compound fractures. It may be either acute or chronic.

Compound Fractures of the Vault.—In the majority of instances the nature of the injury can be seen at once. There is a fissure, appearing as a thin, red line, out of which blood continues to ooze, contrasting with the white bone around, or the bone is plainly comminuted and driven in, or the broken edge of a knife or other foreign body can be seen upon the surface. The wound must be carefully and thoroughly explored with the finger, and its extent and the depth and character of the displacement must be made out as accurately as possible, especially in the case of punctured wounds.

Serious complications are much more common in compound fractures. The more nearly a fracture approaches the punctured form, the more dangerous it becomes; it does not matter so much if the depression is wide and extensive, or if, owing to the softness and elasticity of the bones, there is little or no splintering; the dura mater is not injured, and symptoms of compression, merely from displaced bone, are exceedingly rare; but when the inner opening is fringed with a circle of little spikes projecting vertically inward, and tearing, and irritating the membranes and the brain, inflammation is almost certain. In addition compound fractures are always exposed to the risk of decomposition. Blood is extravasated into the diploe, and between the dura mater and the bone; the fracture is often comminuted; there are numerous little spaces and fissures between the fragments which cannot drain, and the wound is frequently filled with dirt and other foreign substances. Under these circumstances, unless steps are taken to prevent it, inflammation must follow, and though fortunately it often remains limited to the wound and merely causes necrosis of the broken fragments, it may at any moment spread into the surrounding bone, or, especially if the dura mater has been pricked, into the membranes of the brain, and set up fatal meningitis.

Treatment. *Simple Fractures.*—Unless there are definite symptoms of compression, either growing worse or refusing to clear up, nothing should be done. But if associated with concussion and contusion of the brain, the patient must be placed in a darkened room with the head shaved, and an ice-bag, or, better, Leiter's coil, applied; every source of irritation or excitement should be excluded, the bowels should be opened, preferably with a calomel purge, and nothing but the simplest diet allowed. Rest in bed must be strictly enforced for at least 3 weeks, and the patient must be carefully watched for months. The great fear during the first few days is that hyperemia and inflammation of the brain may occur; after that the chief risk comes from the bone, which may inflame and cause necrosis, meningitis, or pyemia; still later, even years after, symptoms of cerebral irritation may make their appearance, sometimes merely undue excitability or fits of temper, especially if there is any indiscretion in diet or abuse of stimulants; occasionally, but fortunately very rarely, more serious disturbance, such as epilepsy and even insanity.

Compound Fractures.—The wound in the soft parts should be treated as already described; the hair should be shaved off, the scalp well washed, the hemorrhage arrested, foreign matter and dirt carefully removed, and then all the part that has been exposed thoroughly washed out with corrosive sublimate or some other antiseptic. It should then be well dried, the edges dusted over with iodoform and brought together with sutures (catgut is especially useful when there is no tension), leaving suitable openings for the escape of the lymph, and, if necessary, one or two tubes may be inserted. Then it should be carefully covered over with a thick layer of some dressing sufficiently absorbent to soak up any discharge at once, and bandaged to avoid displacement and secure rest. Simple linear fissures, not depressed and not caused by the impact of a sharp weapon, may be covered in at once, the pericranium being replaced if it is torn off. There is no splintering in such a case, no fear of spicules irritating the dura mater and the brain, and the sooner the fracture is converted into a simple one, the less the risk of decomposition and suppuration. Punctured fractures, on the other hand, should always be trephined, the wound in the outer table being included in the circle of the instrument. It is impossible to ascertain the condition of the inner table; in nearly every case it is "starred" and the splinters driven inward; the operation adds nothing to the gravity of the case, and deep punctured wounds passing through strata of different consistence can neither be cleaned nor drained.

In compound depressed fractures portions of bone that are detached or loose or driven into the substance of the dura mater must be picked out, avoiding any unnecessary violence or persistence. If there are symptoms of compression, or if the size and depth of the wound make it probable that the inner table is splintered, the bone must be elevated and, if necessary, part of a circle removed with the trephine, the pin resting on the uninjured margin. See BRAIN (Injuries).

Fracture of the base of the skull is sometimes the result of direct violence—when, for example, a revolver is discharged into the mouth, or a stick is forced through the roof of the orbit, or the condyle of the jaw is driven through the glenoid fossa. More often it is caused by a fissure extending from the vault. The fracture starts from the point that is struck, and generally passes across the base of the corresponding fossa, sometimes when the force is great involving more than one. The middle fossa suffers the most frequently, as may be expected, and a very common course for the fissure to take is across the petrous portion of the temporal bone and the internal auditory meatus. Occasionally it is produced in other ways. The skull, for example, may be driven down on the vertebral column, just as a hammer-head is forced onto the shaft, with such violence as to break the bone around the foramen magnum; or, as it falls upon the head, the vertebral column may be driven against the skull. In fracture by *contre-coup* the

injury is on the opposite side of the head, at the other end of the diameter. The orbital plate of the frontal bone, for example, is sometimes fissured from a fall upon the occipital region. The skull is suddenly shortened in its anteroposterior diameter, and correspondingly widened in its lateral and vertical ones; both the frontal and the occipital regions are flattened out; but the former, being the thinner, more brittle, and less regular in its elasticity, gives way first. It must not be forgotten that fractures extending into the ear, nose, and pharynx are really compound.

Symptoms.—Sometimes there are no distinctive signs, and the condition is overlooked. It is often confused with drunkenness. Generally, however, there are present the symptoms of compression or other severe lesion of the brain. The signs considered especially diagnostic are (1) the escape of cerebrospinal fluid from the ear, nose, or mouth, or from an open wound if it exists; (2) the similar escape of blood; (3) effusions of blood under the conjunctiva, about the mastoid process or suboccipital region; (4) injury of one or more cranial nerves.

Prognosis is always grave, the cases generally, but not always, terminating fatally from concomitant injury or inflammation of the brain.

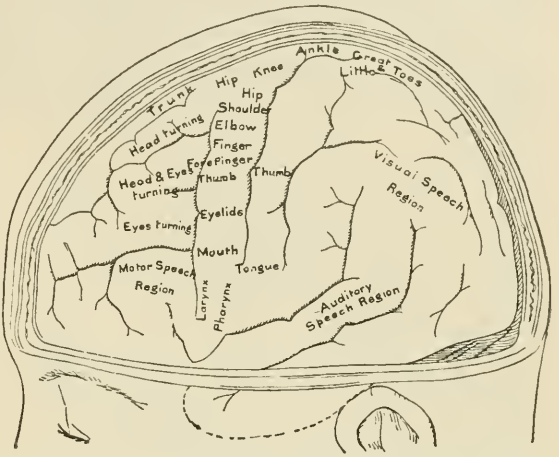
Treatment.—Fractures of the base of the skull must be treated in the same way as fractures of the vault; the brain is always severely in ured, and the greatest care must be taken tojward off any source of irritation. If the cribriform plate of the ethmoid is comminuted, an attempt should be made to remove the fragments, either through the orbit or the nose, for fear of the dura mater being injured, and to insure more perfect drainage. The discharge is certain to become purulent—unless drained and antiseptically irrigated—and is usually exceedingly offensive, especially if the injury is followed by necrosis. In the case of the ear, the meatus should be gently syringed out with an antiseptic, and then covered with a large pad of absorbent cotton, renewed as often as required. The fracture is compound, but meningitis rarely follows. Callus is scarcely every thrown out, the parts lie absolutely quiet, and there is no irritation; in many cases union is by fibrous tissue only; and the edges of the fracture become smoothed down and absorbed to some extent, so that the fissure, when the skull is macerated, appears much larger than it really was. See SKULL (Surgery).

SKULL, SURGERY.—Conditions calling for cranial surgery are cerebral abscess, tumors, injuries, hydrocephalus, idiocy, general paralysis, and severe cephalalgia and intracranial hemorrhage.

The tumors are glioma, psammoma, localized tubercular lesions, syphilitic scars that drugs cannot absorb, scar tissue and cystic formations following injury, and parasitic cysts. Sarcomatous and carcinomatous growths are usually too extensive for removal, or are multiple from the first. Moreover, since they have no capsule they are not sufficiently distinguishable from the surrounding brain-substance to insure their complete excision and their nonreturn in the scar.

Symptoms.—The chief signs of a cerebral tumor are vomiting, persistent headache, optic neuritis, localized spasms or paralysis, and epileptiform convulsions, and convulsive seizures usually starting in the part connected with the cortical area involved in the growth (Jacksonian epilepsy).

Localization.—Among the symptoms that may enable the surgeon to localize the growth are the following: (1) If at the beginning of the epileptiform fit there are: (*a*) Pain, peculiar sensation,

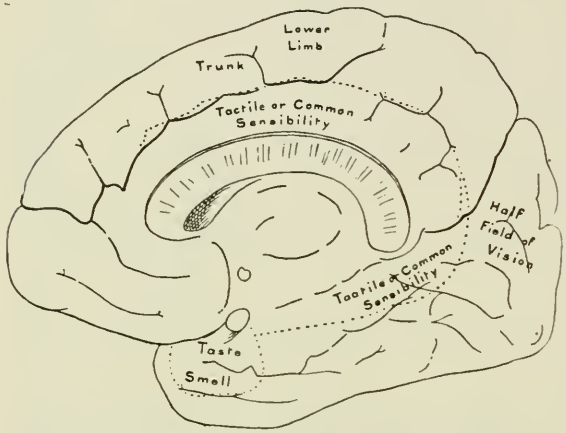


AREAS ON THE CONVEX SURFACE OF THE CEREBRUM.—(*Horsley and Russell.*)

flexion, or hyperextension of the great toe, a lesion of the leg area on the opposite side of the cortex about the upper end of the fissure of Rolando close to the middle line is indicated; (*b*) movements of the shoulder, a lesion near the upper part and in front of the fissure; (*c*) flexion of the thumb, a lesion about the genu of the fissure; (*d*) turning of the head and eyes to the opposite side, a lesion about the hinder portion of the superior and middle frontal convolutions; (*e*) movements of the mouth and tongue, a lesion about the lower end of the fissure of Rolando. An epileptiform movement starting in one of these parts may be followed by loss of power in the part for some time after the fit. (2) Aphasia indicates a lesion of Broca's convolution. (3) Loss of half the fields of vision in both eyes points to a lesion of the angular gyrus of the side opposite to the lost fields of vision. (4) Loss of hearing suggests a lesion of the two upper temporosphenoid lobes. (5) Aid to localization may also be derived from the involvement of the cranial nerves (Walsham).

When, from a consideration of the foregoing symptoms, a tumor or new growth is believed to be fairly circumscribed and in an accessible situation the skull should be trephined, a sufficient portion of the bone removed to fully expose the growth, by a Hey's saw, Gigli saw, Hoffmann's, Keen's, Dahlgren's or Hudson's forceps, or the surgical engine, and the growth cut away by making

perpendicular incisions into the brain around it, and raising it by means of a sharp spoon. Many experienced brain surgeons, notably Horsley and Krause, make use of the osteoplastic flap method, which consists in raising a flap composed of both soft tissues and bone, the latter being cut through along the line through which the former are incised, and the base then fractured by leverage and raised with the superficial tissues. It is frequently advisable to do the operation in two stages, allowing an interval of six to fourteen days between the formation of the flap and the removal of the tumor. When the operation is thus done, the flap is replaced and held in position by means of deep sutures. Whenever the operation is begun with the intention of completing it at one sitting a rim of bone at least one centimeter in



Areas on the Mesial Aspect of the Cerebrum.—(*Horsley and Russell.*)

breadth must be cut away (Krause). In order to prevent bony union the blood-pressure should be taken at the beginning of the procedure and every few minutes while the surgeon is operating; any decided fall should be considered a danger signal and the operation either hastily completed if it be already almost done, or abandoned to be finished at another time. The mortality in operations for cerebral tumors is high under all circumstances, but statistics show it to be less in those cases in which the operation is done in two stages than in those in which it is completed at one séance.

The removal of a portion of the cortex will be followed by loss of function of the area removed, but this will be regained to a great extent by the aid of the surrounding areas, especially as regards the coarser movements. The finer movements of the fingers and thumb will not be completely regained; hence in this region the removal of cortex should be as limited as is consistent with success. Parasitic cysts should be drained.

In focal epilepsy, that is, epilepsy without obvious gross lesion—when the fits become very frequent—for example, more than one an hour—and the mental processes are becoming further impaired, the focus in the cortex representing the initial movements may be exposed, the exact spot for the initial movements found by exciting the brain with the faradic current, and this area of the cortex excised. After such an operation a diminution in the number of fits as well as an improvement in the health of the patient may be expected.

In general paralysis trephining in a few cases has been of some benefit in the early stages of the disease. Thus the hallucinations, have disappeared, and the patient has so far improved as to be fit to be set at liberty.

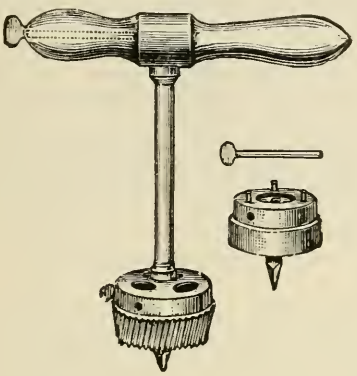
In severe cephalalgia, incapacitating the patient for work or preventing sleep, trephining may give relief. In such cases an exostosis, a spicule of bone, an enlarged Pacchionian body, or a fibrous tumor or cyst of the dura mater has been found, and its removal has been followed by complete recovery. In other cases when a tumor, etc., of the brain that did not permit of removal has been discovered, the relief of pressure has freed the patient from the excessive pain or threatened blindness.

Hydrocephalus, especially when accompanied by fits, when progressive atrophy of the optic nerve threatens, or when dementia or coma supervenes, may be treated by tapping the ventricles at intervals and applying slight pressure to the skull, or, if this fails, by continuous drainage of the ventricles.

Microcephalus combined with idiocy, due, it is thought, to too early synostosis of the cranial sutures, especially the sagittal and coronal, may be benefited by craniectomy—*i. e.*, the removal of a strip of bone on either side of the middle line of the skull. The aim of the operation is to allow the brain, the development of which has been prevented by the early synostosis, to expand. See Craniectomy.

Trephining.—Trephining is an operation required for the relief of (1) injury; (2) abscess, especially following ear disease; (3) tumors, including cysts; (4) trigeminal neuralgia. *After injury* it is required for (*a*) All cases of compound depressed fractures, including punctured wounds, gutter fractures and grazing of the skull by bullets. (*b*) Simple or subcutaneous depressed fracture in children if at all marked, whenever over the region of the sensorimotor areas, also for depressions occasioned during birth which tend to cause irritation and epilepsy. (*c*) Localized intracranial hemorrhage, particularly from rupture of the middle meningeal artery. (*d*) Signs of increasing intracranial tension or of suppuration, whether localized or not. (*e*) In late results of injury, localized pain and tenderness, and for focal epilepsy. If a wound of the scalp exists, it should be enlarged, otherwise a large semicircular flap of the scalp should be turned down, so that when it is replaced after the operation, the trephine hole is completely covered. The pericranium having been turned back from the bone, the trephine, with the pin protruded 1/10 of an inch, should be applied, and steadily worked, clearing the teeth

from time to time with an aseptic sponge or the brush provided for the purpose in the trephine case. A good groove having been formed in the bone, the pin should be withdrawn. When the diploe is reached, which may be known by the bone-duct being soft and red, greater caution must be used, and a quill or probe introduced into the goove at intervals to ascertain whether perforation has taken place at any situation. When the crown of bone is loose, it should be removed with the sequestrum forceps, and if it is intended to replace it, it should be kept warm in some weak antiseptic solution, and at the end of the operation cut into small pieces and placed in the hole, and the flap laid down over it. If more room is necessary, the trephine hole may be enlarged by a Hey's



saw, Hoffman's or Keen's forceps, or by the surgical engine. The strictest antiseptic precautions should be used throughout. Thus, the whole scalp should be shaved, and washed with soap and hot water, then with ether, turpentine, or ammonia, to remove all grease, and afterward with perchlorid of mercury or other antiseptic. Healing by first intention should be obtained if possible by accurately uniting the wound—except perhaps at its lowest part, which may be left open for drainage—and by applying a dry antiseptic dressing, and over it an ice-bag to prevent inflammation. The trephine should not be applied, as a rule, over a suture, an air or venous sinus, or over the middle meningeal artery, unless the operation is undertaken with a view to secure that vessel. The conic trephine of Walsham will be found a safer instrument than that in ordinary use, as with it the dura mater is less likely to be injured, and the handle also is more comfortable to work with. It can now be had with a metal handle and the improved button-pin. Before trephining for the removal of a cerebral tumor morphin should be given, as it causes contraction of the small blood-vessels, and so has a tendency to lessen the hemorrhage. See Craniometric Points.

SLEEP, DISORDERS.—See Insomnia, Nightmare, Somnambulism, Sleeping Sickness, etc.

SLEEP, TWILIGHT.—See Twilight Sleep.

SLEEPING SICKNESS, Definition.—The humantrypanosomiasis endemic in Africa, the terminal stage of which is characterized by somnolence, torpor, and coma.

History.—Sleeping sickness was known and described in Africa as far back as 1800 A. D. The disease at that time was confined to a few endemic areas, but of late years it has become widespread on account of the opening up of new areas of trade and travel over tropical Africa. Prior to 1903, the disease was known by its clinical symptoms only. In 1901, Forde discovered an intracellular protozoal organism in the blood of an Englishman, who had spent 6 years on the Gambia river in British West Africa. Dutton recognized and described the parasite as a new species of trypanosome infecting the blood of man. In 1902, Dutton and Todd found the parasite in 6 cases out of 1043 natives in the Gambia. In 1898, Brault had suggested that sleeping sickness might be caused by a trypanosome, but the relation between the two was not made until 1903, when Castellani demonstrated the trypanosome in the cerebro-spinal fluid of patients suffering from sleeping sickness. Since Castellani's discovery, the disease has been investigated by numerous Commissions, whose reports cover in great detail every phase of the subject.

Geographical Distribution.—Sleeping sickness has not been discovered outside of equatorial Africa. The limits of the disease on the west coast are the Senegal on the north and Mossamedes in Portuguese West Africa on the south. Along this coastal territory, the distribution is decidedly irregular. In some places a large percentage of the native inhabitants are infected, while other districts are comparatively free. The basins of the Senegal, Gambia, Niger, Congo, and head waters of the Nile rivers are infected. No cases have been reported from the Zambesi. In the interior whole tribes have been destroyed. Around Lakes Albert Nyanza and Victoria Nyanza the majority of the native inhabitants have perished. The east coast of Africa is free from the disease and no cases have originated within 400 miles of the coast. Outside of the endemic area both natives and Europeans have been diagnosed as suffering from the disease, but inquiry has always led to a history of residence within the infected area. Within this area there are many places endemically free. The low-lying banks of streams and shores of lakes of those localities, whose native inhabitants live near the water, harbor the infection in a particularly virulent form. In the West Indian slave trade days, there were many cases of sleeping sickness among the West African negroes imported from Africa, but the disease never became endemic and no cases of sleeping sickness are known to have occurred in any native born West Indians.

Predisposing Causes.—Before any series of exhaustive observations had been made, it was believed that the natives alone were liable to infection. This has been disproved and it is now known that all races and both sexes are equally liable, providing exposure to the infecting agent has taken place. The white inhabitants of an infected district are less liable to contract the disease than a native on accout of the protection rendered by his clothing and different mode of life.

but there is a large series of cases on record now of the disease in both white men and white women. Age seems to have no influence upon liability to infection, and among natives of an infected area, all ages are seen suffering with the disease.

Etiology.—Prior to the establishment of the fact that sleeping sickness is the terminal stage of human trypanosomiasis, many theories had been advanced to explain the disease, and it had been considered at various times by different observers, a manifestation of bacterial, filarial, strongloides, and hook-worm infections. Chronic food poisoning had also been incriminated. Castellani's discovery in 1903, of the trypanosome in the cerebrospinal fluid of sleeping sickness patients has been confirmed by many workers, and now the entire cycle of infection with the transmitting agent is known, with the exception of a few minor points.

The Parasite.—After the recognition of the parasite in Forde's case it was named trypanosoma gambiense. Nepveu had first seen the parasite in the blood of man, but his description is imperfect. Castellani gives its dimensions as from 16 to 24 microns long, and from 2 to 5 microns broad. Anteriorly it is either pointed or rounded and along one border is an undulating membrane, which is a thickening of the ectoplasm. This is continued posteriorly into a free flagellum. The origin of the undulating membrane takes place from a minute spot of nuclear material of oval shape, called the kinetonucleus, situated near the anterior end of the trypanosome. About the middle of the body of the parasite is an oval mass of nuclear material, irregularly shaped, called the trophonucleus. A few chromatin granules may be seen posterior to the trophonucleus, and the cytoplasm is continued in a narrow diminishing band for some distance along the flagellum. In Castellani's report in the Reports of the Royal Society on Sleeping Sickness are pictured besides the ordinary forms, multinucleate, polyflagellate, and nonflagellate forms.

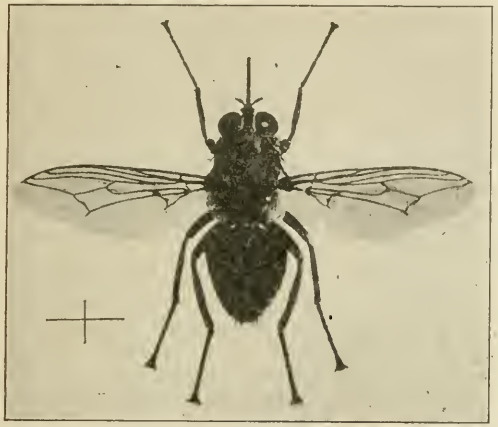
Occurrence of Parasite in Man.—The main facts of the life cycle of the parasite have been worked out but there are still a number of unknown points. In man the trypanosome is found in the peripheral circulation, the cerebrospinal fluid, and the lymph nodes of cases of sleeping sickness at various times during the progress of the disease. The majority of observers believe that the parasite is found in the peripheral circulation and lymph glands during the early stages (the so-called trypanosomatic fever); and that the invasion of the cerebrospinal fluid marks the beginning of the later stages. Various methods have been devised for demonstration of the trypanosome in the blood of man. Unless the trypanosomes are quite numerous they will be overlooked in the ordinary fresh blood preparations; the use of a large hanging drop, searching from 10 to 15 minutes, will give positive results in a larger percentage of cases in the early stages. The trypanosome may be located first with the low power of the microscope by the movements of the red blood cells as they are lashed by the flagellum of the parasite. Further investigation should then be made with the high power. The surest method of demonstration in fresh blood preparations is by the use of the centrifuge. About 10 c.c. of blood are drawn in the usual manner from a vein at the bend of the elbow. This is drawn in 1 percent sodium citrate in normal salt solution to prevent coagulation, centrifuged three times and the third or fourth residue examined. For staining blood preparations the various modifications of the Romanowsky stains give very good results. Koch, in his work on Lake Nyanza used a heavy drop of blood, which he stained with a dilute solution of Giemsa's stain. In the hands of experts, this is a very reliable method, but one or two trypanosomes may be overlooked on account of their being concealed by red blood cells and fibrin. During the latter stages of the disease, the trypanosomes may be demonstrated by examination of the cerebrospinal fluid obtained by lumbar puncture. In examining the cerebrospinal fluid, fresh and stained preparations are made and if these are negative, the fluid is centrifuged and the sediment examined. The lymph nodes and channels contain the trypanosomes at a very early stage of the disease and puncture of an enlarged lymph gland is the most certain method of demonstrating the parasite. A technic of gland puncture used by Grieg and Gray has given most satisfactory results. An enlarged gland of the posterior cervical chain is grasped between the thumb and index-finger and punctured by a sterile hypodermic needle. Then the barrel of the instrument is placed on the needle and the latter withdrawn. The drop of gland juice may thus be expressed upon a slide and examined as a fresh or stained preparation. Artificial culture of the trypanosome of sleeping sickness has not been successful, although they were kept going for 68 days by Thomas and Breinl.

The Transmitting Agent.—After the discovery that the trypanosome was the cause of sleeping sickness, it was soon noted that the distribution of the disease in the endemic foci was limited to those areas in which a certain species of the tsetse fly was found. There are ten species of this fly in Africa, but only one species, *Glossina palpalis*, has been proved to be the transmitting agent of the Trypanosoma gambiense of man. In appearance, *Glossina palpalis* is a dark colored fly, about 8 to 12 mm. long. A point of recognition is the arrangement of the fly's wings in the resting position. They overlap like a pair of scissors. This point differentiates the tsetse fly from other blood-sucking diptera with which it is associated.

Distribution.—The tsetse flies are limited to Africa. The *Glossina palpalis* is found along the west coast from about 13° to 15° south of the equator. In the interior it is not found farther north than 8° in the Anglo-Egyptian Soudan, nor farther south than 12° on the Luapula river in northeast Rhodesia. It is found in Angola, Congo State, The Gambia, Gold Coast, Ivory Coast, Lagos, North and South Nigeria, Prince's Island, Sierra Leone, Anglo-Egyptian Soudan, Uganda, Northeast Rodesia, Togoland, Senegal, Niger, French Guinea, French Congo, Dahomey,

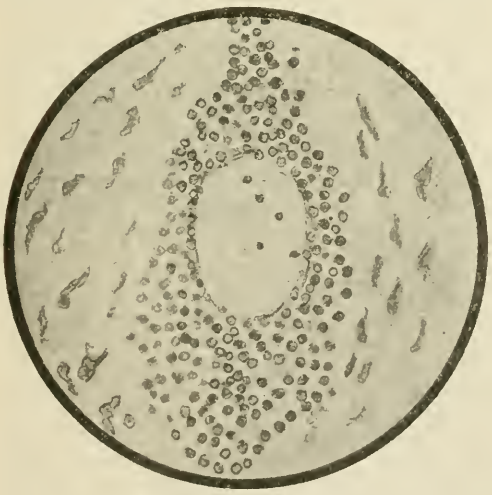
and the Gaboon. It is very numerous on Lakes Victoria Albert and Albert Edward. Lake Tanganyika and Mveru. It is not found on the east coast nor within approximately 400 miles of it.

Habitat, Habits, Method of Propagation.—All of the glossinæ are typical sanguiverous diptera, and



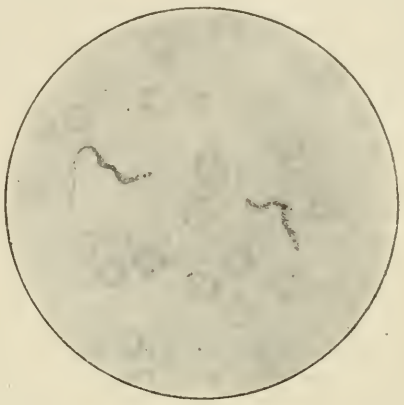
Glossina Palpalis.—(*Adapted from Wellcome Research Laboratory Reports.*)

they bite all mammalia. In examining the intestinal contents of a large number of *Glossinæ palpales*, Koch found red blood cells from crocodiles most frequently, and from man next. Avian blood was found very rarely. The flies only bite



Perivascular Infiltration of Lymphocytes in Sleeping Sickness.—(*Mott. B. M. J.*, Dec. 16, 1899.)

during the daytime from sunrise to sunset. The Portuguese Commission working on Prince's Island reported that they were less liable to bite during the mid part of the day, but observers in other parts of Africa lay no stress upon this point. Both male and female flies bite, and they seem to prefer a dark to a light surface. The optimum habitat of the fly is a loose soil, well shaded, bordering a lake, stream, or pool, with a temperature range of 25° to 30° C. and a high degree of humidity. It is not found in the dense jungle where the ground is always shaded nor in clear places where there is no shade. It has not been found above an



Trypanosoma Gambiense in Human Blood.—(*Schleip.*)

altitude of 4000 feet. Hodges considered that the natural range of the fly was about 30 yards with a following range of very long distances. The native boats and caravans distribute these flies over a wide area by mechanical transmission and it is by this method that human trypanosomiasis has been so widely spread during the

Forms of Trypanosoma Gambiense seen in Blood and Cerebrospinal Fluids.—(*Adapted from Manson's Tropical Diseases.*)

past 10 years. Dutton and Todd, on the Congo believed that the natural flight of the fly was a considerable distance, and Roubaud on the same river reported that it would attack passengers on boats a mile from shore. The flight of the fly is swift and there is a buzzing sound. Clothing is a fairly adequate protection against the bite of the

fly, but observers report that it can bite through socks, white drill or duck, khaki, and flannel shirts. There is little or no pain accompanying the bite, and little or no irritation follows. The female *Glossina palpalis* gives birth to a larva every 9 or 10 days. This larva buries itself in the loose soil, crevice of a tree trunk, or decaying mass of vegetation, and changes to the pupal stage. Both larvæ and pupæ are killed by prolonged exposure to water, and if shade is removed, they die under the direct rays of the sun. In 32 or 33 days the pupa hatches.

Cycle of Trypanosoma Gambiense in the Fly.—The French Commission working in the Congo believes that for the transmission of the trypanosome over long distances, the *Glossina palpalis* is necessary, but for the transmission from one individual to another, such as would take place in a native family inhabiting the same hut, other biting insects may mechanically transmit the trypanosome. Bruce, working with Nagana, the trypanosomiasis of cattle, could discover no trace of the trypanosomes in the proboscides of tsetse flies later than 1 hour after they had bitten infected animals. Munchin, Gray, and Tulloch found no trace of trypanosomes in the bodies of infected flies later than the third day after infection. During the 3 days after infection, trypanosomes were found in the midgut of the fly. Kleine, working with *Glossina palpalis* and Trypanosoma gambiense on experimental animals concluded that *Glossina palpalis* is a true host of the trypanosome. Some of the flies were able to infect laboratory animals immediately after biting. They lost this ability to transmit the trypanosome for about 18 days, when they were able to infect experimental animals again. The duration of the period of infection is unknown. Two years after the native population had been removed from the shores of Lake Victoria, the British discovered that the tsetse flies were still infective to experimental animals. There is a possibility in this case of the flies finding new infection in natives. If this source could be barred, there would remain the possibilities of (1) a reservoir of human trypanosomiasis existing in some animal, (2) the life of a tsetse fly extending over 2 years, (3) and hereditary transmission of the trypanosome in the fly. Both dogs and monkeys are infective and the disease runs a fairly rapid course of about 2 months in the former and about 12 months in the latter. In the laboratory animals, the infection runs a more chronic course.

Symptoms.—For purposes of description, the course of the disease is divided into three stages. During the first stage the parasite is present in the peripheral circulation and in the enlarged glands; the second stage is marked by an invasion of the cerebrospinal fluid; and in the third stage, the symptoms of serious nervous involvement are seen.

First Stage.—In blacks there may be no symptoms. In a reported case of a European, there was fever, irregular in type, accompanied by irritability, insomnia, headache, and loss of strength. This persisted for 15 to 20 days, then there was an improvement. The fever persisted, however, coming on at irregular intervals, with a tendency to rise at night. During this stage there is an acceleration of the pulse, which is distinct from the febrile rise. The pulse rate at this stage is often 120. During the second and third months, Kérandel's sign of deep hyperesthesia is noted. Kérandel in describing this symptom said that ordinary contact with objects, such as would pass unnoticed in a normal individual caused very severe pain. In Europeans, an erythema appears which may have an irregular distribution. This skin eruption may not be noticed in the blacks. Fugitive and painful patches of transitory edema on face and ankles may be present. Loss of sexual power in men, and amenorrhea in women are common. Anemia, loss of flesh, headache, itching, may be present. Iritis and cyclitis have been noted and blacks complain of photophobia and sensations of mist. Vomiting, colic, bloody diarrhea may occur. Adenitis is sometimes absent, but in the majority of cases there is a painless enlargement of the cervical glands. Polyadenitis may be present.

Second Stage.—The symptoms of the first stage are accentuated. The anemia is more pronounced, the headaches more frequent and severe. Patches of edema are more constant. The febrile attacks occur oftener and finally there is a daily afternoon rise of temperature. During the course of the disease, the temperature seldom arises above 103° F. There is a gradual change of character, with intellectual apathy and a tendency to drowsiness. Fibrillary tremors of the tongue appear, which may interfere with speech. Tremors in the arms, when extended, may be present. Zones of anesthesia and hyperesthesia and muscular atrophy are reported. There are attacks of giddiness and the gait may be hesitating. It is reported that during the first part of this stage, Romberg's sign is absent, later it is present, and finally the patient must stand upon both legs with eyes open to keep from falling. Martin, Guillain, and Darré describe a medullary (spinal) and a cerebrospinal form, in the former there being loss of sensation and motion, and in the latter, mania and hallucinations.

Third Stage.—In the final stage the nervous symptoms show that serious structural changes have taken place in the cerebrospinal axis. The intellectual apathy is extreme and somnolence has given place to torpor. There are tremors, and convulsions may take place similar to Jacksonian epilepsy. The patient lies in coma toward the end. The axillary temperature at this time is usually subnormal. Death takes place while in coma, or from some intercurrent disease, such as pneumonia, dysentery, or tuberculosis. It is the third stage which gave the name sleeping sickness to the disease.

Duration of the Disease.—This is uncertain. In one case reported, a European, there was an interval of about one month between known exposure to infection and beginning symptoms. The first stage may last from a few months to a few years. During the second and third stages, careful nursing will prolong life considerably.

The length of life of Europeans, after definite symptoms appear, varies from 1 1/2 to several years. In untreated blacks, it may be shorter.

Blood.—All observers agree that there is a relative increase in the lymphocytes. The French Commission reports the following as an average differential count:

Polynuclears,	49.04
Lymphocytes,	36.6
Large mononuclears,	6.36
Eosinophiles,	6.24
Transitional,	.76

The eosinophilia was caused by filariasis. There are no reports of a leukocytosis in uncomplicated cases of human trypanosomiasis.

Pathology.—Bruce reports that the gross appearance of the brain is fairly characteristic of sleeping sickness. He says that "upon removing the calvarium, a great deal of fluid escapes. The dura mater is not adherent and as a rule presents nothing abnormal. On reflecting it, the convolutions on the surface of the brain are found to be flattened and the sulci filled with opaque looking subarachnoid fluid, giving a ground glass appearance. The vessels on the surface are injected. On section, the brain appears normal, but the lateral ventricles are dilated and contain an excess of fluid." The microscopic pathology was worked out by Mott. He reported that the specific lesion was a meningoencephalitis in which there was a perivascular infiltration of mononuclear leukocytes around both large and small blood-vessels of the brain and cord. Bruce concludes that "human trypanosomiasis is essentially a disease of the lymphatic system, and the irritation and proliferation of the lymphocytes is probably due to a toxin, secreted by or contained in the bodies of the trypanosomes. The characteristic symptoms of the disease are no doubt due to the accumulation of these lymphocytes in the perivascular spaces of the brain, compressing the arteries and so interfering with the normal nutrition of the brain cells. The progressive weakness of the body, the tremulous conditions of the muscles, the feeble, rapid pulse, the weak voice and uncertain gait, the rise of temperature, would all be accounted for by this obstruction or interference with circulation, giving rise to degenerative changes in the nerve cells and proliferation of the neuroglia."

Diagnosis.—A tentative diagnosis may be made upon the clinical symptoms; but the absolute diagnosis depends upon the discovery of the trypanosomes in the enlarged cervical glands, in the peripheral circulation, or cerebrospinal fluid, according to any of the methods described under the **"parasite."** Numerous observers have reported an autoagglutination of red blood cells in cases of human trypanosomiasis, and African workers regard this as a very suggestive sign.

Treatment.—Besides general hygienic measures, which seem to prolong life only, a specific treatment with arsenical derivatives with or without some of the anilin dyes has been made use of. This specific treatment is based on animal experimentation, some of the arsenical derivatives, notably atoxyl, destroying the trypanosomes in the blood of infected animals. Breinl states that the injection of atoxyl and mercury, atoxyl and antimony, and arsenophenylglycin will produce cures in infected monkeys provided careful general treatment is carried out. He concludes that in man, atoxyl by itself affects a permanent cure in comparatively few and exceptionally favorable cases of sleeping sickness. The trend of medical opinion inclines now to a combined treatment with atoxyl and mercury, salts of antimony or some of the anilin compounds, such as trypan-red. Nattan-Larrier gives the results of treatment of eight Europeans. Of those who received general treatment only, one remained well for 17 months and then relapsed, another had a relapse with cerebral symptoms, and the third remained without symptoms two years. Of 5 treated cases, 3 received weekly hypodermic injections of 0.5 G. of atoxyl. There were two relapses and the condition of the third is doubtful. Another case, which relapsed, received atoxyl by mouth and injections of mercury. A case treated with atoxyl and strychnin improved. Atoxyl occasionally causes partial or total blindness. Soamin, a trade name for sodiumaminophenylarsenate is recommended as possessing all of the beneficial effects of atoxyl with none of its deleterious action. Yet cases are reported of optic atrophy from the use of this drug as well.

Prognosis.—The consensus of opinion seems to be that there is a slight prospect of cure provided the case is seen in the very earliest stages, but in the vast majority of cases, there is a fatal termination that may be only temporarily halted by proper nursing with administration of atoxyl or some other arsenical derivative.

Prophylaxis.—This may be either personal or general. Individuals who are obliged to enter the infected districts should wear clothing and face nets which will protect against the bites of the *Glossina palpalis*. The British, French, Germans, and Portuguese are endeavoring to rid their African territory of sleeping sickness by measures, which include the segregation and treatment of infected natives and the destruction of the *Glossina palpalis*. The British removed the natives from the infected areas around the Victoria Nyanza and established sleeping sickness camps where cases might be observed and studied. Koch rid an island in the lake of the tsetse flies by deforestation. The larvæ and pupæ of the fly will not develop unless they are shaded. Deforestation, however, is impracticable, except in certain localities. Travel between infected and noninfected districts has been regulated, and there is some prospect that eventually, the disease may be limited to certain foci.

SMALLPOX (**Variola**).—An acute, contagious disease, epidemic, characterized by an eruption that makes its appearance first as a papule, then is converted into a vesicle, finally becoming pustular, with the formation of a crust. See also VACCINATION.

Varieties.—(1) Discrete; (2) confluent; (3) hemorrhagic; (4) varioloid.

The period of incubation is from 7 to 12 days.

Etiology.—The specific microorganism of smallpox is probably an intracellular protozoon. Unicellular bodies are formed near the nucleus of the epithelial cell; and its final spores are considered by Councilman to be the true agent of infection. The virulent poison seems to be more abundantly present in the crusts. At this stage it is most highly contagious, is capable of being carried by fomites for great distances, and has the power of causing the disease after long periods of time. The disease is modified by a previous vaccination. One attack generally confers immunity, but subsequent attacks may occasionally take place.

Pathology.—The eruption consists at first of a small, hard, red papule, surrounded by a red areola. Within a short time liquefaction necrosis begins, forming a vesicle depressed in the center. The papules seem to originate in the epidermis immediately over the papillæ; it is here that liquefaction necrosis occurs. At the same time there is an exudation of a lymphoid material, through which are seen threads of denucleated cells dividing the vesicle into distinct divisions. In the stage of maturation the rete malpighii is filled with leukocytes and the products of coagulation necrosis. If the suppurative process extends through the cutis, scarring is inevitable. The eruption is very frequently seen on the soft palate and mucous membrane of the mouth and on the tongue. The red blood-corpuscles are greatly diminished; the leukocytes are not affected until the pustular stage; they are then increased.

Internal Organs.—The lungs and spleen are congested. The liver and kidneys occasionally show a degree of parenchymatous degeneration.

Symptoms and Clinical Course. Discrete Smallpox.—The onset is usually marked with a chill, intense frontal headache, and lumbar pains, often nausea and vomiting. In young children convulsions are frequent. The fever rises rapidly to from 103° to 104° F. within the first 48 hours, where it remains until the third or fourth day, or until the papular eruption appears, when it falls several degrees. The eruption is first noticed about the forehead at the junction of hair and on the wrists. The pulse is rapid and full.

The temperature remains low until about the eighth or ninth day, when the pustular stage arrives and there is a secondary rise of temperature—105° F. or more—proportionate to the severity of the attack. There is now great swelling about the face, and the eyelids may be entirely closed. Intense pain is present over the affected area. At this stage a peculiar odor is detected. If the case terminates favorably, toward the twelfth day desquamation begins with restoration of the diseased epidermis.

The Eruption.—It may be said, with due allowance, that the eruption for 3 days remains a papule, 3 days a vesicle, and 3 days a pustule. The papules are at first hard to the touch, and can be rolled around under the skin like a shot. The vesicle is depressed in the center (umbilicated) and is divided by the meshes into distinct compartments (loculated) which, if incised in one portion, all of the fluid will not escape, but only in the mesh in which the incision is made.

Confluent Smallpox.—The onset is the same as in the discrete form—with the papules at first discrete or separate, but later run together. The primary rise of temperature is higher, as a rule, than in the discrete form; and the same is true of the secondary fever, which may also be very irregular. With the rise of secondary fever the suffering becomes more intense, and there may be delirium and stupor, with rapid pulse.

Hemorrhagic Smallpox (Malignant Smallpox).—The primary symptoms are all exaggerated, and instead of the eruption first appearing, there are seen small punctiform hemorrhages about the groins and conjunctivæ, which gradually increase in size until large areas are affected. Hematuria, hemoptysis, and hematemesis are very common. Death usually occurs from the fourth to the seventh day. In this form there is usually no distinct eruption.

Varioloid.—This is a modified form of smallpox occurring in a person who has been previously vaccinated. The symptoms come on very suddenly, with a rise of temperature, headache, and severe pains in the back. The papules, as in discrete smallpox, appear on the forehead and arms on the third or fourth day. As a rule, they are fewer in number than in discrete smallpox. The papules become vesicles within a day or two, then pustules, and finally desquamate; the whole process frequently is completed within a period of 5 or 6 days. See Vaccination.

Complications.—Bronchopneumonia (most common), laryngitis, pleurisy, iritis, keratitis, conjunctivitis, boils, convulsions.

Diagnosis.—With the appearance of the perfect papule all doubt in the diagnosis of smallpox generally ceases. Ignorance of the initial rashes, measly and scarlatinal, has often led to errors of diagnosis. On the other hand, the resemblance of the eruption of measles to smallpox has also given rise to errors, the result of which has been no less serious; because in consequence, cases of measles have more than once been sent to smallpox hospitals, with disastrous consequences. Never, in measles, is there so severe a pain in the back as in smallpox, while the early cough and coryza are only found in measles. The lesson taught is to defer a positive diagnosis because less serious mischief may result from an error thus occasioned than as the result of an opposite course. The possibility of mistaking relapsing fever for smallpox has been alluded to in considering the former disease. Cerebrospinal fever may also be simulated by the hemorrhagic form of smallpox. Pustular syphilids and accidental croton-oil eruption have been mistaken for smallpox, as has also chicken-pox.

Prognosis depends upon whether or not the person has been vaccinated, upon the character of the epidemic, and upon the season of the year. If there has been a previous vaccination, the prognosis is always good. Occasionally, there is a type of smallpox which is virulent in certain epidemics.

The summer season is always favorable to smallpox, as the room can be kept well ventilated, more

comfortable, and there is less danger of complications.

The hemorrhagic type is the most fatal. In young children the prognosis is very unfavorable.

Ominous Symptoms in Smallpox.—Eliot has always noticed, in moving a patient to the hospital, that those who voluntarily covered their faces and heads, without any suggestion to do so, invariably died. When the face of a white patient assumes a dark leaden hue during the first days, death may be predicted almost with certainty. Those patients who present great swelling of the face and head in the beginning always suffer from severe attacks. There is a peculiarity of the walk which is very ominous: the patient lifts the feet high, as if he were ascending stairs, and this applies to the early eruptive stage. The general mortality is from 15 to 30 percent.

Prophylactic Treatment.—The patient should be isolated. If in the summer, a tent answers very well; or a house should be chosen that can subsequently be thoroughly disinfected. Nothing should remain in the room that cannot be boiled and washed in a solution of mercuric chlorid, 1:2000. The bed-clothes and bedding should be burned. The furniture, walls, and ceiling should be thoroughly scrubbed with soap and water; then with the solution of mercuric chlorid; 1 : 2000; and all furniture that can be moved should be sunned for at least a week. All sweepings, cloths, and waste around the yard should be swept up and burned. Burning sulphur and scattering a few drops of carbolic acid about an infected place is a primitive custom, and does no good unless the cause of the evil is removed. Formalin is a good disinfectant. See DISINFECTION.

The physician should wear such outside garments as can be thoroughly washed, and should always change the clothing before attending other cases. His clothing should be kept in an unoccupied room from which all drapery has been removed. It should subsequently be disinfected. After a visit to a patient with smallpox, the face, hair, and hands should be thoroughly scrubbed with soap and water; then with a solution of mercuric chlorid—1:1000 on hands and 1:4000 on face and hair—taking care that the liquid does not come in contact with the eyes. All persons in the immediate vicinity of the patient should be vaccinated. See VACCINATION.

Medicinal Treatment.—In mild cases few drugs are indicated. In no other disease are careful nursing and the proper hygienic precautions more necessary. It is always well to begin the treatment with calomel, 1/4 grain being taken every hour until 5 or 6 doses have been taken, followed by 1/2 of an ounce of Rochelle or Epsom salt. The kidneys should be kept active, and probably there is nothing better than potassium bitartrate, 20 grains of which may be given every 3 or 4 hours. Acetanilid or phenacetin may be given for hyperpyrexia. A light nutritious diet should be given. If the temperature rises above 102.5° F., it may be reduced by the administration of 5 grains of phenacetin; or the following formula may be given:

℞. Antipyrin, ʒ jss
Tincture of digitalis, ʒ ij
Peppermint water, ʒ iij
Water, enough to make ʒ ij.

One teaspoonful every 3 or 4 hours, if necessary, to reduce fever.

These antipyretics, besides reducing the temperature, mitigate the pain and render the patient more comfortable. If the temperature cannot be satisfactorily controlled, one should not hesitate to use the cold tub-bath. Cold drinks, such as lemonade, assuage the thirst fairly well.

As a diuretic:

℞. Solution of potassium citrate, ʒ ij
Sweet spirit of niter, Elixir of curacoa, each, ʒ iv
Water enough to make ʒ iv.

One tablespoonful every 3 or 4 hours.

If the nervous system begins to suffer, or if the heart is weak; 1/2 ounce of whisky may be given every 3 or 4 hours. Frequently morphin, 1/4 of a grain hypodermically, may be given to relieve pain and to produce sleep.

Finsen's red light treatment has proved effective in preventing suppuration.

Antistreptococcus serum is recommended in the stage of pustulation.

To Prevent Pitting.—Apply cold cream or vaselin on lint to affected parts. Schamberg found the most efficient treatment to be painting with iodin. Romero advocates picric acid applications (picric acid 30 grains, alcohol 1/2 ounce, water 6 1/2 ounces; or as an ointment). Lint dipped in a solution of mercuric chlorid, 1:3000, may also be applied.

Quarantine should be enforced for at least 2 weeks.

SNAKE-BITES.—See BITES AND STINGS.

SNAKEROOT.—See CIMICIFUGA, SENEGA SERPENTARIA.

SNEEZING.—The causes of excessive sneezing may be broadly classified as extrinsic and intrinsic. Tobacco-snuff and pollen are instances of the former, while the latter occur in association with various affections, as whooping-cough, asthma, hay-fever, gout, hysteria, disordered menstruation, derangement of the sexual functions, and pregnancy. A bright light or an intense color may cause excessive sneezing in some persons. The ingestion of pungent substances may cause violent sneezing. Some individuals exhibit special idiosyncrasy to certain articles of food. For instance, in some, chocolate, eaten or drunk, will provoke sudden sneezing. The initial sneezing in the beginning of an ordinary "cold" needs no mention here. Impacted cerumen may be a reflex cause. Sexual excesses may act similarly.

Treatment.—An attack may be cut short by pressure on some branch of the trigeminal nerve. A mustard poultice to the back of the neck, an emetic, an astringent nasal inhalation or a spray of creosote, iodin, or menthol, or an application to the nasal mucosa of a solution of cocain (3 percent)

may suffice. The head may be immersed in cold water. Irregularity in the function of any affected organ should be rectified. One drop of Fowler's solution 3 times daily may be given in paroxysmal sneezing allied to asthma. Potassium iodid, 10 grains several times daily, and iodin inhalations are sometimes used. In incessant sneezing, with profuse watery discharge from the eyes and nose, camphor powder snuffed and an alcoholic solution of camphor inhaled are also recommended. See Asthma, Hay-fever.

SOAMIN.—Sodiumaminophenylarsonate. One of the new arsenical compounds used in the treatment of syphilis. It is almost identical with atoxyl though it is claimed to be more stable and hence safer; but it is less stable and more toxic than arsacetin. Cases of optic atrophy, however, have been reported from its use. Dose, 1 to 5 grains. See Arylarsonates.

SOAP (Sapo).—A chemic compound made by the union of certain fatty acids with a salifiable base. It is used for washing and cleansing purposes. A table is appended showing the composition of the chief soaps of pharmacy, as analyzed by M. Dechan.

Therapeutics.—Soap is a laxative, antacid, and antilithic. Externally, it is a stimulating discutient, and is used for cleansing the skin, removing fatty substances, and softening the epidermis; but if too long applied, it may prove decidedly irritant. It is a good antidote in poisoning by acids, and should be administered freely in such cases until more energetic alkalies can be obtained. In aqueous solution it makes a useful enema for constipation, or a plug of soap may be inserted into the rectum. Soft soap is a powerful detergent stimulant, and is much employed in skin-diseases, especially eczema rubrum, in which the tincture is well rubbed on, the diseased skin well washed and then covered with a bland ointment. The tincture is the most desirable form for use, and may be diluted with 3 parts of alcohol for shampooing the scalp. The liniment is used with friction in sprains, bruises, and stiff joints, being a little more stimulating than camphor liniment. It makes a good basis for extemporaneous liniment prescriptions.

Preparations.—**Sapo** (*white castile soap*) is soap prepared from sodium hydroxid and olive oil; a whitish solid, hard, yet easily cut when fresh, of faint, peculiar odor free from rancidity, a disagreeable alkaline taste and alkaline reaction; readily soluble in water and in alcohol. It is an ingredient of three of the official pills, and two plasters. **Sapo Mollis,** *soft soap, green soap,* is soap prepared from potassium hydroxid and linseed oil; a soft, unctuous mass, of a yellowish-brown color, soluble in about 5 of hot water and in 2 of hot alcohol. The name green soap is a misnomer, as it is not green in color. Insoluble soaps are combinations of the oily acids with earths and metal oxids, as the soap of lime, official as linimentum calcis, and the soap of lead monoxid, the former lead plaster. **Emplastrum Saponis** has of soap 10, lead plaster 90, water *q. s.* **Linimentum Saponis** has of soap 6, camphor 4 1/2, oil of rosemary 1, alcohol 72 1/2, water to 100. **Opodeldoc** is a similar preparation. Soap liniment is an ingredient of chloroform liniment. **Linimentum Saponis Mollis,** *tincture of green soap,* has of soft soap 65, oil of lavender 2, alcohol to 100.

Variety.	Fatty Acids.	Combined Alkali.	Free Alkali.	Silica.	Sulphates and Chlorides.	Insoluble Matter.	Water.	Insoluble in Alcohol.
Hard soap (*sapo durus*).	81.5	9.92	0.08	....	0.28	0.20	10.65	0.50
White Castile soap (*sapo Cast. alb.*).	76.7	9.14	0.09	....	0.36	0.90	13.25	0.60
Mottled Castile soap.	68.1	8.9	0.19	0.15	0.63	0.80	21.70	1.30
Tallow soap (*sapo animalis*).	78.3	9.57	0.28	....	0.47	0.40	12.50	1.10
Soft soap (*sapo mollis*).	48.5	12.6	0.38	0.17	0.93	1.00	39.50	1.60

SOAPBARK.—See Quillaja.

SODA-WATER.—See Carbon Dioxid.

SODIUM.—Na = 23; quantivalence, 1; sp. gr., 0.972. A metal of the alkaline group, characterized by its strong affinity for oxygen. It has a silver-white luster, and is softer than lead. It decomposes water, forming sodium hydroxid.

The action of the sodium salts is similar to that of the potassium salts, except that the former are feebler as alkalies, are not so depressant, and are not so poisonous to the cardiac muscle or the nerves. They are diffused more slowly, are neither absorbed nor excreted so readily, and have not so marked diuretic action. Locally applied in large doses to muscular and nervous tissues they are paralyzant, but not so powerfully as potassium salts. **Sodium urate** is not soluble like the urates of lithium and potassium, and is therefore much less readily excreted, forming the masses called chalk-stones in gouty subjects. **Soda** is a less active escharotic than potash, having less affinity for water. **Liquor sodii hydroxidi** renders the blood and secretions more alkaline, but does not alter nutrition to the extent that the potassium solution does. The **acetate** is converted into the carbonate in the blood, and is a less active diuretic than the corresponding potassium salt. The **carbonate** is irritant to the stomach, and is chiefly used in the preparation of the other salts. The **nitrate** is mildly purgative and diuretic, and in solution is solvent to false membranes. The **ethylate** is antiseptic, and a powerful but almost painless escharotic. **Sodium bicarbonate** has the same action as the corresponding potassium salt, except that it is more slowly absorbed and is less depressant. It is antacid, antipruritic, and analgesic, the latter being probably due to the increased alkalinity imparted by it to the blood. Internally in small doses it is neutralized by the hydrochloric

acid of the gastric juice; in medium doses it is solvent to the gastric mucus, slightly irritant to the stomach, and sedative to the gastric nerves; in large dose it renders the stomach contents neutral or alkaline and stops the gastric digestion.

Preparations.—**S. Acetas,** $NaC_2H_3O_2 \cdot 3H_2O$, diuretic, a good saline draft. Dose, 5 to 30 grains. **S. Arsenas,** Na_2HAsO_4, used in preparing liquor sodii arsenatis. **S. Benzoas,** $NaC_7H_5O_2$. Dose, 10 to 30 grains. **S. Bicarbonas,** $HNaCO_3$, "saleratus," "baking soda;" antacid; 20 grains neutralize 16.7 grains of citric acid or 17.8 grains of tartaric acid. Effervescent. It is much used for the aeration of bread. Dose, 10 to 30 grains. **S. Bicarb., Troch.,** each contains 3 grains of the salt. **S. Boras,** $Na_2B_2O_7$, BORAX (*q. v.*). **S. Bromidum,** NaBr. Dose, 10 to 30 grains. **S. Cacodylate.** See CACODYLIC ACID. **S. Carbonas, monohydratus,** Na_2CO_3, antacid; 20 grains neutralize 9.7 grains of citric or 10.5 grains of tartaric acid. Effervescent. Dose, 1 to 7 grains. **S. Chloras** $NaClO_3$, the basis of an agreeable gargle. Dose, 1 to 10 grains. **S. Chloridum,** NaCl, common salt. Dose, 10 grains to 1 dram. **S. Cinnamas.** See CINNAMIC ACID. **S. Citras.** Dose, 5 to 30 grains. **S. Ethylas,** C_2H_5NaO, caustic alcohol, unof., in contact with water breaks into caustic soda and alcohol. **Sodium Glycocholate,** an excellent cholagogue, markedly stimulating the digestion of fats. Its dose is 2 to 5 grains. **S. Hydroxid,** Na(HO), "caustic soda," very alkaline and powerfully escharotic. **S. Hydroxid. Liq.,** solution of soda. Dose, 5 minims to 1/2 of a dram well diluted with water, contains 56 parts of the hydroxid in 944 of distilled water. **S. Hypophosphis,** $NaPH_2O_2$ used in preparing syrupus hypophosphitum **S. Iodidum,** NaI. Dose, 3 to 10 grains. **S. Nitras,** $NaNO_3$, "cubic niter," "Chili saltpeter." Dose, 5 to 30 grains. **S. Nitris,** $NaNO_2$, used in preparing sweet spirit of niter. **S. Oleas,** antacid and mild laxative. Dose, 2 to 20 grains. **S. Perboras,** antiseptic and bactericide. A substitute for hydrogen peroxid. **S. Phenolsulphonas,** $NaC_6H_5SO_42H_2O_2$, (sodium sulphocarbolate). Dose, 10 to 15 grains. **S. Phosphas,** Na_2HPO_4, sodium orthophosphate. **S. Pyrophosphas,** $Na_2P_2O_7$, sodium pyrophosphate. **S. Salicylas,** $NaC_7H_5O_3$, sodium salicylate. Dose, 10 to 15 grains. **S. Santonas,** $Na_2C_{15}H_{18}O_4$, a vermifuge for thread-worms. Dose, 5 grains. **S. Sulphas,** Na_2SO_4, "Glauber's salt," a mild purgative. Dose, 5 to 20 grains; as a purgative, 1/2 to 1 ounce. **S. Sulphis,** Na_2SO_3, sodium sulphite. **S. Thiosulphas,** $Na_2S_2O_3+5H_2O$, an antiseptic salt.

SOFTENING OF THE BRAIN.—A disease of the cerebral tissue dependent upon inflammation or blood failure, the symptoms varying according to the part affected, but consisting of loss of function, partial or complete. According to the appearances presenting, the softening has been distinguished as red, yellow, or white. See PARALYSIS (General).

SOLUTION.—See LIQUOR; PERCENTAGE SOLUTIONS.

SOMATOSE.—A preparation in which the albuminoids and nutritive constituents of flesh are converted into soluble albumoses, 5 parts of somatose representing 30 parts of beef in nutritive value. It forms a pale yellowish powder, which is readily soluble in water, forming an almost odorless and tasteless solution. It is employed as a food for patients afflicted with weak digestion, 1/2 to 1 ounce being given in milk, cocoa, or soup.

Iron Somatose (Ferrosomatose).—A preparation of somatose containing about 2 percent of iron in organic composition, and forming a light brown, inodorous, and tasteless powder, readily soluble in warm fluids; it does not attack the teeth or constipate. Dose, 1 to 3 drams daily.

Milk Somatose.—A tasteless, inodorous, strength giving food-product in powder form, prepared from milk. It contains the albumoses of milk in soluble form with 5 percent of tannic acid organically combined. It is used in chronic diseases of digestive organs such as are connected with inflammation of the stomach and with typhoid conditions. Daily doses for children, 1 or 2 teaspoonfuls; adults, 2 or 3 tablespoonfuls.

SOMNAL.—A hypnotic formed by the union of chloral, alcohol, and urethane. It acts like chloral, but is more pleasant. It occurs as a colorless liquid, resembling chloroform in its behavior with cold water, forming globules and refusing to dissolve or mix. It is soluble in hot water, in alcohol, and in alcoholic solutions 3 : 1. The advantages claimed for it are that in 20-grain doses it induces a quiet sleep, within a half-hour, lasting for 6 to 8 hours, and with no unpleasant after-effects. Doses of 45 or even of 60 grains do not depress the heart. Doses of 30 grains in solution with syrup of tolu or whisky are well borne and without deleterious effects. Its effects are more striking than urethane and less depressing than chloral. There is no vertigo, as after sulphonal. It is not powerful enough to control delirium tremens, maniacal delirium, or severe pain, but manifests its best hypnotic and sedative action in insomnia of convalescence from acute disease. In whooping-cough, in spasmodic laryngitis and in asthma, in the so-called "nervous cough," in chorea, in melancholia, and in mental depression, it is of much use. It is said to be injurious in general paralysis, and to be contraindicated in cases of impaired digestion.

SOMNAMBULISM.—The condition of half sleep, in which the senses are but partially suspended; also termed sleep-walking. Also the type of hypnotic sleep in which the subject is possessed of all his senses, often having the appearance of one awake, but whose will and consciousness are under the control of the operator. Charcot calls this simply **somnambulism,** which constitutes the third type of the hypnotic state. The second he calls **catalepsy,** produced by the gong suddenly sounded or the electric light suddenly brought before the subject's eyes; the eyes are wide open, and the muscles acquire the curious waxy condition designated as *flexibilitas cerea.* The subject seems to have no mental communication with the outside world. This latter characteristic also distinguishes **lethargy,** or the first type of the hypnotic state, in which there are unconsciousness, irresponsiveness of the senses to stimulation, and a fixed position of certain muscles. See CATALEPSY, HYPNOTISM.

Somnambulism is practically confined to childhood and youth. Idiots and imbeciles are rarely affected. There may be no definite symptoms of ill health in the simpler cases. A neurotic temperament or a tendency to disturbances of the nervous equilibrium, such as epilepsy, hysteria, chorea, or migraine may exist. Other cases may be accompanied by mere chagrin, anger, or surprise.

The eyelids are usually closed, but may be open, and the pupil is dilated. The sense of touch is much exalted, and a sleep-walker seldom runs against furniture, chairs, etc. Some subjects hear well, others do not. The sense of smell varies with the subject. A sleep-walker may enjoy a meal and not remember the fact of having eaten.

Sensibility to pain may be entirely suspended. The muscular system is intact, and permits of extraordinary exploits. The ordinary mental processes are active in somnambulists, and elaborate work may be performed. A dream in all probability precedes and accompanies the action taken. Occasionally, the particular dream may be recalled. Vivid hallucinations may arise, determining the particular act to be performed. Speaking and singing are not uncommon.

Treatment.—Treatment is limited to regulating any indiscretions in diet and correcting any gastric disturbance. The best hygienic surroundings for quiet sleep should be obtained. See Insomnia.

SOMNIFACIENTS.—See Hypnotics.

SOMNOFORM.—A mixture of ethyl chlorid 60, methyl chlorid 35, ethyl bromid 5, said to be more rapid in action than ethyl chlorid.

SORBEFACIENTS. (Discutients).—Agents promoting absorption. They may be divided into two classes: (1) those which stimulate the lymphatics to the removal of morbid or inflammatory deposits, (2) those which promote the imbibition of nutritive or medicinal material into the system. (See Alteratives.) These agents include the following: arsenic, mercury, iodin, iodids, cadmium, ichthyol, lanolin, oleic acid, cacao butter, massage, vapor bath, hot water bath, poultices, counter-irritation, galvanism.

SORE THROAT.—See Laryngitis, Pharyngitis, Tonsillitis.

SPANISH FLY.—See Cantharis.

SPARTEIN.—A volatile liquid alkaloid not containing oxygen. It occurs in *Scoparius*, and is a colorless, thick oil, boiling at 311° C. It is narcotic. It stimulates the action of the vagus, and acts more quickly than digitalis, but not so powerfully. It is an uncertain diuretic and cardiac tonic, but is often efficacious when digitalis fails. Dose, of the sulphate, 1/5 grain. See Scoparius.

SPASMS, INFANTILE.—See Convulsions (Infantile).

SPEARMINT.—See Mentha Viridis.

SPECIFIC GRAVITY.—The comparative weight of bodies of equal bulk. It is ascertained by weighing the bodies with an equal bulk of pure water at a given temperature and atmospheric pressure, which is taken as the unit.

To obtain the specific gravity of a body, it is only necessary to balance it with an equal bulk of the standard and to ascertain how many times the weight of the standard is contained in its weight. For example, a fluidounce of water (standard) weighs 455.7 grains; a fluidounce of lime-water weighs 456.3 grains; $456.3 \div 455.7 = 1.0015$: that is, the lime-water weighs 1.0015 times more than water, bulk for bulk. In other words, its specific gravity is 1.0015. A fluidounce of alcohol weighs 422.8 grains; $422.8 = 455.7 = 0.928$, specific gravity.

This general rule may be given for finding specific gravity: Divide the weight of the body by the weight of an equal bulk of water; the quotient will be the specific gravity.

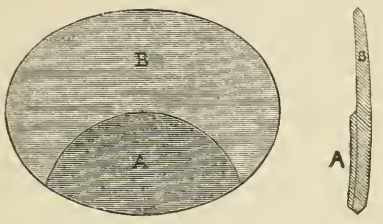
SPECIFICS.—Agents which have each a selective curative influence on a particular disease. Mercury is said to be specific to syphilis, quinin to malaria, and other drugs are more or less specific to certain affections, but they have so many actions and uses that they are usually placed in other groups. The true specifics are the various animal extracts and sera, though even these are being found remedial in other than their specific diseases. The most important of these agents are the thyroid and suprarenal glands, and antidiphtheritic serum or diphtheria antitoxin, which are official but many other animal extracts and sera are used in medicine.

SPECTACLES AND EYE-GLASSES.—The fitting of spectacles and eye-glasses is a most necessary adjunct to the art of ophthalmology. Spectacles should always have stout temple-pieces, to maintain their shape and stay in proper position by their weight. To prevent jarring while walking or running, the sidepieces should fit closely to the face and temples; in fact, it is sometimes preferable that they should exert sufficient pressure to slightly groove the skin. By this means a definite and fixed support is given. Fourteen-karat gold is to be preferred, and stout steel should be the second preference. Although silver does not rust, it cannot be made of sufficient rigidity. Delicate wires, either of gold or steel, should not be accepted, as they can only maintain their position by uncomfortable pressure behind the ears and on the nose.

Spectacles are preferable to eye-glasses whenever there is astigmatism, or when the nose is not properly shaped for the ready adjustment of eye-glasses. Hooks are to be preferred to straight temple-pieces when the glasses are to be worn constantly. Reading-glasses are sometimes more convenient with straight side-pieces, particularly in women, on account of the abundance of hair about the temples. For constant use, lenses should be slightly inclined at a compromise angle between the straight position and the inclination preferred for a reading-glass. Of course, the occupation of the patient must be taken into consideration in adjusting the glass. In high defects the glasses should be fitted closely to the eyes, and, if necessary, the lashes should be trimmed from time to time. Glasses should be worn constantly in high defects, in astigmatism, and in all cases in which there are asthenopic or reflex symptoms.

Bifocal glasses are particularly valuable for a presbyope or for a myope of high degree who is compelled to use different glasses for reading and for distance. The improved form, with a reduced

curved segment cemented on the distance glass, is far more satisfactory than the old straight Franklin bifocals. The lower segment should be about 2 cm. wide, and the upper edge should be more curved than the lower. If the occupation of the patient subjects him to high degrees of heat or steam, the lower segment should be inserted into a groove in the bottom of the distance glass instead of being cemented on. Although it takes the patients some little time to become accustomed to bifocal glasses, they ultimately give far greater satisfaction, and are more convenient than two different pairs of glasses.



Bifocal Lens.
B. Distance lens. *A*. Reading lens, cemented to the Distance lens.

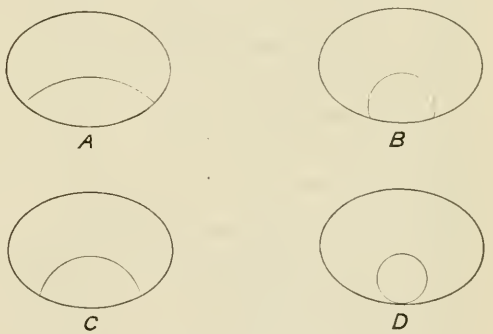
"In another form of bifocal glass the small supplemental lens is *countersunk*, that is to say, is cemented into a corresponding concavity ground in the distance glass. Or the distance glass may be composed of two full-sized plano-convex lenses with their plane surfaces in apposition, each of these surfaces being ground out at its lower part, so as to house the small supplemental lens between them. These two forms admit of a reduction of weight and the abolition of chromatic aberration in the heavy glasses required in aphakia. To accomplish the latter purpose the distance lens is made of crown glass and the supplemental lens of flint glass. In this form they are called *achromatic bifocals*. Their advantage lies in the expense of their manufacture.

"*Fused bifocals* are a variant of the countersunk supplemental lens. In their manufacture a small lens of flint glass is let into a large lens of crown glass by countersinking. Instead of cementing the supplemental lens in position, however, the lenses are heated to the point of fusion of the glass, when its two portions unite. The surfaces of the glass are then reground. One surface of the small supplemental lens is exposed to the grinding and is reduced to the same curvature as the corresponding surface of the main lens. The necessary difference in the refraction of the upper and lower portions is dependent on the difference in index of refraction of the crown glass of which the main lens is composed and the flint glass of the supplemental lens" (Phillips).

Before discharging the patient, the adjustment of the glasses should be carefully examined and the correctness of the lenses verified by neutralization. The good effects of many a careful diagnosis of refraction are ruined by maladjusted and decentered glasses.

Tinted glasses of any kind should never be ordered for constant use, but only temporarily prescribed in inflammatory conditions, during mydriasis, for use at the seashore, etc. Once formed, the habit of wearing tinted glasses is difficult to overcome. Photophobia is usually due to uncorrected or improperly corrected ametropia. It is a well-known fact that tinted glasses are most used in countries in which the importance of eye-strain in comparatively low defects is unrecognized. During mydriasis, London smoked plano-lenses should be worn. Coquilles generally have some spheric or cylindric effect on an irregular surface. See Lenses.

The Care of Spectacles.—"Spectacle frames will last longer and perform their function better if the wearer is instructed to exercise care in handling them. In putting them on and off, the hooks should be lifted from or into their position behind the ears; both hands being used, so as to avoid straining the temples widely apart or otherwise bending them. They should be folded together as little as possible, and when not in use should be laid in a safe place, open, and resting on the edge of the lenses, to avoid scratching the surfaces of the latter. For cleansing them nothing is better than a piece of clean old linen, or, if very much soiled, a little ammonia and water may be used, except on cemented bifocal glasses. While cleansing, the frame should be grasped by the end piece and not by the bridge, and in replacing the glasses on the eyes care should be taken not to crush them against the lashes and thus soil the refracting surfaces at once. When cylindrical or prismatic glasses are worn, patients may return after a time with the statement that the spectacles are unsatisfactory, when the trouble will frequently be found to be due to bending of the frame; or a lens may have fallen out and been replaced upside down, or with the wrong edge inward. It is well to have such persons report periodically to have their glasses readjusted" (Phillips).



Forms of Bifocal Lenses.—(*Phillips.*)

SPEECH-DEFECTS.—The importance of speech as a factor in the mental and physical growth of our race is not generally appreciated. Speech has been defined as "a system of articulate words adopted by convention to represent outwardly the internal process of thinking;" but not only does it represent the process of thinking, but it is

so closely interwoven with it as to be essential to its highest development. Speech is also one of the essentials to the highest physical development, for its use tends to expand the chest and aerate the blood. The faculty of speech is presided over by delicate and complicated cerebral areas inciting to action and working in harmony with peripheral organs having other important bodily functions in addition to those of voice and speech production. Defective speech, therefore, having its origin in a defective action of some of these important central areas and peripheral organs, is a serious malady, and deserves most careful consideration.

For convenience of study, these defects may be divided into two classes: in the first class are all those cases in which the defect is the chief cause for complaint; and in the second, those in which it is merely a symptom of some more alarming condition: as, for example, cerebral abscess or intracranial pressure, from whatever source.

It is convenient, also, to make two divisions of this class; and of the terms that have been used to designate them, the best are **dyslalia** and **pseudolalia.** Under dyslalia come those forms of defective speech in which there is difficulty of utterance: as, for example, stammering, or stuttering; and under pseudolalia come all those defects that may be characterized as slight deviations from the normal speech, as the slurring or omitting of certain elements and the substitution of one element for another.

Stammering (Dyslalia)

Stammering may be defined as interrupted speech characterized by a spasm of certain opposing muscles more or less closely related to the vocal or oral articulating mechanism. This spasm is not always confined to the muscles directly concerned with speech, but may extend to any part of the body, especially when great effort is made to overcome the interruption. It is never exactly the same in any two cases, nor does it always remain constant either in degree or location, but it changes with the temperament of the individual. The phlegmatic person will sometimes stand and only stare, and use no apparent muscular effort at all until such time as he thinks he may be able to proceed. This has been called the silent form of stammering, and in it there is but little noticeable spasm. In the majority of cases, however, the tendency is at least to try to speak, and the degree and extent of spastic muscular contraction will be proportionate to the strength of the effort put forth.

A muscular spasm, therefore, of greater or less intensity is the one condition that is characteristic of all forms of stammering. The cause of this spasm is manifestly a result of misapplied energy in the effort to speak, and it has its counterpart in the grimaces of the letter-writer unaccustomed to the occupation, and in the muscular contortions of the beginner on a bicycle. To the expert, the control of a pen or a bicycle becomes automatic, and the nervous energy expended is almost *nil;* but to the beginner, the control must be voluntary, and the amount of nervous energy expended is immense and is out of all proportion to that which is required. So in the normal person speech tends to become automatic and to require the least possible amount of nervous energy; but when something happens to interfere with the development of this automatic action of the organs of speech, and voluntary action attempts to come to the rescue, the result is always more or less of a failure. There is a surplus of nervous energy expended, and this surplus overflows, so to speak, into muscles that may have but little to do with the process of speech production—and the result is a spastic contraction, or a spasm of these muscles.

The overflow takes place along the channels of least resistance, which channels vary in different individuals; and, therefore, the spasm does not occur in the same muscles in all cases, nor, indeed, in any two cases. It may occur in almost any part of the muscular system, and its manifestation is often grotesque in the extreme.

Etiology.—The cause of stammering has given rise to much conjecture, and many superficial observers have supposed that they had discovered it, only to be disappointed upon further investigation. The mistake has been made of supposing that there is but one cause for stammering, and that this cause operates alike in all cases. The fact is, there are many causes, as there are many causes for dyspepsia or any other functional disturbance; and the precise cause in any individual can only be determined after a careful and oftentimes prolonged study of the case.

Among the predisposing causes heredity must be placed first. About 35 percent of the reported cases had relatives who stammered. It is an affliction that belongs to youth, and it begins at, or soon after, the time the child begins to talk. It may continue to old age; but stammerers, as a rule, are not long lived. Statistics show that about 84 percent of all cases seeking relief are males, and this would seem to indicate that sex must be regarded as a factor in the cause of the affection.

A nervous temperament, either inherited or acquired, is a condition common to most children who stammer. This condition may follow one of the infectious fevers or other diseases of childhood, or it may be the result of eye-strain, hypertrophied tonsils, adenoid vegetations, or intranasal pressure from whatever source. About 15 percent date the origin of their trouble to a severe nervous shock caused by fright or injury. One child had his head ducked in a tub of cold water and has stammered ever since. Another was threatened with arrest by a policeman for playing "pussy" on the street. He was thrown into a convulsion, and has stammered from that time. A child fell downstairs and received a slight injury, attended by a great nervous shock, and stammering immediately followed.

The various neuroses are more or less prevalent in stammerers and in their ancestors, and therefore they must be regarded as probable predisposing causes. Not only do glandular enlargements in the pharynx and intranasal hypertrophies and spurs act as causal factors in this affection, indirectly and in a reflex manner through the nervous system, but in so far as they interfere directly with

the free automatic action of the muscles of vocalization and articulation must they be considered as direct causes. Moreover, we find decided evidences of arrested or imperfect development in the articulating organs of a large percentage of these cases. High and irregular palatal arches are more common than in persons having normal speech; bifid uvula is of frequent occurrence, and we often find abnormalities in the various muscles of the tongue. A very large and imperfectly shaped epiglottis may prove to be the cause in some cases. Anything that interferes with the uniform development and harmonious action of the various mechanisms of speech must be placed among the causal factors of this affection.

Treatment.—Few children would be confirmed stammerers if they could have the proper treatment at the very inception of the trouble. Whatever may be the direct or exciting cause in any particular case, the child begins to hesitate in speech during a period of mental excitement. There is a confusion of ideas that leads naturally to a confusion of words and of the elements of which words are composed. It is here that the turning-point is made. Usually, the child is scolded or ridiculed, either of which procedures tends to add to the confusion and to make future attempts at oral expression still more difficult.

If the little patient can be tided over this period of nervous excitement, in most cases the development of the affection is prevented. Most careful and gentle treatment should be employed. Any attempt at speech should be interdicted until mental quietude is fully established. A careful examination should now be made, with a view to discovering the cause of the trouble, bearing in mind that any condition that may add to the nervous excitability of the patient becomes a contributory cause. Especially must the nose, the nasopharynx, and the throat be examined for obstructions. Careful examination of the mouth should also be made, and so far as possible any irregularities of structure should be corrected and glandular enlargements reduced; the general health of the patient should be put in the best possible condition.

During all this time the child should be encouraged to talk but little, and to think of only one thing at a time, and to express his thoughts with the greatest deliberation. The word "stammering" should never be used in his hearing, nor should his attention be directed in the slightest possible degree toward his speech; for the fear of future trouble in speech is easily aroused, and it is one of the greatest obstacles in all cases to the accomplishment of a cure.

The automatic action of the various mechanisms of speech is no longer possible and the patient is equally incapable of voluntary control of these mechanisms. Manifestly, the object to be attained is the reestablishment of the normal automatic processes of speech, and this can only be done, in a great majority of cases, by making use of voluntary control of the vocalizing and articulating muscles, and thus gradually, the unconsciously, leading the patient back to the normal processes of speech. The first step should be to try to discover the cause, and to remove it if possible. It is well to remember, however, that the original cause may have long since ceased to exist, and that only the results may remain. The stammering, for instance, may be the result of a nervous shock received years ago, or of an adenoid growth long since removed; so that the exciting cause of the trouble may not be apparent at the time of the examination. If, however, we can find any condition that may impair the harmonious action of the nervous system, our attention should be directed toward its improvement.

The general health of the patient, his diet and methods of life, should be carefully investigated and regulated in the minutest detail. The organs of articulation and vocalization should be carefully examined, and an attempt made to correct any abnormality, however slight it may be. A short lingual frenum interfering with the normal action of the tongue is often a great hindrance to freedom of speech, and we frequently find an abnormal development in the various muscles of the tongue; and whether it is the cause or the result of stammering, a slight surgical operation, followed by carefully chosen exercises, will assist very materially toward accomplishing the desired result. Irregularities in the structure of the palate are common in these cases. There is great lack of uniformity in the size and shape of the palatal half-arches. This is probably due in a great measure to adhesions that form between the folds of the palate and the tonsil, thus causing these folds to be irregularly bound down to the tonsil and interfering with their normal action in speech. The condition is easily corrected by the separation of the adhesions and a slight cauterization of the cut surfaces of the tonsil, to prevent the formation of new adhesions. The vault of the pharynx must be examined, and catarrhal conditions treated on general surgical and therapeutic principles. Nasal stenosis, while it may not be a common cause for stammering, undoubtedly serves as an obstruction to its cure, both by its interference with normal respiration and its reflex influence on the nervous system. Intranasal pressure, therefore, should be removed by surgical procedures, if necessary.

Having corrected the patient's habits of life, both dietary and moral, and having removed, so far as possible, all other sources of nervous excitability and physical and mental depression; and having put the peripheral organs of speech in the most favorable condition for normal action, the after-treatment should consist in the development of a perfect voluntary control of certain important muscles employed in respiration, vocalization, and articulation; and this, as has been suggested, should be used as a means—and in the majority of cases it is the only means—for the reestablishment of the normal automatic muscular action.

Unfortunately, many stammerers are deficient in will power, and in these cases a voluntary control is difficult to acquire. They not only do not control their speech, but, to use an expression that is common among them, they "stammer in other things" as well. They do not think connectedly nor do

they pursue any line of action to its logical conclusion. These are the cases that are difficult to cure, although they are by no means hopeless. The faculty of the will may be developed by training, just as any other faculty of the mind may be developed; and there are no exercises so efficient for this purpose as those required for the improvement and development of speech.

To gain voluntary control over the organs of speech, certain important muscles that have been considered hitherto as involuntary must be brought under the domination of the will. These muscles belong for the most part to the vocal and respiratory mechanisms. The management of the breath, which is the motor power of the vocal mechanism, is deficient in all cases of stammering, and it is to this point that attention should first be directed.

There is a certain definite and precise action of the great muscles about the lower thoracic and abdominal regions that is necessary to the production and control of voice, and that must be acquired by the patient before any real progress can be made or permanent improvement can take place. Just what the precise action of each one of these muscles is has been the subject of much discussion, and its importance in connection with this work cannot be overestimated. This action is exceedingly complicated, and cannot well be explained within the limits of this article and without a subject for demonstration.

The respiratory muscles must be so used as to bring just sufficient breath upon the vocal cords, and no more than is sufficient, to produce the syllable or word that is required. Not only so, but this little blast of breath must come at exactly the proper instant for the production of the sound. A lack of promptitude at this point is observed in many cases. The voice, of which speech is made, is not present or forthcoming at the instant that the oral mechanism requires it for articulation. The articulating organs try to perform their function, but there is no voice present to be articulated, and the result is a more or less spasmodic hesitancy. The patient dwells upon the initial consonant or repeats it until such time as the vocal mechanism may come to the rescue with the vocal element that is necessary for the completion of the syllable or word.

In other cases it is the oral mechanism that is at fault, and the patient dwells upon the vocal element or repeats it until such time as the articulating organs may be brought into action for the formation of the syllable or word. Suitable exercises must be given to make the action of these two mechanisms entirely harmonious, and this can be done by teaching the voluntary control of the various muscles of that mechanism in which the action is delayed, and then practising this voluntary control daily until the necessary promptitude of action is acquired.

In most cases it is necessary, for the exercise of this voluntary control, to have the patient speak in syllables. Alexander Graham Bell has said that syllabification is the cure for all vocal and oratoric defects. Of course, this is claiming too much for the exercise, but it certainly should have a prominent place in the treatment of stammering. In many cases it is necessary even to divide the syllables into their component parts and to drill the patient on these individual elements. Then, after a certain time, the elements that unite to form each syllable should be practised together and syllabic conversational exercises given, with careful attention to voluntary control over the important respiratory and vocalizing muscles.

In all these exercises there should be an attempt to harmonize the various faculties of the mind, not only with one another but with the exercises themselves. The patient should be induced to think introspectively and to study the impressions that the proper muscular action in the production of each syllable makes upon the mental and physical organisms. Not only should he be conscious through his sense of hearing that the syllable is accurately given, but he should be taught to recognize, by means of the sense of feeling, the physical impressions made by the normal action of the muscles and the resultant vocalization.

The stammerer generally knows how the syllable would sound if properly given, but he has no definite knowledge of how it would feel to give it or what would be the physical and mental impressions. In other words, the mental and physical sensations of speech should be studied and developed in what has been called the kinesthetic center of the brain; and after these sensations are recognized and felt, the patient should be taught to reproduce them.

Pseudolalia

In this division may be conveniently placed all those defects of speech in which there is no spasmodic hesitation. The chief characteristic of this form would be a defective or false utterance of certain syllables or words. In some cases there is a substitution of one element for another. In others there may be an entire omission of the element. In one case that has been reported there was a complete substitution of a language entirely unknown for that which the patient attempted to use; and not a single element of this false language had any resemblance to the element for which it was substituted.

This, however, is unusual, and the majority of these cases give proper utterance to at least one of the elements and thus suggest the syllable or word intended to be spoken. The first element in a word is sometimes omitted, and, as some one has said, the word becomes "decapitated." More often, however, the final consonant is not given, and the word becomes "decaudated;" and when all the elements are mispronounced, the word may be said to be "mutilated." This mutilated speech is characteristic of imbeciles and idiots and all those having a cerebral lesion. That there is some defective cerebration in all these cases must be admitted.

Nice distinctions are not made in the utterance of the various elements of which words are composed. The auditory word center in the brain fails to recognize or to register accurately the exact sound produced by the peripheral organs of speech.

No distinction may be made, for instance, in the physiologic sounds of the consonants *D* and *G* or *T* and *K;* the one being substituted for the other without any conscious recognition of the substitution, or one of these consonants may be omitted entirely and the ear fails to recognize the omission.

Other cerebral areas may be similarly deficient in the performance of their natural functions, or, as is often the case, this auditory center is the only one affected. It must be remembered also that normal cerebral development depends very largely upon the use of the faculty of speech, and therefore that defective mentality which at first glance may seem to be the cause, may in reality be the result, of defective speech.

Pseudolalia, like dyslalia, often has its origin in abnormalities in the structure of the peripheral organs of speech. The slightest irregularity in the organs of articulation may be responsible for the development of mutilted speech in children. It may be said that anything that interferes with the normal action of the articulating organs may result in serious defects of speech. The shape of the hard palate, the dental arch, and the condition of the teeth all affect the character of the speech. A short lingual frenum or any deformity of the lingual muscles not only causes defective speech, but may make speech so disagreeable as to greatly delay its development and thus interfere with the child's mentality. Enlarged faucial tonsils and adenoid vegetations in the vault of the pharynx have long been supposed to interfere in some mysterious way with the mental development of children; but they probably interfere with mental development only so far as they impair the patient's physical condition and obstruct the development of normal speech.

Another common cause of these defects of speech is the paralysis that often follows diphtheria and the various infectious fevers prevalent in children. This paralysis may be of only short duration, and yet if it come during the formative speech period, it is sure to leave its deleterious influence. It is during the earlier years of adolescence that these irregularities in the peripheral organs of speech do harm; and although they may disappear altogether after a few years, as is sometimes the case with hypertrophied tonsils, or they may be removed by surgical interference later in life, yet the defects of speech of which they were the direct cause remain as fixed physical habits until they are corrected by suitable training.

This is well illustrated by those cases having cleft palate. If the operation for the closure of the cleft is delayed until after the formative speech period and until that peculiar speech characteristic of cleft palate is fully established, it will have little or no effect upon the speech, however well the deformity may be corrected. This fact would seem to indicate that it is not so much the cleft palate that causes the defective speech, as the abnormal muscular action that is the direct result of the cleft palate. However that may be, this abnormal muscular action must be corrected after the two halves of the palate are put in apposition if improvement in speech is to be effected.

Treatment.—In discussing the treatment of stammering it was found that the object to be attained was the correction of a faulty coordination between the vocal and the oral articulating mechanisms, and indirectly, perhaps, between the muscles within one or the other of these two mechanisms. In pseudolalia the lack of coordination is entirely within the oral articulating mechanism. There is a faulty action in some of the muscles of the lips, the tongue, or the palate; and whatever may be the cause of this faulty muscular coordination, there is always a corresponding defective action in the nerve centers that preside over these mechanisms.

A careful physical examination of the patient must first be made, with a view to determining the cause of the defect, always keeping in mind that this cause may have existed only in the past and during the formative speech period. All structural peculiarities of the articulating organs should be carefully noted, and any obstructive irregularities corrected or removed. When this is accomplished, muscle training should be given, with a view to correcting the faulty action and establishing correct coordination. A lack of uniformity is often found in the development of these muscles, and this condition may be corrected by suitable voluntary exercises entirely independent of speech. For instance, muscles of the lips or of the tongue that have been entirely involuntary may be brought under control of the will and made to act independently of others, and thus be trained to perform their natural functions. This muscle training is an important factor in all speech defects, not only on account of its value in harmonizing the action of the muscles themselves, but also on account of the fact that it serves as a direct stimulus to the development of the cerebral areas that preside over the muscles, and the general mental development resulting from these exercises is sometimes very marked.

Exercises for the correction of the special defects that may exist in each individual case should follow this muscle training. Speech is voice articulated or molded into certain definite shapes or forms. The vocal mechanism furnishes the voice, and the oral articulating mechanism the molds into which the voice may be regarded as being poured. Each syllable of speech requires a separate and distinct adjustment of the articulating organs, and those syllables that are composed of two or more primary elements require for and during their utterance certain variations in the molds. For instance, the syllable "*m-a-t*" has in it three primary elements, for each of which a separate mold is required; but in the utterance of this syllable these elements follow one another in quick succession and close sequence, and therefore these primary elements must be made to follow one another so closely as to form what is practically one variable mold, upon the structure and formation of which depends the character of the resultant speech.

If any part of this mold is imperfect in its formation, there will be corresponding defect in the articulation of the syllable. For instance, if the first

primary mold required for the physiologic sound represented by "*m*" is omitted, the syllable will be "decapitated;" and if the last sound represented by the letter "*t*" is omitted, it will be "decaudated," and if the three primary molds are improperly formed and coordinated, the syllable will be "mutilated."

The decapitation, decaudation, and mutilation of syllables are phenomena designated pseudolalia, and in the treatment of this affection the proper formation and coordination of the primary molds of speech and their coordination into what have been called the variable molds required for the utterance of syllables and words must be taught. To do this one must have an accurate knowledge of the anatomy and physiology of the organs of speech, and the location of each muscle; and he must be able to form a clear mental picture of the exact position of the organs of articulation required for the formation of the primary molds for the elements of speech and their coordination into the variable molds for the syllables and words.

The patient must be taught the precise voluntary muscular action required for the formation of these molds. He must be shown, for instance, how to shape the lips and where to place the tongue for each element of speech in which he may be found deficient; and thus, by frequent repetition of this voluntary control of the organs of speech, he may be trained to speak automatically with great accuracy.

It will be observed, therefore, that the principle underlying the treatment of all defects of speech consists in the establishment of an accurate voluntary muscular control of the organs, this control to be continued until the faulty processes or habits of speech have been entirely eradicated, and the new and improved methods become habitual and automatic. See APHASIA.

SPERMATIC CORD, DISEASES.—Torsion of the spermatic cord—*i. e.*, a twisting of the cord so that the epididymis is felt in front instead of behind the body of the testis—is occasionally met either in a testis to all external appearance previously normal, or in a testis retained in the inguinal canal. The twisting has been attributed to spasm of the cremaster. If unrelieved, the testicle will atrophy or necrose.

Symptoms.—The torsion is attended by a tender and painful swelling in the groin or scrotum, dull on percussion, irreducible, and without impulse on cough, the symptoms generally coming on suddenly after great strain or exertion. Vomiting is nearly always present, and there may be constipation. Thus, when the testis is retained, a strangulated hernia is very closely simulated.

Treatment.—When seen early, the cord may be readily untwisted if the testis is in the scrotum, the symptoms at once disappearing. If the testis is in the groin or inguinal canal, it should be removed and the canal and ring closed by sutures.

See also HEMATOCELE, HYDROCELE, TESTICLE, VARICOCELE.

SPERMATOCELE.—See HYDROCELE.

SPERMATORRHEA.—See NOCTURNAL EMISSIONS.

SPERMATOZOA.—See SEMINAL STAINS.

SPERMIN.—Spermin has been found in the form of a phosphate in the thyroid and thymus glands, the spleen, the ovaries and the blood, as well as in the testes. Poehl believes it to be an alkaloidal product of the retrogressive metamorphosis of albumins (a leukomaïn), and a most powerful intraorganic restorative of the oxidizing properties of the blood. He states that it should not be regarded as a specific for any particular malady, but should be used as a means of promoting oxidation in the body. It has been employed with decided benefit in ataxia and delirious epilepsy, as a tonic in tuberculosis also in senile marasmus and the nervous affections of the aged. The hydrochlorate is used hypodermically, in doses of 1/8 grain twice daily, in the morning and at noon, avoiding evening administration, as it may cause insomnia. No reaction follows its injection.

SPHACELODERMA (Dermatitis Gangrenosa, Spontaneous Gangrene of the Skin).—See DERMATITIS GANGRENOSA INFANTUM, RAYNAUD'S Disease.

SPHENOIDAL SINUSES, DISEASES.—See NOSE (Accessory Sinuses).

SPHYGMOGRAPH.—See PULSE.

SPIDER-BITE.—See BITES AND STINGS.

SPIGELIA (Pinkroot).—The dried rhizome and roots of *S. marilandica*. A popular vermifuge, generally administered with senna. Should be employed with the usual precautions as to feedings, and a purge should be administered while the worm is narcotized, to carry it out of the bowel. In large doses it is an uncertain cathartic. Poisoning is manifested by palsy of spinal origin, the respiration becoming slow as death approaches, and finally ceasing simultaneously with the action of the heart. Vertigo, dimness of vision, dilated pupils, dyspnea, convulsions, and spasms are lesser phenomena. Dose, 30 grains to 2 drams. **S., Flext.** Dose, for a child, 10 to 20 minims; for an adult, 1/2 to 2 drams. **S., Infus., Comp.,** "worm tea," "pink and senna," unof.; spigelia 15, senna, fennel, each 10, manna 30, water 500. Dose, 1 1/2 to 5 ounces.

SPINA BIFIDA. (Hydrorrhachis).—A congenital deficiency in the bony covering of the spinal cord, or failure of the spinal laminæ to unite, present in about one in every 1000 births. Sometimes there is a small congenital gap in the spine, the cord and membranes remaining in the canal (*spina bifida occulta*); the skin is frequently indented over this defect and the dimple filled with hair. These cases need no treatment unless there are symptoms of pressure on the cord, when the removal of such compression, which may be due to hypertrophy of the skin and subjacent soft parts, would be indicated. In 2 percent of the cases the cleft is wide, the skin is absent, and the cord protrudes through the opening, its central canal communicating with the surface of the body (*myelocele*). This condition is not compatible with existence. In 10 percent the membranes alone escape through the opening (*meningocele*), but in the vast majority (about 75 percent) there is also a portion of the cord in the protuberance (*meningomyelocele*), and very rarely the tumor is the result of a dilata-

tion of the central canal of the cord (*syringomyelocele*). The last variety is often situated laterally. More than one vertebra is usually fissured, and cases have been reported in which all the vertebræ were involved. Rarely the body of the vertebra is implicated (*anterior spina bifida*). One-half of all cases occur in the lumbar region and more than one-third in the lumbosacral or sacral portion of the spine. (Stewart).

The coverings of the sac may be healthy skin, but more commonly normal skin is only found at the sides, the central portion consisting of a thin bluish membrane. Sometimes a slight depression is seen on the lower part of the sac at the spot where the cord terminates in the wall. This is called the umbilicus, and at its bottom the central canal of the cord has at times been seen to open. In some instances there is no protrusion, but rather a depression in the situation of the cleft between the vertebræ (*spina bifida occulta*) the cleft being occupied by the blended membranes, cord, and skin, and the spot covered with a tuft of hair. In obscure paraplegias, contractures, and deformities of the feet the back should be examined, since this condition may be present but has been overlooked by the mother.

Symptoms.—The swelling is usually of a globular or oval shape, translucent, sessile or slightly pedunculated, and flaccid, but becomes tense and distended on coughing or crying. Pressing upon it sometimes causes the fontanels to swell up, and may produce convulsions. When the spinal cord and large nerves are involved, there may be paralysis of the extremities or of the bladder or rectum. The gap between the laminæ of the vertebræ may at times be felt on pressing on the sac. As a rule, these tumors show a great tendency to enlarge, and rupture spontaneously, in which case death usually follows from the draining away of the cerebrospinal fluid and septic meningitis. Death, however, is sometimes due to marasmus and defective nutrition. When a spontaneous cure takes place, it is usually due to the gradual shrinking of the sac.

Diagnosis.—Its congenital origin will at once distinguish a spina bifida from a new growth developed subsequently to birth; and its situation in the middle line, translucency, increase of tension on straining, and the gap between the laminæ, when this can be felt, will usually serve to diagnose it from other congenital tumors.

Treatment.—As there are no means of accurately determining that the spinal cord is not in the sac, it has hitherto not been considered safe to attempt excision or ligation, although these operations have at times been attended with success. Repeated tappings are very fatal. The treatment usually employed, except when the spina bifida is very small or is apparently undergoing a spontaneous cure, when it should be left alone, is to inject the sac with Morton's iodoglycerin fluid. This method when successful causes the tumor to shrink, and most closely follows the process of nature when a spontaneous cure occurs. The injection is best performed when the child is two months old; but it may be done earlier if the sac threatens to burst. The best results may be expected when there is no hydrocephalus or paralysis, and the sac is covered by healthy skin. It is contraindicated when there is advanced marasmus, great and increasing hydrocephalus, and intercurrent disease. The child should be placed on its side, and the puncture made obliquely through healthy skin on one side, and the base of the tumor, and not through the thin and imperfectly formed skin, which nearly always covers the sac in the middle line, the object being to avoid wounding the expanded spinal cord, and the subsequent leakage of the cerebrospinal fluid. About a dram of the iodoglycerin fluid (iodin (10 grains), iodid of potassium (30 grains), glycerin (1 ounce)) should be injected, and the injection repeated in a fortnight if the first trial is not successful. The fluid contained in the sac should not be drawn off before the injection. The advantage of Morton's fluid over tincture of iodin alone is that, owing to the glycerin it contains, it becomes uniformly diffused over the sac-walls. The injection of iodoglycerin is not unattended with danger; therefore, when the sac is small and its walls are thick and it is not increasing in size, beyond protecting it with a metal or leather shield, no further treatment should be attempted. Mayo Robson advocates excision in all cases except when there is well-marked paraplegia, hydrocephalus, or marasmus, or when the tumor is small and well covered by a firm pad of integument. In spinal meningocele he makes skin flaps, removes the sac, ligates or sutures the base, and brings the flaps together by suture. In meningomyelocele he separates the skin from the sac, opens and dissects out the sac, taking care that the lines of suture in the meninges and skin are not opposite.

SPINAL CORD, ANESTHESIA.—See Intraspinal Anesthesia.

SPINAL CORD, DISEASES.—These are considered under their special headings. See Amyotrophic Lateral Sclerosis, Caisson Disease, Friedreich's Ataxia, Locomotor Ataxia, Muscles (Progressive Atrophy, Progressive Dystrophy), Myelitis, Paralysis (Acute Ascending, Bulbar, Infantile), Paraplegia, Lateral Sclerosis, Syringomyelia, etc.

SPINAL CORD, INFLAMMATION.—See Myelitis.

SPINAL CORD, INJURIES. Contusion of the Spinal Cord (Hematomyelia).—Hemorrhage into the substance of the cord is nearly always the result of forced flexion, and occurs naturally in the region in which fracture by indirect violence is most common. Sometimes the similarity of origin is shown by their occurrence together, but independently of each other. It is possible, however, that it may be caused by direct violence. The hemorrhage nearly always lies in the gray substance of the cord, because this is the softest and the most vascular part, and it may occupy an indefinite length. The effect is immediate, becoming intensified later, as the hemorrhage extends. Motion and sensation are lost over a corresponding area; reflex action is suspended for a time, but rarely as completely as when the cord is

crushed; and then later, as the circulation around the injured area becomes more active, hyperesthesia sets in; motor disturbances are rare. The subsequent course depends chiefly upon the degree of the primary injury. The extravasated blood may be in great measure absorbed, leaving a certain degree of anesthesia, with paralysis or spastic rigidity of the muscles corresponding to the part of the cord that has been destroyed; or, on the other hand, red softening and ascending myelitis may follow, the paralysis extend higher, bed-sores and cystitis set in, and, if the injury is in the cervical region, phenomenal temperatures, just as when there is a fracture.

Wounds of the spinal cord are rare in civil practice, but they may be produced by stabs, the weapon passing between the arches of the vertebræ, possibly notching or incising them as it does so; or by gunshot injuries. The symptoms in either case depend upon the seat and the extent of the injury, and only differ from those of crushing of the spinal cord in fractures by their proneness to inflammation and suppuration.

Compression.—This is much more rare; it may be caused by a lamina driven in, though when this occurs the delicate nervous tissue is almost sure to be utterly crushed; or by hemorrhage, either inside the theca or between it and the bones (it is impossible to distinguish one from the other); or later it may result from inflammation, as in Pott's disease. If due to bone, the symptoms are immediate; if to hemorrhage, there is a distinct interval before they commence, and they progress from below upward, affecting the leg first, and then the trunk, until the respiratory muscles are involved. The loss of motion is more marked than that of sensation, but it is rarely so definite as in contusion; pain along the course of the nerves, hyperesthesia extending around the trunk, and muscular tremors are more frequent. In many instances the blood is absorbed again and the symptoms subside; occasionally it accumulates to such an extent as to prove fatal, either from its pressure or from secondary softening and degeneration. See SPINE (Diseases, Injuries).

Concussion.—This injury occurs practically under the same conditions as contusion, and can only be distinguished from it by the symptoms being general, not confined to any one portion of the spinal cord, and by their passing off within a few hours. Afterward, when the immediate symptoms have disappeared, hyperemia may set in, as in concussion of the brain. If there is no contusion, as very rarely happens, this may be merely transient, and under proper treatment subside without leaving behind any serious result; but if the part is not kept at rest, or if there is severe contusion, it may increase, and either run to inflammation or lead to softening and degeneration.

Railway Spine.—Railway accidents are not infrequently followed by a peculiar train of symptoms, which have been grouped together under the name "railway spine," justly stigmatized by Page as absurd. The symptoms do not set in immediately and are not those of any gross lesion of the cord, such as contusion or inflammation. As a rule, they do not appear for 3 or 4 days; then, after lasting some time, they either begin to subside or steadily grow worse. The chief difficulty is to distinguish them from locomotor ataxia and chronic meningomyelitis, both of which may undoubtedly follow injuries to the back. If, however, sufficient attention is paid to objective symptoms, to the distribution of areas of anesthesia, for example, and the electric reactions of muscles, it can usually be surmounted. Railway accidents are always accompanied by an extreme degree of shock that occasionally, but fortunately not very often, grows worse and worse; the patient becomes more feeble, and without being able to assign any definite reason for it, or find any gross lesion, death ensues after a few weeks or months, just as sometimes happens after a severe mental shock. More frequently there is a certain amount of improvement for a time, but not perfect recovery. The extreme depression passes off, but the patient remains weak and feeble, unable to control himself or to exercise deliberate judgment, with mental capacity and bodily vigor alike impaired. The symptoms are of the most varied character. Some, such as palpitation, flushing, alternate sensation of heat and cold, and menorrhagia, may be accounted for by the disordered working of the vasomotor system; others, like sleeplessness, dreaming, headache (often posterior), irritability of temper, emotional display, noises in the ears, and failure of sight, are due to interference with the blood supply of the brain and the organs of special sense. The bodily strength fails; gastrointestinal disturbances are present; the patient becomes worn and emaciated; the cerebral symptoms grow more pronounced, and at last he becomes utterly broken down in health, feeble in mind as well as body, and aged before his time. This history is not in any way peculiar to railway accidents. It may be induced by injuries of all kinds, especially in those who from heredity or for other reasons are in any way predisposed to the occurrence of nervous disorders. It is not uncommon, for example, after severe and prolonged mental worry; it may even follow a single shock, as noted by Moullin.

In another class the symptoms resemble those ordinarily grouped together as hysteric. There may be epileptiform attacks from time to time, with insanity, melancholia, or suicidal impulse. Anesthesia and hyperesthesia may occur, affecting the special nerves as well as those of ordinary sensation. In other instances muscular paralysis, affecting physiologic groups rather than anatomic ones, or spasmodic contraction is present, the electric reaction remaining unaltered. Retention of urine and aphonia are very common; and numerous other symptoms are met from time to time—pains in the joints, for example, of the most excruciating character, without any objective sign, dysphagia, torticollis, closure of the jaws, etc.

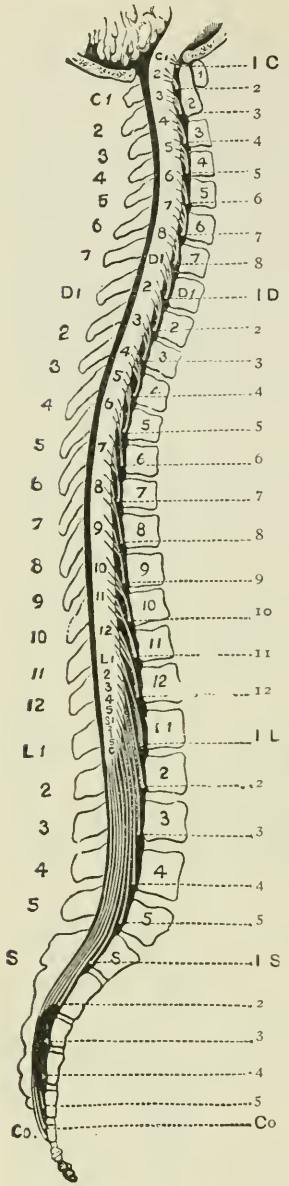
If in any of these groups of cases there is, in addition, a severe sprain of the muscles or ligaments of the neck and back, so that every movement is attended with pain, the difficulty of proving that the injury is limited to external structures, and

that the spinal cord is not involved as well, may be imagined. The local symptoms, the stiffness, rigidity, and pain, grow worse and worse as time goes on. If the hypnotic state continues, each suggests some further trouble, and it is almost impossible to distinguish between the real and the functional disorder. The desire to recover is often not genuine, even when it is present, and it is impossible to obtain any assistance from the patient. If there is even a suspicion of chronic inflammation of the spinal cord, it is a serious matter to propose active measures. Time is thus wasted, and the muscles become more rigid from disuse; the extravasated blood becomes organized; adhesions are formed in all directions; and it ends in leaving a permanently crippled condition.

The diagnosis from chronic inflammation of the spinal cord rests chiefly upon the absence of definite local signs. Stiffness and rigidity of the back are not leading characteristics of chronic meningitis. When this sets in, there are other symptoms, usually of an unmistakable character: There is pain along the course of certain nerves; or anesthesia and hyperesthesia of definite regions; special groups of muscles are wasted or paralyzed; the electric reactions are abnormal; the cutaneous reflexes are enfeebled or lost; in short, there is definite evidence of injury to nerves or centers in the cord, such as does not occur in sprains of the vertebral column alone, however severe the mental depression and bodily weakness may be (Moullin).

SPINAL CORD, LOCALIZATION.—The following table (after Starr) shows the location of function in the different segments of the spinal cord:

Segment.	Muscles.	Reflex.	Sensation.
Second and third cervical.	Sternomastoid; trapezius; scaleni and neck; diaphragm.	Hypochondrium (?). Sudden inspiration induced by sudden pressure beneath the lower border of ribs.	Back of the head to the vertex. The neck.
Fourth cervical....	Diaphragm; deltoid; biceps; coracobrachialis; supinator longus; rhomboid; supraspinatus and infraspinatus.	Pupil. Fourth to seventh cervical. Dilatation of the pupil induced by irritation of neck.	The neck, upper part of the shoulder, and outer part of the arm.
Fifth cervical.....	Deltoid; biceps; coracobrachialis; supinator longus; supinator brevis; rhomboid; teres minor; pectoralis (clavicular part); serratus magnus.	Scapular. Fifth cervical to first dorsal. Irritation of skin over the scapula induces contraction of the scapular muscles. Supinator longus. Tapping its tendon at wrist induces flexion of forearm.	Back of the shoulder and arm. Outer side of the arm and forearm, front and back.
Sixth cervical.....	Biceps; brachialis anticus; pectoralis (clavicular part); serratus magnus; triceps; extensors of wrist and fingers; pronators.	Triceps. Sixth to seventh cervical. Tapping elbow tendon induces extension of forearm. Posterior wrist. Sixth to eighth cervical. Tapping tendons causes extension of hand.	Outer side of the forearm, front and back. Outer half of the hand.
Seventh cervical...	Triceps (long head); extensors of wrist and fingers; pronators of wrist; flexors of wrist; subscapular; pectoralis (costal part); latissimus dorsi; teres major.	Anterior wrist. Tapping anterior tendons causes flexion of wrist. Palmar. Seventh cervical to first dorsal. Stroking palm causes closure of fingers.	Inner side and back of arm and forearm. Radial half of the hand.
Eighth cervical....	Flexors of wrist and fingers; intrinsic muscles of hand.	.....	Forearm and hand, inner half.
First thoracic.....	Extensors of thumb; intrinsic hand muscles; thenar and hypothenar eminences.	.....	Forearm, inner half. Ulnar distribution to the hand.
Second to twelfth thoracic.	Muscles of back and abdomen; erectores spinæ.	Epigastric. Fourth to seventh thoracic. Tickling mammary region causes retraction of the epigastrium. Abdominal. Seventh to eleventh thoracic. Stroking side of abdomen causes retraction of belly.	Skin of chest and abdomen, in bands running around and downward, corresponding to spinal nerve. Upper gluteal region.
First lumbar.....	Iliopsoas; sartorius; muscles of abdomen.	Cremasteric. First to third lumbar. Stroking inner thigh causes retraction of scrotum.	Skin over the groin and front of the scrotum.
Second lumbar....	Iliopsoas; sartorius; flexors of knee (Remak); quadriceps femoris.	Patella tendon. Striking tendon causes extension of leg.	Outer side of the thigh.
Third lumbar.....	Quadriceps femoris; inner rotators of thigh; abductors of thigh.	.....	Front and inner side of the thigh.
Fourth lumbar....	Abductors of thigh; adductors of thigh; flexors of knee (Ferrier); tibialis anticus.	Gluteal. Fourth to fifth lumbar. Stroking buttock causes dimpling in fold of buttock.	Inner side of thigh and leg, to the ankle. Inner side of the foot.
Fifth lumbar.....	Outward rotators of thigh; flexors of knee (Ferrier); flexors of ankle; extensors of toes.	.....	Back of the thigh and leg, and outer part of the foot.
First to second sacral.	Flexors of ankle; long flexors of toes; peronei; intrinsic muscles of foot; perineal muscles.	Plantar. Tickling sole of foot causes flexion of toes and retraction of leg. Foot-reflex. Achilles tendon. Overextension of foot causes rapid flexion; ankle-clonus. Bladder and rectal centers.	Back of thigh. Leg and foot, outer side. Skin over sacrum. Anus. Perineum. Genitals.



Motor.	Sensory.	Reflex.
	Neck and scalp.	
Sternomastoid.		
Trapezius.	Neck and shoulder.	
Diaphragm.		
Serratus	Shoulder.	Scapular.
Shoulder		
Arm musc.	Arm.	
Hand		
(ulnar, lowest).	Hand.	
	Front of thorax.	Epigastric.
Intercostal muscles.	Ensiform area.	
Abdominal muscles.	Abdomen. (Umbilicus, 10th).	Abdominal.
	Buttocks, upper part.	
	Groin and scrotum (front).	Cremasteric.
Flexors, hip.	Thigh — outer side.	Knee-joint.
Extensors, knee.	Thigh — front.	
Adductors. hip.	Thigh — inner side.	
Abductors	Leg, inner side.	
Extensors (?).	Buttocks, lower part.	Gluteal.
Flexors, knee (?).	Back of thigh.	Foot-clonus
Muscles of leg moving foot.	Leg and foot except inner part.	Plantar.
Perineal and anal muscles.	Perineum and anus.	
	Skin from coccyx to anus.	

Diagram and Table Showing the Approximate Relation to the Spinal Nerves of the Various Motor, Sensory, and Reflex Functions of the Spinal Cord. (*Arranged by W. R. Gowers, from anatomic and pathologic data.*)

SPINAL CORD, TUMORS.—The diagnosis of tumors of the cord and its membranes necessitates a knowledge of the symptoms of tumors involving the spinal column. It, therefore, seems appropriate to consider tumors of all these structures under the same general heading.

Tumors of the Spinal Column.—Tumors of the spine resulting from spina bifida and other congenital tumors are discussed under their various heads.

Etiology.—Tumors of the spine are exceedingly rare before the thirtieth year. They are not frequent at any time of life, but are found most commonly during the fifth decade. They occur with slightly greater frequency in the male than in the female. Injury to the spine is undoubtedly the exciting cause in some instances.

Pathologic Anatomy.—Carcinoma—either of the scirrhous or encephaloid variety—osteosarcoma, and sarcoma are the most frequent growths of the spine. Tumors of the spine may be primary or secondary. Cancerous growths of this region may be secondary, especially when the primary lesion is in the breasts, stomach, or mediastinum. According to Gowers and others, primary growths

are more likely to begin in the bodies of the vertebræ. If the bodies of the vertebræ are weakened by the neoplasm, angular curvature of the spine may take place, as in caries. The spinal nerves may suffer by compression, inflammation, or infiltration (Gowers). The spinal cord is rarely, if ever, infiltrated; but it is often compressed by the growth extending into the spinal canal. In nearly all advanced cases the cord is inflamed opposite the seat of the growth.

Symptoms.—These result from involvement of bone, the spinal nerves—which rarely ever escape—and from compression and inflammation of the cord. The latter may appear early or not until late in the course of the disease. The bone symptoms differ from those of caries in that among the former there may be a discoverable tumor, especially in the cervical region, and a greater severity of the spinal pain, well pronounced on bending the spine in different directions.

The nerve-root symptoms, especially pain, which is usually as early symptom, are often pronounced. Radiating pains and areas of hyperesthesia and anesthesia are frequently more marked than in caries or in tumors of the membranes. The cord symptoms are those of myelitis. In some instances complete paralysis takes place within a few days or a few weeks after the first cord symptoms appear.

Diagnosis.—The diseases likely to be confounded are caries and tumor, after the symptoms point unmistakably to organic disease of the spine. The presence of a tumor, when this can be felt, a primary growth in some other portion of the body, the severity of the pain, both bone and nerve-root, and in cases of cancer the rapid progress of the disease, are points in favor of a tumor.

Duration and Prognosis.—Carcinoma of the spine runs a rapid course, and results in death in a few months. . Life is rarely prolonged a year. Slowly growing tumors may run a course of one to several years. Gowers quotes a case that lasted 13 years, death finally taking place from meningeal hemorrhage. Death usually takes place from myelitis. Unless the tumor is so situated that it may be removed, which is, unfortunately, rarely the case, death invariably results.

Treatment.—In inoperable tumors of the spine the treatment resolves itself into prolonging life by giving nourishing food, and in making the patient as comfortable as possible by the judicious use of various anodynes and analgesics, of which, unfortunately, morphin is our main reliance. In cases in which the pains are not too severe, the following formula has postponed the use of morphin until late in the disease:

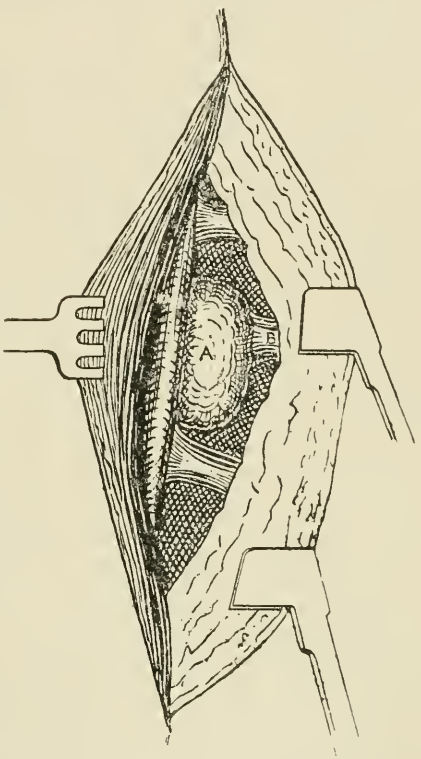
℞.	Extract of cannabis indica,	gr. 1/6
	Sulphate of codein,	gr. j
	Phenacetin or acetanilid,	gr. iij
	Citrated caffein,	gr. ij.

In capsule, and repeated only as often as it is absolutely necessary for the relief of pain.

Codein is much less objectionable than morphin in those cases in which the pain can be relieved by it.

Tumors of the Cord and of Its Membranes

The symptoms of tumors of the cord are so similar to those of the membranes that it will be more convenient to study these together; and in the section on diagnosis to endeavor to bring out the differential points between an unmistakable case of tumor of the cord and one of the membranes. In many cases, especially when the neurologist is consulted, it is only possible from the symptoms present to make a diagnosis of intraspinal tumor, irrespective of the primary seat of the lesion. In others, however, by a careful study



Showing the Relation of the Tumor to the Cord which it had Displaced to the Left.—(*Eskridge.*)

A. Tumor. *B.* Eroded end of fourth rib. The neoplasm had apparently taken its origin on the anterior surface of the body of the fourth dorsal vertebra and extended into the spinal canal, completely separating the end of the rib from the vertebra.

of the history, with especial reference to the initial symptoms and to the manner of development of additional ones, and by thorough, repeated, and systematic examinations, a fairly definite diagnosis can be made between tumor of the cord and of the membranes. Theoretically, the symptoms of tumor in the substance of the cord are such as denote destruction of tissue and abolition of function; while those that result from a growth in the membranes are such as one would expect from irritation of tissue—perversion of function. Practically, however, the early symptoms of tumor of the cord may be irritative in character and in the

advanced stages of tumor of the membranes the function of the cord may be totally abolished.

Etiology.—Intraspinal tumors may occur at any time of life. They are most frequent between the fifteenth and the forty-fifth years. In an analysis of 50 cases Mills and Lloyd found 14 percent before the twentieth year. They are slightly more frequent in the male than in the female. Syphilis and tuberculosis are diathetic conditions that may lead to the development of tumors of the cord or of the membranes. Traumatism has been credited with causing many of the intraspinal tumors. Growths here are often secondary to similar ones in other portions of the body. In the majority of cases no real cause can be found.

Pathologic Anatomy.—In the substance of the cord sarcoma and the different varieties of it, especially glioma, are the most frequent tumors met. Solitary tubercles, syphiloma, and a few other growths may take place here. In the membranes fibroma, sarcoma, fibrosarcoma, myxoma, psammoma, tubercle, syphiloma, and several other varieties occur. Neuromata are found on the spinal nerve-roots and the cauda. The dorsal region is the most common seat of tumors. Fibroma is rarely more than an inch or two in length, and its long axis corresponds with that of the spinal canal. The sarcomata and some other growths may be several inches in length, and in rare instances have extended nearly throughout the entire length of the cord or spinal canal. Tumors may arise from the fatty substance between the bone and dura—especially lipoma—from the external or internal surface of the dura, from the soft membranes, or from the substance of the cord itself. In some instances a tumor takes its origin from the soft tissues outside of the spinal canal and grows inward through the intervertebral foramina. Extradural growths have always been found to be single; the intradural ones, while often single, may be multiple. Tumors of the membranes, while usually small, may be limited in size only by the width of the spinal canal; hence tumors of the cauda often attain a larger size than those occurring higher up in the spinal canal. Tumors of the substance of the cord are usually small, and generally begin unilaterally. Growths of the membranes compress the nerve-roots, the cord, and often give rise to meningeal irritation. The growths are usually unilateral, but in some instances they involve the membranes so as completely to encircle the cord.

Symptoms.—The tissues irritated, compressed, or destroyed in intraspinal tumors may vary so much in different cases that the symptoms are rarely the same in any two. A knowledge of the numerous conditions that may exist within the spinal canal, although apparently at first confusing, will often enable one, by a careful analysis of all the symptoms in an individual case and a minute sifting of the details of the history of the disease, to make a fairly accurate diagnosis.

The early symptoms may be from unilateral irritation of the spinal nerve-roots, sensory or motor; from unilateral irritation of the membranes, or of the membranes and nerve-roots; from unilateral irritation of nerve-roots, membranes, and cord; from unilateral irritation of the cord alone; from bilateral irritation of the nerves and membranes; from bilateral irritation of the nerves, membranes, and the cord, or from bilateral irritation of the cord alone. The symptoms are more decided in character—both of irritation and destruction—in infiltrating than in noninfiltrating growths. The symptoms vary in character according to the region of the spinal canal in which the tumor is situated; they are modified by the structures in which the tumor takes its origin, especially whether the cord is primarily the seat of the growth or is affected by compression; and finally the rapidity with which the symptoms develop depends upon whether the tumor is slow or rapid in its growth.

The symptoms may be divided into nerve-root, meningeal, and cord symptoms. In tumor of the spinal cord the cord symptoms are usually the primary ones. In rare cases in which the growth is situated in the posterior portion of the cord, usually unilateral and involving the nerve-root fibers from the posterior horn, the early symptoms may be of a nerve-root character. Extramedullary tumors give rise to nerve-root and meningeal symptoms before those of the cord are manifest.

Nerve-root Symptoms.—These are usually unilateral and sensory in character early in the course of the disease. If the cauda is affected, the symptoms are bilateral and affect the legs and feet; if the tumor is in such a position as to involve some of the nerves of the lumbosacral plexus, the pain will be felt in one leg; if the brachial plexus is affected, the pain radiates in one arm; if some of the trunk nerves are the seat of the irritation, the early symptom may be pain at the distal portion of one or two nerves, without pain or tenderness in any other portion of those nerves for a while.

In some cases hyperesthesia throughout the distribution of the affected nerve or nerves is well marked; and later anesthesia replaces the hyperesthesia. In those cases in which the nerve-roots become infiltrated by the growth, wasting of the muscles supplied by the affected nerves takes place, and there may be the reactions of degeneration. These phenomena are especially pronounced in the legs in tumors of the cauda. The skin over the area of distribution of the inflamed or degenerated nerves may show changes, such as herpetic eruptions, glossiness, and thickening. Meningeal irritation is evidenced by pain in the back, tenderness on pressure, and muscular twitching. The pain and tenderness in the back are not nearly so pronounced as they are in tumor of the vertebræ, nor are movements of the spine so agonizing. The pain is entirely absent in some cases. Tenderness may not be elicited unless the pressure is firm enough to produce some flexing of the spinal column. Rigidity of the muscles of the back is rarely pronounced except in those cases in which there is considerable involvement of the spinal nerves and usually of the membranes. The nerve-root and meningeal symptoms are among the earliest in extramedullary tumors. They are at first usually unilateral and later bilateral. In those cases in which the tumor is situated in regions of

the canal that are narrow, as in the upper cervical and dorsal regions, the indirect symptoms of nerve-root origin arising from the cord being crowded against the bones of the opposite side of the canal, may be more pronounced late in the disease than those that arise from the direct irritating effects of the growth. Eskridge has seen 2 cases in which the tumor had caused displacement of the cord, and crowded the nerve-roots of the opposite side against the bones of the spinal canal; and in each the indirect symptoms were as great as, if not greater than, the direct ones.

Cord symptoms manifest themselves early in intramedullary growths, and are usually at first unilateral in character, but soon become bilateral. If the tumor begins in one of the posterior horns of the cord, nerve-root symptoms of a sensory nature are the earliest. These symptoms, however, differ from those caused by an extramedullary tumor affecting principally a posterior nerve-root, in that in the former on the opposite side of the body from the one on which the nerve-root symptoms are manifest, and beginning at a level one inch or more below the level of the nerve-root symptoms, some disturbance of sensation, either subjective or objective, will be found, if carefully searched for early in the course of the disease, and cord symptoms develop about the same time that nerve-root symptoms are first complained of. In extramedullary tumors, on the other hand, nerve-root symptoms almost always precede cord symptoms for weeks or months, except possibly in rare cases in which the tumor is small and so situated as not to impinge upon the nerves before some pressure is exerted upon the cord. In such cases the growth might be located anteriorly, posteriorly, or laterally. The tumor under such circumstances would necessarily be a slowly growing one, and the symptoms would be those of gradually increasing compression of the cord, irritative in character, and not indicating destruction of cord tissue for a prolonged period at least. In intramedullary tumors, with the exception noted, the symptoms would probably be unilateral, at first those of irritation, later leading to destruction of cord tissue and abolition of function. Such symptoms would not be preceded by those of nerve-root and meningeal irritation. If the cord symptoms begin unilaterally in intramedullary growths, they soon become bilateral. It is important to bear in mind that in intramedullary tumors beginning unilaterally, while a well-defined case of Brown-Séquard paralysis, loss of motion on the side corresponding to the seat of the lesion, and loss of sensation on the opposite side is rarely seen, yet in nearly all of these the greatest loss of motion and disturbance of the deep reflexes, with weakened muscular sense, occur on the side corresponding to that on which the neoplasm is located; impaired sensation, subjective or objective, and disturbed superficial reflexes are most marked on the opposite side below the seat of the lesion in all those cases in which the tumor is situated above the lumbar enlargement. In some cases, especially in those in which the growth begins in the central canal, the symptoms are bilateral from the beginning. Nerve-root symptoms and rigidity of the muscles of the back are slight or almost entirely absent in intramedullary tumors. Muscular wasting and the reactions of degeneration are more common in intramedullary than in extramedullary tumors, except in those cases in which the growth originates in the cauda, then the symptoms are bilateral from the beginning.

Individual Symptoms. Motor.—Paralysis of more than a few muscles of one side of the trunk or of one limb rarely occurs in extradural tumors until cord symptoms develop. The exception to this is found in tumors of the cauda, in which case the paralysis is bilateral. The paralysis is usually a later symptom than pain in extradural tumors. Motor symptoms may precede the sensory by several weeks. Paralysis of the anal and vesical sphincters may take place early in tumors of the lumbar and sacral portions of the cord and in tumors of the cauda. Retention of urine may occur comparatively early in intramedullary tumors above the lumbar region. Paralysis of the sphincters only results late in the progress of tumors, intra- or extramedullary above the lumbar enlargement, except in rare instances in which the inflammation may descend and involve the lower portion of the cord. The ataxia, sometimes observed in extra- and intramedullary tumors of the dorsal region, is attended by pain in the back and other unilateral or bilateral symptoms of focal lesion of the cord.

Reflexes.—The reflexes in extradural tumors before cord symptoms develop are abolished only in the region of distribution of the affected nerves. When cord symptoms develop either from extra- or intramedullary tumors, the reflexes are affected in the same manner that they are found to be in myelitis of the different portions of the cord. Rigidity of the back muscles is rare in intramedullary tumors, but it is common in extramedullary growths. Muscular wasting and the reactions of degeneration, except in isolated muscles, denote an intramedullary or a caudal tumor.

Sensory Disturbances.—Pain is one of the earliest and most pronounced symptoms of an extramedullary tumor. It is usually at first unilateral, and radiates along the course of one or two spinal nerves. A tender point, or rather localized pain, is usually found at the distal portion of the affected nerves. Pain in the back, often severe in character, but rarely ever as agonizing as in tumor of the vertebræ, is frequently complained of in extramedullary tumors, especially when the patient tries to bend the spine freely in different directions. It is not a pronounced symptom in intramedullary growths. Hyperesthesia at first and later anesthesia are found in the area of distribution of the affected nerves. Dissociation of the sensory phenomena is common in tumors of the cord, and may be found in extramedullary tumors after the cord has become seriously affected by compression. It is not common to have temperature sense abolished over areas in which tactile sense is preserved. Pain and temperature sensations may both be abolished, and tactile sense preserved. Dissociation of the sensory phenomena is rarely so

typical in extramedullary tumors as is the case in neoplasms of the cord.

Vasomotor and Trophic Disturbances.—Either extra- or intramedullary tumors in the cervical region may give rise to inequality of the pupils and unilateral sweating, especially of the neck and head. Dilatation of the capillaries may take place on one side of the body in the parts below the seat of an intramedullary growth. Trophic disturbances may occur in the skin over the area of distribution of the affected nerves in extramedullary tumors. These may consist of herpetic eruptions, dryness, thickening, and harshness of the skin. The most marked trophic disturbances occur in tumors of the cauda and of the lumbar region of the cord. These are pronounced muscular atrophy, with the reactions of degeneration, bed-sores, and cystitis. In intramedullary tumors of the dorsal and cervical regions the trophic changes are largely limited to the parts on a level with the lesion.

Variability of Symptoms.—These occur in both intra- and extramedullary tumors, but are most pronounced in the latter. The symptoms vary considerably in intramedullary tumors, but the changes are never so sudden or so great as those observed in the extramedullary variety. In the former the patient slowly, rapidly, and, in some instances, suddenly, gets worse, so that it becomes apparent that without a change in the course of the disease life cannot long continue. Gradually the patient begins to improve, and this goes on for several weeks. At the end of this time the patient seems to be in nearly as good condition as he was before the change for the worse. Such sudden changes and the pronounced improvement that follows them can only be explained on the theory of acute focal myelitis, which has subsided and been resolved, or of a local hemorrhage which has been absorbed.

Course and duration of intraspinal tumors vary greatly. The course is shorter, and acute myelitis of a destructive character is more likely to occur in intramedullary than in extramedullary tumors. The intramedullary tumors usually progress steadily to a fatal termination more quickly than an extramedullary one. The average duration is from a few months to 2 or 3 years. Some exceptionally rare cases last much longer than this. Most cases steadily grow worse from month to month, although the symptoms may show much variability during a period of several months.

Diagnosis.—The questions to decide are: Is the trouble organic or functional? If it is organic, its character, or, in this instance, is it tumor? What is the location of the tumor: First, with relation to the bone; second, with reference to the cord itself; third, in regard to the membranes; and, lastly, opposite what segment of the cord does it lie? The final questions to determine, if possible are: What is the nature of the growth, and is it operable?

Is the trouble organic or functional? This question in the vast majority of instances will not be difficult to answer even early in the history of the case. In the majority of instances the symptoms are numerous and pronounced. They consist of spinal pain, tenderness, and lessened freedom of movement of the spinal column, radiating pains from the same level, muscular weakness and loss of reflexes at this level, and exaggeration of the reflexes below. All these symptoms first being unilateral in character soon become bilateral. In other words, there would be positive evidences of a focal lesion affecting the spinal column, membranes, nerve-roots, or cord. These are numerous, have been described under the head of symptoms, and are familiar to those who have become expert in examining for obscure affections of the spine and cord.

Is the lesion a tumor? The diseases that should be considered and excluded before arriving at the conclusion that a tumor exists are: Hemorrhage into the cord; a transverse myelitis without compression of the cord; caries; aneurysm; cervical pachymeningitis; neuritis; traumatic injuries of the spine and cord; and, lastly, syringomyelia.

Hemorrhage into the Substance of the Cord.—Hemorrhage that comes on suddenly, and gives rise to paralysis more or less complete in a few minutes, or few hours at most, after the first onset of the symptoms, and commonly ends in death from acute myelitis, may be mistaken for tumor of the cord. Tumor of the cord substance, especially glioma or sarcoma, might be attended by hemorrhage, as is the case with reference to these tumors when situated in the brain. In such cases, however, the history would show that spinal cord symptoms had preceded the paralysis for weeks and months. The history of hemorrhage into the substance of the cord reveals traumatism or freedom from spinal symptoms preceding the hemorrhage, while sudden paralysis from tumor would be preceded by the history of spinal symptoms.

Transverse Myelitis without Compression of the Cord.—In transverse myelitis without compression there are no nerve-root pains, spinal tenderness, or pain on bending the spinal column. The disease begins, in the vast majority of instances, bilaterally, and all the functions of the cord below the seat of the lesion are greatly affected or almost completely abolished soon after the beginning of the initial symptoms. The reverse of nearly all of these phenomena obtains in the case of tumor of the membranes and bones, and in tumor of the cord, except the nerve-root pains and spinal tenderness which are also absent in the majority of cases of intramedullary tumors.

Caries of the Spine.—Pain, limited to one or two vertebræ, tenderness of the spinous process over the same region, nerve-root symptoms, muscular rigidity, and cord symptoms are common to caries and tumor of the vertebræ, membranes, and, to a less extent, to tumor of the cord. The intense, agonizing pain in the back, both when the patient is at rest and while the spine is being moved, is not found in caries. In the latter the nerve-root symptoms are less marked than in tumor of the bone or membranes. They are absent in tumor of the cord. The symptoms are bilateral in caries, except in exceedingly rare cases. In tumor they are almost always unilateral early in the history of the disease. Rapid progress of the morbid process and

failure to yield to rest would point to tumor. Deformity of the spine would exclude tumor of the cord or membranes, but not tumor of the bones. The history of syphilis or of the removal of a tumor from another portion of the body, especially a malignant tumor of the breast, would be in favor of tumor.

Aneurysm.—The advanced age of the patient, except when the subject is syphilitic, would be equally in favor of tumor and aneurysm. If the subject is young and syphilis can be excluded, aneurysm may also be excluded. If, by careful auscultation and palpation over the entire back, no aneurysmal bruit is detected, it is useless to consider aneurysm as a causative factor.

Cervical pachymeningitis and intraspinal tumor have many symptoms in common. Pachymeningitis spreads over a larger vertical extent than does tumor, except in rare instances. The former more usually begins bilaterally than the latter, and gives rise to greater muscular rigidity than does tumor. Muscular wasting in tumor affects at first a limited group of muscles; pachymeningitis causes wasting in several groups. Tumor of the cord is not likely to be mistaken for pachymeningitis, because nerve-root symptoms are almost never prominent in the former.

Traumatism of the Spine.—In those cases in which the symptoms resulting from traumatism are similar to those of tumor the history will show that the symptoms immediately followed injury, and will lead to a careful examination of the spine, showing marked tenderness over a considerable vertical extent. The tenderness is much greater than in tumor of the membranes or of the cord. The history would be the main reliance in differentiating injury of the bones from tumor of the same, except that in the former the spinal tenderness involves a much greater vertical extent of the bones. It must be borne in mind that an injury of the spine may be followed by tumor; but under these circumstances there would be a history of two periods—the one immediately following the injury during which the symptoms will have been indicative of inflammation, and during the other there will have been a set of symptoms that mark the irritation caused by the beginning and development of the tumor. Traumatism of the cord in which nerve root and bone symptoms are absent would not easily be mistaken for tumor of the cord, as the acute symptoms of myelitis following trauma develop a few days after the receipt of the injury, and the patient is most commonly paralyzed immediately after the accident.

Neuritis affecting one nerve may occur from tumor. It may follow the development of tumor in the cervical region of the spinal canal, and affect one brachial plexus. Such a neuritis is due to pressure, and pressure neuritis in its early stage is not attended by tenderness over the trunk of the nerve, below the seat of the pressure, although pain is felt throughout the nerve and is most severe at its terminal end. Tenderness of the entire nerve does not take place until the neuritis descends the affected nerve. Spinal tenderness and pain in the spine on movement would probably be present in neuritis from pressure within the spinal canal. This would be absent in ordinary neuritis.

Syringomyelia, in the majority of instances, is due to a gliosis, or a benign and slowly growing tumor of the central canal of the spinal cord. The symptoms are usually bilateral, the morbid process is spread over a large vertical extent of the cord, and the disease advances slowly, and often lasts many years. Dissociation of sensory symptoms is much more typical and pronounced than is the case in tumors of the cord.

Location of the Tumor.—Is it in the vertebræ, cord, or membranes, and opposite what segment of the cord does it lie? Having satisfied one's self that a tumor exists, the next task is to locate it in some structure.

Tumor of the vertebræ is attended by pain, out of all proportion in severity to that caused by tumor of the membranes or of the cord. The pain after the disease becomes well advanced is almost constant, even while the patient is lying quietly in bed. Movements of the spine greatly increase the patient's suffering. Deformity of the spine, especially when the cervical region is the seat of the tumor, is not rare. Tenderness of the spine almost always exists, but in some cases it is not great unless severe pressure is made. There is marked rigidity of the back muscles, so that the spinal column is constantly fixed in such a position that jars are least likely to affect it. The nerve-root pains are severe, appear early, and last throughout the course of the disease, unless the affected nerves are completely destroyed. The nerve-root symptoms begin unilaterally, and the cord symptoms usually appear before they become bilateral.

Tumor of the cord usually manifests itself by unilateral symptoms. Nerve-root pains are absent, unless the tumor begins in one posterior horn, and affects the nerve-root fibers within the cord. Under such circumstances there will probably be some sensory disturbance below the tumor on the opposite side of the body. Cord symptoms begin unilaterally, unless the tumor is situated near the center of the cord. Bone, nerve-root, and meningeal symptoms are usually absent in tumor of the cord.

Tumor of the Meninges and Cauda.—The most prominent symptom of tumor of the spinal canal, extramedullary in character, is unilateral pain affecting one or two nerves, unless the cauda is involved, in which case they are bilateral from the beginning and affect many nerves of both legs. Bone symptoms, except slight pain in the back, some rigidity of back muscles, and some tenderness over a limited portion of the spine are absent throughout; cord symptoms occur late, but these are likely to appear before the nerve-root pains become bilateral.

After the tumor has been located in some structure—bone, membranes, or cord—it is not difficult to determine opposite what segment of the cord the highest portion of the tumor lies. The safe rule to follow is to ascertain the highest level of sensory disturbance—such as hyperesthesia or anesthesia—and locate the lesion about two spinous processes above this level.

What is the nature of the growth and is it operable? The history of syphilis, or evidences of constitutional infection, such as bone disease, an old iritis, the presence of sores in the mouth, or a tumor of the brain, would be in favor of the spinal tumor being syphilitic. This evidence would be strengthened by rapid development of symptoms. Scrofulous glands, or the presence of tubercles in the lungs, testes, or other portions of the body, would lead one to suspect that the spinal growth was tubercular in its nature. In the absence of syphilis or tuberculosis, tumor in the membranes of a child or young adult would probably be a fibroma or a sarcoma, and later in life a sarcoma or a carcinoma. The most common tumors of the cord are tubercular, gliomatous, syphilitic, and sarcomatous. In regard to whether the tumor is operable, this question cannot always be decided before making an exploratory incision. All tumors of the cord are inoperable—*i. e.*, those that are strictly confined to the cord substance. Some slowly growing bone tumors are removable. In all cases of tumor of the vertebræ an effort should be made to remove the growth if the diagnosis is made early, and it is fairly evident that the neoplasm is not malignant. Theoretically, all tumors of the membranes are operable, and in doubtful cases the patient should be given the benefit of the doubt, unless the contraindications to surgical procedure are too strong.

Prognosis.—Syphilitic growths yield readily to proper medication. If treatment is instituted early and before irreparable damage has been done to the cord, a complete recovery may take place. In all other kinds of growths that are not operable the prognosis is unfavorable. Life may be preserved for several months, or even for years, in slowly growing neoplasms that are not malignant.

Treatment.—Little space need be consumed in discussing the treatment of tumor of the spine, cord, or its membranes. In tumor of the meninges, unless it is quite evident that the neoplasm is not syphilitic, the patient should be placed on increasing doses of potassium iodid and inunctions of mercury pushed to the point of tolerance. In meningeal tumors, if the patient does not show the slightest improvement within 2 or 3 weeks, exploratory operation is advised. In case the symptoms grow steadily worse during this time, it is not safe to defer operating even for 2 or 3 weeks, as the structures of the spinal cord might be irreparably damaged before the expiration of 3 weeks if the tumor is growing rapidly or other conditions suddenly develop that cause considerable pressure on the cord. In inoperable tumors, if thorough antisyphilitic treatment for a period of 6 weeks is not attended by any improvement, it is not probable that further specific treatment will be followed by good results. Tubercular growths of the cord, membranes, or bones may be somewhat benefited by small doses of potassium iodid, by cod-liver oil, arsenic, quinin, iron, and a full meat diet, together with rest in bed. In all cases of tumor of the vertebræ that are not amenable to internal medication, operative interference should be instituted before the cord is seriously affected, unless there is evidence that the neoplasm is malignant. In all inoperable tumors that will not respond to specific or tonic treatment the patient should be made as comfortable as possible by rest in bed, a generous diet, relief of pain by means of anodynes, preventing the formation of bed-sores, and by taking care of the bladder and bowels.

SPINAL SCLEROSIS.—See Lateral Sclerosis (Primary).

SPINAL SCLEROSIS, POSTERIOR.—See Locomotor Ataxia.

SPINE, CARIES (Pott's Disease; Tuberculous Spondylitis).—Inflammation of the vertebra is nearly always tubercular—in children, almost without exception—although it is not impossible that the immediate starting-point of the disease is some slight injury causing an extravasation of blood into the substance of the cancellous tissue. In exceptional cases it may be due to syphilis—perhaps more frequently than is suspected, in the case of adults—and late in life to rheumatism, osteoarthritis, and ostitis deformans. Tubercular ostitis is essentially a disease of childhood, although it may occur at any period of life. Sometimes it is excited by injury, and usually affects but one part of the spine, though several vertebræ, etc., are involved together.

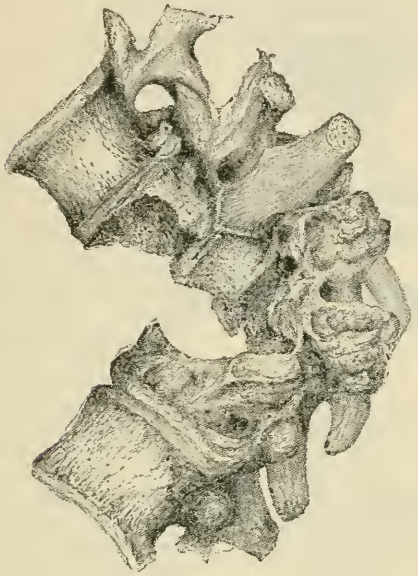
Location.—Like tubercular ostitis elsewhere, it nearly always begins in the cancellous tissue, where growth is more rapid and the blood supply most abundant. The upper or under surface of the bodies of the anterior border is the favorite seat; the spinous and transverse processes are almost never involved at the first, although later they become welded together as the inflammation extends to them; and the articular processes only when, as in disease of the atlas and axis, synovitis precedes ostitis. The most common situation is at the junction of the lumbar and thoracic regions; here the bodies are large, and strains are felt most severely. The cervical vertebræ enjoy much greater immunity; and the two highest—in children, at least—the greatest immunity of all. There is some reason to think that disease of the atlas and axis is proportionately more common in adults. Usually, the intervertebral discs are destroyed with the bones between which they lie, the granulation tissue eating into them and causing their gradual absorption. Sometimes they disappear at a very early period, as if the force of the disease was spent on them rather than on the bodies; very rarely they persist, as when the vertebræ are absorbed by the pressure of an aneurysm.

The pathology does not present any special feature. The disease begins as rarefying ostitis, the bone becoming softer, more open, and vascular, and the bone corpuscles undergoing fatty degeneration. According to the virulence and number of bacilli on the one hand, and the strength and resisting power of the tissues on the other, resolution, caseation, or liquefaction follows.

Disease of the upper two cervical vertebræ always commences as synovitis, and extends from

the articulation to the bone beneath, spreading along the most vascular lines; and, therefore, if it involves the axis, separating the odontoid process from the body.

The deformity depends upon the amount of destruction. If the caries is superficial, involving only the anterior surface of the body, and if repair begins at once, deformity may be entirely absent. If the bodies are softened or destroyed, even if only part of one, the spine sinks forward, the spinous processes project backward, and compensatory curves in the opposite direction are developed above and below. This is most distinct in the thoracic region; the lower cervical rarely becomes



Ankylosis of Dorsal Vertebræ with Great Deformity, Consequent on Caries of the Bodies.—(*Moullin.*)

convex backward; only a little thickening is perceptible, and the lower lumbar practically is not so distorted. Disease between the axis and atlas is peculiar, again, in this; for, owing to the shape of the articulation on the former, the latter, when the ligaments are softened by inflammation, or when the odontoid process is detached from the base on which it rests, slips bodily forward, carrying the head with it, so that when the patient is viewed from one side, it appears as if the head were placed in front of the spine. The effect of this displacement (when it is below the third cervical vertebra) on the diameter of the spinal canal is exceedingly slight; often it is actually enlarged; exceptionally, a wedge-shaped portion is driven backward into the substance of the cord. When the upper two vertebræ, however, are concerned, the atlas slides forward and the anteroposterior measurement opposite the odontoid process may be reduced to less than ⌊1/2 of an inch. This, if it is effected gradually, is not incompatible with life, and the odontoid process may even become ankylosed in its new situation as much as 1/2 of an inch in front of its natural one. The deformity cannot, of course, remain limited to the spine. When the cervicothoracic region is affected, the chin is brought down on the sternum so that the movements of the neck cannot be carried out; and, similarly, when the curvature is lower down, the thorax is crushed together, respiration is carried out by the diaphragm only, and the heart and the abdominal viscera are placed at great disadvantage.

Repair may commence at any time, the caseous material, if any has formed, and the débris being absorbed, dried up, or discharged externally. The vertebræ above and those below fall together; the spines, laminæ, and, in the thoracic region, even the ribs become welded into a solid mass; the sinuses gradually close up; and bony splints are thrown out in proportion to the degree of strength required.

Symptoms.—The most prominent symptoms are pain, rigidity of the back, peculiar posture, and a sense of weakness, which last, even when the child cannot describe it, can usually be recognized from the child's actions.

Pain is rarely local; nearly always it is referred to the distribution of the spinal nerves, not to their origin; thus, in atloaxoid disease it is felt over the back of the head; or, when the thoracolumbar region is concerned, over the pubes. Sometimes there is a sense of constriction around the thorax, and children often describe it as stomachache. Usually, it is worse after standing or after any exertion; lying down, it may not be felt at all. As movement causes pain, the child will guard its spine against jarring by refraining from any violent or unusual action and the surgeon should not resort to jarring of the head and shoulders in the course of his examination.

Muscular rigidity is highly characteristic; every movement of the segment of the back for some distance above and below the seat of mischief is avoided with the greatest care. If the cervical spine is involved, the whole trunk is turned around instead of the head when the patient wishes to look to one side, and it is done with the utmost deliberation. If it is the back, and the child is told to pick up anything from the floor, the hips and knees are bent, the head is thrown back, and the spine is kept absolutely rigid. Sometimes it voluntarily goes on hands and knees. For the same reason the walk is very peculiar, entirely different from the natural mobile gait, and wry-neck and other distortions are not infrequently present. When children are concerned, the weakness of the back must be judged of by their actions. They cease to play and run about; they wish to be let alone; and if they must stand, they try to support the weight of the head and shoulders by resting their hands upon the furniture, or even upon their knees, propping themselves up in a crouching attitude. With adults it is easier, as they can explain the peculiar difficulty they experience in holding themselves upright.

Spinal Abscess (Psoas and Lumbar).—When suppuration occurs, the pus collects in front of the diseased vertebræ in the angle formed by the

falling forward of the upper upon the lower portion of the spine. The anterior common ligament and the periosteum, relaxed by the bending of the spine, yield to the pressure of the pus, and, with the pleura or peritoneum, become thickened and form the abscess wall. The pus, prevented from traveling upward by the overhanging vertebræ, from traveling downward in front of the column by the attachments of the anterior common ligament, and from traveling backward by the posterior common ligament, and by the vertebræ being less diseased behind than in front, makes its way on one or the other side of the column. There it either enters the sheath of the psoas, and, destroying the contained muscle, presents in the iliac fossa or groin as an iliac or a psoas abscess, or it passes backward through or external to the quadratus lumborum, and points in the loin, when it is known as a lumbar abscess. In rare instances the pus may take a different course. Thus Walsham has seen it make its way into the ischiorectal fossa, or pass through the great sciatic foramen, or travel along the course of a rib and reach the surface near the sternum. Occasionally an abscess forms on both sides of the spine at once. In the cervical region the abscess will point in the pharynx (**retropharyngeal abscess**) or in the neck.

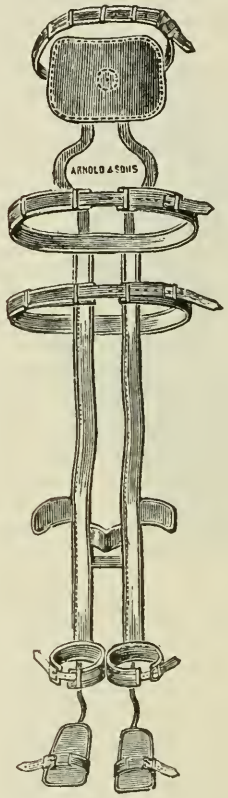
Spinal paralysis, like suppuration, may begin at any period, although naturally it is more common in the later stages of the disease. Loss of motion always precedes that of sensation, and may be nearly complete without the latter being seriously impaired. The gait becomes shuffling; the movements of one or more of the limbs are awkward; and the loss of power becomes more and more evident, with a certain degree of numbness, until at length complete paraplegia follows. As long as the cord is merely compressed, the patient may retain power over the rectum and bladder; but this, too, is not infrequently lost in the later stages. When myelitis sets in there is often severe pain along the course of the spinal nerves, with spasmodic muscular contraction; the skin becomes dry and branny; all power of the sphincters is lost; the limbs are wasted; the joints, generally speaking, are flexed; and the muscles are rigid and not infrequently thrown into violent spasmodic contractions from the uncontrolled reflex irritability of the spinal cord. Occasionally, the inflammation suddenly becomes acute, and extends upward, with symptoms of high fever, to the meninges of the brain. In disease of the cervical spine respiration may be seriously endangered either from displacement forward of the atlas and cranium upon the axis, or, when the disease is lower down, from gradual flattening of the cervical curve, owing to the softening of the ligaments. Under these circumstances any sudden movement of the head, either forward or backward, or even lying in the supine position without a support beneath the arch of the cervical spine, may cause immediate asphyxia.

Diagnosis.—In the early stages caries must be differentiated from neuralgia, rheumatism, lumbago, aneurysm, tumors, and hysteria; in the later stages the angular curvature may have to be distinguished from the kyphotic curvature of rickets.

From **neuralgia, rheumatism,** and **lumbago** it is not always easy to distinguish it. The history of the former rheumatic attack, the effect of remedies, and the absence of the signs described, must then be relied upon.

Hysteria may simulate it very closely. The absence of signs of caries, except pain; the inconstant and more diffused character of the pain; and the presence of other signs of hysteria or of uterine disease, are the points to be attended to.

A careful auscultation of the chest and examination of the abdomen will usually serve to exclude **aneurysm.**



Double Thomas' Splint for Spinal Caries.

From **tumors** of the vertebral bodies leading to the breaking down of the vertebræ caries cannot at first be differentiated, as both give rise to the same symptoms; but the age of the patient and the presence of a carcinomatous growth elsewhere would lead to suspicion of cancer.

The curve of **rickets** is more generally kyphotic, and disappears completely on gently holding the child up by its arms, or on extending it with its face downward across the nurse's knee. There are, moreover, concomitant signs of rickets, and absence of those of tubercle.

Treatment.—The general principles are those of the treatment of tuberculosis. With very few exceptions local removal of the diseased portion is out of the question; all that can be done is to improve the general health and to subdue the local inflammation, in the hope that the tissues may be able to cope successfully with the disorder.

Rest is the first consideration. In most cases it is advisable to confine the patient, for a time at least, to the recumbent position, on a well-made hair mattress, with sand bags as splints. In disease of the upper cervical vertebræ rest is absolutely essential, a bag being placed on each side, coming well down against the shoulder, and a third smaller one under the arch of the spine. If the patient's condition is favorable, this may be kept up for many months without the least deterioration in health; indeed, distinct improvement is not uncommon, especially when the pain has pre-

viously been severe. Later, when the acute symptoms have subsided the back may be incased in some kind of splint, and the patient allowed very gradually to begin to move about. To insure absolute recumbency Walsham uses a double Thomas' splint, modified by the addition of a pelvic band, a support for the shoulders, neck, and head, and two sliding foot-pieces. The two upright bars

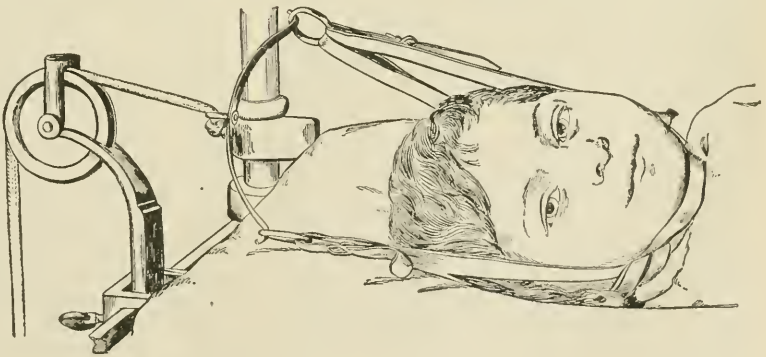
Sayre's Tripod.

which are prolonged to the head support, are made after the shape of a normally formed child when in the recumbent position.

The supports most in use at the present day are Sayre's plaster-of-Paris case and Cocking's poroplastic felt jacket, though some surgeons prefer steel instruments. The plaster-of-Paris case may be applied with the patient either in the upright position, suspended with his heels just off the ground by Sayre's tripod, or in the recumbent position, by Davy's hammock apparatus. A skin-fitting vest having been previously applied, and a line drawn across the back with a pencil at the level of the axillæ, to indicate the upper limit of the jacket, crinoline bandages, impregnated with plaster-of-Paris, are wound round and round the trunk, until a sufficient thickness is obtained, dry plaster being from time to time rubbed in with the hand. The cast should reach from the pencil line to just below the crest of the ilium, stopping short of the great trochanter and the pubes, and may be strengthened, if necessary, in places by inserting strips of perforated tin vertically between the bandages. Before applying the bandages a folded towel should be placed over the abdomen beneath the vest, so that, when afterward withdrawn, space will be left for abdominal respiration (Sayre's stomach pad). When the plaster case is dry, it may be sawed through down the front, removed, and the fronts edged with leather and perforated with eyelet-holes, so that it can be worn laced up, and can be taken off from time to time. To apply the poroplastic felt, the jacket, which is first made to measure, must be put in a steam oven, and when rendered thoroughly plastic, further molded to the patient, who should be prepared and suspended in the same way as for applying plaster-of-Paris. Of steel instruments, that known as Taylor's is perhaps the best. When the disease is in the cervical or upper thoracic region, Sayre's jury-mast may be fitted to the plaster-of-Paris cast or poroplastic jacket; or a cervical collar composed of leather or poroplastic felt may be used; or, better, the combined poroplastic jacket and collar.

The treatment of a tubercular abscess is either expectant or operative. Many of these are readily absorbed when proper mechanical support is afforded and the general health is improved. There are three indications for operative interference, viz.: if the abscess is rapidly increasing in size, if it is interfering with the health of the patient, or if it is pointing, but unless one at least of these is present, a tubercular abscess should be left alone. Aspiration may be employed first to stay the progress of the abscess and possibly to remove it entirely. Force should not be used in aspirating, and it may be repeated frequently provided the trocar be inserted into healthy tissue each time. In these abscesses lavage of the sac with iodin water, followed by injection of iodoform emulsion, is of great benefit. The trocar and cannula used for evacuation should be large enough to prevent clogging during the outflow, and the puncture should be sealed with iodoform collodion laid on a thickness of gauze.

In some cases in which necrosis has been associated with caries success has attended the removal of the sequestrum through a properly planned incision made in the loin. In exceptional cases, in which the paralysis of the lower limbs continues in spite of absolute rest and recumbency, and in



Head Extension for Pott's Disease.—(*Young.*)

port, to improve the outward appearance, and to prevent further deformity. In slight cases they should on no account be used. The exercises employed are directed in part to improving the muscular tone generally, and in part to strengthening those muscles in particular that tend to lessen or straighten the curves. For the former purpose, such exercises as swinging by the hands from a bar, forcibly stretching an elastic cord fixed to the floor, and dumb-bell exercises should be practised. For strengthening the muscles in particular that tend to straighten the curve, the back should be manipulated until that posture is found in which the curves are least marked, and the patient should be made to hold herself in this position as long as possible. At first she will be only able to do this for a few minutes at a time; but by frequently assuming the posture the muscles thus brought into play are gradually strengthened, until at last the improved posture is maintained constantly and without effort. For further improving the tone of these muscles, Busch and Roth recommend exercises similar to the following: The patient's body, held in the improved posture, is brought over the end of a couch or table, and while she is prevented from falling by an assistant holding her legs, she alternately flexes and extends her body at the hips, the surgeon resisting her efforts. Some surgeons use the sloping seat, as recommended by M. Bouvier and Mr. Barwell, in counteracting the curves. A similar effect may be obtained by wearing a thick sole on one boot, and by sitting on the off side of the horse when riding. After the exercises, or twice or thrice during the day, the patient should lie on her back for from half an hour to an hour; and while sitting, her back should be supported by a reclining chair. Walsham has had considerable success in removing rigidity in cases where there is slight osseous deformity by applying a weight to the convexity of the curve, the patient standing with her legs straight and body horizontal, and being supported in this position by her elbows on a chair.

Kyphosis

Kyphosis is a general curving of the spine with its convexity backward or an exaggerated condition of the normal dorsal curve. It depends upon an unequal compression of the intervertebral cartilages and, to a less extent, of the vertebral bodies, which thus become wedge-shaped, with their bases looking posteriorly. It is generally the result of muscular debility, rickets, slouching habits, or occupations necessitating stooping.

Symptoms and Diagnosis.—The chief point of interest is to distinguish it from the serious angular curvature induced by caries. In children and in adults this is generally easy; but in rickety infants, in whom the ordinary test for caries cannot be applied, it is often very difficult. In such a case the infant should be placed across the nurse's knees and gently extended, when the rickety curve will disappear, but the angular curve will remain. The back, moreover, in caries, is rigid, and the child is uneasy in this position and tries to resist the extension by muscular effort, and draws up his legs. In rickets the back is flexible and there are other signs of rickets.

Treatment.—In the infant, recumbency; in growing lads and girls, the correction of stooping habits by the use of muscular exercises and a spinal brace, with partial recumbency and tonics, is the treatment usually indicated. For the confirmed kyphosis of the old, nothing can be done.

Lordosis

Lordosis, or curving of the spine with the convexity forward, is a symptom rather than a disease, inasmuch as it is formed as a compensatory curve to restore the equilibrium of the spine when from any cause its normal antero-posterior curves are disturbed. Thus, it is most common in the lumbar region, where it is merely an exaggeration of the normal curve, and is there produced to counterbalance the tilting forward of the pelvis consequent upon hip-disease, congenital distortion of the hips, rickets, etc.

SPINE, DISEASES.—See Spine (Caries, Curvature), Spondylitis Deformans.

SPINE, INJURIES.—**Sprains** of the spine are exceedingly common, and may be caused by any violent twist or bend of the back. See Back (Injuries).

Dislocation and Fracture.—Dislocation of the spine without fracture is extremely rare; indeed, except in the cervical region, it is said never to occur. Fracture unaccompanied by dislocation is also uncommon; but uncomplicated cases of fracture of the spinous process and laminæ, and, more rarely, of the transverse and articular processes, are sometimes met with. In the majority of cases fracture and dislocation are combined. Thus, usually there is fracture of the body and of the articular processes of one or more vertebræ, with dislocation of the whole of the spine above the seat of injury from the spine below. This common form of injury is known as fracture-dislocation.

Fracture-dislocation is either the result of direct violence applied to the spine, or of indirect violence, as a fall upon the head.

When the result of **direct violence**, which can only be applied to the posterior part of the spine—one or more of the spinous processes may be detached without implicating the vertebral canal. When the violence is very great—as in a fall from a height on the back across a beam or rail, or as the result of a severe blow, as from a crane—the spine is bent violently backward, tearing asunder the structures forming the anterior segment of the column and crushing those forming the posterior segment. Hence the vertebral bodies are generally uninjured, but are wrenched apart, the intervertebral cartilages are ruptured, the anterior common ligament is torn, and the arches of the vertebræ and of the articular and spinous processes are crushed. The vertebræ above the injury are dislocated forward, as, the articular processes being fractured and the intervertebral

cartilages torn, nothing remains to keep them in position.

In fracture from **indirect violence**—such as may be received in a fall from a height upon the head, or catching the head while passing under an arch, or from a weight falling upon the head or shoulders—the spine is bent violently forward, crushing the anterior part of the column and tearing the posterior part asunder. Here one or more of the bodies and intervertebral cartilages are crushed between the vertebræ above and the vertebræ below, one of the fragments of the fractured body being frequently driven backward into the vertebral canal, while the arches and the spinous and articular processes are wrenched asunder. Fracture of the

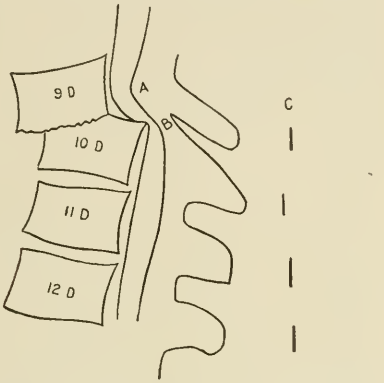


Diagram of Fracture-dislocation of the Spine, showing compressions of the cord by the laminæ of the 9th dorsal vertebra (*A*), and by the body of the 10th dorsal vertebra (*B*). *C*. Spines in same case as felt from the rear.

sternum is occasionally combined with this injury, in consequence, it is said, of the chin coming into violent contact with the sternum as the spine is doubled forward.

Condition of the Spinal Cord.—The importance of fracture-dislocation of the spine lies not so much in the fact that the vertebræ are fractured, as that the cord is generally injured. When the vertebræ are not displaced, the cord may at times altogether escape. More commonly, however, it is compressed; or, perhaps, completely divided; or, again, so bruised that it rapidly undergoes inflammatory softening. When the injury is situated below the second lumbar vertebra, the cord necessarily escapes, as it terminates at that spot; but the nerves of the cauda equina may then be injured.

Symptoms.—The local signs are often but little marked. There may be pain at the seat of injury, or some inequality in the spinous processes; but as often as not these are absent. The general signs depend upon the condition of the cord, and none will be present when it has escaped injury. But when it is compressed or crushed, there will be paralysis of the parts below, more or less complete according to the extent of the lesion. Taking as an example a case of fracture in the lower cervical or upper thoracic region, the most common situation, with severe compression or crushing of the cord, there will be paralysis of both motion and sensation of the whole of the parts below the seat of injury (paraplegia), and perhaps a zone of hyperesthesia immediately above the injured part. The intercostal muscles being paralyzed, respiration can only be carried on by the diaphragm, this muscle receiving its nerve supply through the phrenics that are given off above the seat of injury. Hence, while the chest is motionless, the abdomen rises and falls during respiration. The bladder and rectum and their respective sphincters share in the paralysis, so that there is at first retention of urine and of feces, followed by passive overflow of urine as the bladder becomes distended and will hold no more, and by involuntary passage of feces. Priapism, or involuntary erection of the penis, is frequently present, or is induced by the use of the catheter. The temperature varies: sometimes it may be lower than the normal, but often it is considerably elevated, even reaching as high as 107° F. shortly before death. Consciousness, unless any head injury has been received at the same time, is not affected. The reflexes in the lower limbs are usually at first in abeyance, but may return if the patient does not succumb to the shock of the injury. If the reflexes remain quite lost, the probabilities are that the conducting power of the cord has been completely destroyed. If they return, it is a sign that some power of conductivity is left in certain portions of the cord at the seat of injury. Death occurs, as a rule, in from 24 hours to a few days, from bronchial trouble; but the patient, if the fracture is in the upper thoracic region, may linger from 2 to 3 weeks. The secondary troubles that are then generally met with are bed-sores and chronic cystitis, probably due in part to impaired nerve influence, and in part to slight injury in the passage of a catheter, or to the introduction by the catheter of a microorganism—the micrococcus ureæ.

Such may be taken as a typical example of fracture of the spine as commonly met with in surgical practice. But the nature and gravity of the symptoms will depend upon the situation of the fracture, and upon the amount of injury to the cord. Thus, in some cases of fracture there may be no paralysis; in others, the paralysis may be incomplete: *i. e.*, confined to loss of motion only, or to paralysis of one limb or one group of muscles, or to impairment of sensation over some limited area. Such cases, however, are much less common than that previously described (Walsham). The X-rays should always be employed when possible, to determine the extent and character of the injury to the bony parts.

The prognosis will depend in great measure on the situation of the fracture and on the condition of the cord. Thus, when the fracture is in the cervical region, if death is not instantaneous, the patient may survive from 12 hours to 2 or 3 days; usually, however, death occurs in about 2 hours; when in the upper thoracic region, the patient may linger for 2 or 3 weeks; when in the lower thoracic region, if he survives the period at which the inflammatory troubles commonly occur, he may recover, remaining, however, if the cord is severely injured, paraplegic; when in the lumbar

region, he may recover, with perhaps only partial paralysis of one or other of the lower limbs or of a certain group of muscles, or even without any paralysis whatever. But even when the injury to the cord has been so high as to cause paralysis of the whole body below the neck, patients have been known, in rare instances, to live for several months, or even for years.

Treatment.—In cases in which there is no paralysis, thus showing that the cord is not affected, the indication is to keep the fractured spine at perfect rest, for the purpose not only of obtaining union of the fracture, but also of preventing by any movement displacement of the fragments and injury of the cord. In the more common cases, when there is paralysis, showing that the cord is injured, the indications are to remove any fragments that may be compressing the cord, and subsequently to keep the parts at rest until union of the bones has occurred. When, however, as is too frequently the case, the removal of the fragments is not practicable, or the cord itself has been crushed, all that can be done is to endeavor to guard against the formation of bed-sores and the occurrence of chronic cystitis and its attendant evils. Thus, the patient should be placed upon a water-bed, and his posture gently changed from time to time, so that pressure may not be continuously made on one part, while he must be kept scrupulously clean and dry, and free from urine and feces. The bowels should be cleared, if necessary, by enema, or excessive diarrhea controlled by morphin suppositories or by starch and opium injections. Should bed-sores threaten, the skin should be hardened by sponging with rectified spirit, and dusted with oxid of zinc and starch-powder. If formed, they should be dressed with mild antiseptics, iodoform, balsam of Peru, etc., and all pressure removed from the surrounding skin by the use of water-cushions. To prevent cystitis from occurring, a soft-rubber catheter, thoroughly cleansed in carbolic acid and dipped in carbolic oil, should be passed twice daily. Should the urine become alkaline, the bladder must be washed out with some antiseptic solution, as salol (10 grains to 1 ounce) or boric acid (10 grains to 1 ounce).

Extension of the Spine.—In cases in which, from the marked inequality of the spinous process, there is a probability of fragments pressing upon the cord a cautious attempt to extend the spine and to reduce the displaced vertebræ may be made, and a plaster-of-Paris case may be applied during the extension.

Laminectomy is the operation of removing the posterior vertebral arches. It is performed for the purpose of relieving pressure on the vertebral cord, but is contraindicated when it is likely that disorganization of the cord has been effected. An incision is made down the vertebral spines of the patient, who lies prone, with a firm sand-pillow under the lower ribs. The spinous processes and the laminæ are cleared, and the periosteum is incised and lifted away from the arch. Forceps remove the spinous processes close to their bases, and the laminæ are cut off on each side by rongeur forceps, exposing the dura mater. Fragments may be found exposing the vertebræ, and a blood-clot may exist between the dura and the bone. The dura may be incised and the clot removed, or the dura may be closed with catgut, the wound drained throughout by a tube, the superficial parts being closed with silkworm-gut, and antiseptic dressings applied. In operating, hammers and chisels should not be used, on account of the jarring to the structures.

SPINE, TUMORS.—See Spinal Cord (Tumors).

SPIRILLUM FEVER.—See Relapsing Fever.

SPIRITS.—Alcoholic solutions of volatile substances, which may be solids, liquids or gases. They are officially prepared either by simple solution, by solution with maceration, by gaseous solution, by chemical reaction, or by distillation. The menstruum is alcohol in nearly all instances, 4 having water in addition, and 2 being alcoholic liquors of a specified alcoholic strength (whisky, brandy). The official spirits are 20 in number; those made from volatile oils are frequently called *essences*.

Spiritus ætheris (32 1/2); S. ætheris compositus (32 1/2); S. ætheris nitrosi (4); S. ammoniæ (10); S. ammoniæ aromaticus (9); S. amygdalæ amaræ (1); S. anisi (10); S. aurantii compositus (20); S. camphoræ (10); S. chloroformi (6); S. cinnamomi (10); S. frumenti (37 to 47 1/2); S. gaultheriæ (5); S. glycerylis nitratis (1); S. juniperi (5); S. juniperi compositus (64 1/2); S. lavandulæ (5); S. menthæ piperitæ (10); S. menthæ viridis (10); S. vini gallici (39 to 47). The figures placed after spiritus frumenti, spiritus juniperi comp., and spiritus vini gallici, represent the percentage of absolute alcohol by weight in each; those placed after the others indicate the quantity of the principal ingredient in grammes to each 100 cubic centimeters of the preparation.

SPIROSAL.—The monoglycol ester of salicylic acid. It is an efficient external remedy in rheumatic affections. When rubbed into the skin, it is nonirritant and readily absorbed, and it liberates salicylic acid in the tissues.

SPLEEN, DISEASES. Physical Examination.—The spleen lies in the left hypochondriac region, the internal or concave surface being in close relation with the greater curvature of the stomach and tail of the pancreas; the upper border lying immediately under the diaphragm; the lower border covers the left suprarenal capsule and a small portion of the kidney, to which it is attached by areolar tissue. It extends transversely from the upper border of the ninth to the lower border of the eleventh ribs, and anteriorly to the mid-axillary line. The patient is placed in the recumbent posture. By **inspection,** enlargement of the organ is detected.

Palpation confirms inspection, detects tenderness, position and character of enlargement, whether hard or soft. In the normal condition the organ does not admit of palpation. The spleen is said to be enlarged when the anterior surface can be felt at the free margin of the ribs on deep inspiration, or if it projects beyond the mid-axillary line on percussion.

Percussion.—The patient is placed in the recumbent position on the right side, with the thighs flexed. Deep percussion is necessary, and should begin in the midaxillary region over the lung, gradually going downward in order to detect impaired resonance over a more dense medium. Dulness is usually elicited at the upper border of the ninth rib, and extends downward to the lower border of the eleventh rib, when tympany exists over the region of the intestine. The anterior border is determined by first percussing over the bowel, gradually moving toward the splenic dulness, which is found in health in the midaxillary line. If it projects beyond the midaxillary line, the organ is said to be enlarged.

Morbid conditions of the spleen arise as the result of some general disease, such as malaria, leukemia, syphilis, or by extension of some inflammatory process from a neighboring organ.

Splenitis.—This may be the result of traumatism or extension of a septic process from the stomach, perinephritic abscess, or disease of the diaphragm. It is recognized by enlargement and tenderness of the organ.

Perisplenitis may be due to extension of inflammation from adjacent tissues or from traumatism. The resulting adhesions cause pain during respiration. There may be palpable crepitus over the spleen.

Treatment.—Relief may be obtained by counter-irritant and 10 percent iodin inunctions.

Splenic abscess occurs occasionally during the course of pyemia. It may break into the stomach, intestines, lungs or peritoneal cavity.

Rupture of the spleen is caused by traumatism or pernicious malarial fever. In this condition there is a sudden sharp pain in the region of the spleen, accompanied by evident symptoms of collapse.

Tumors of the Spleen.—The spleen may be the seat of gummatous tumors, or of an echinococcus cyst.

Amyloid spleen occurs as the result of prolonged suppurative process, as in tubercular bone-disease, and may be associated with amyloid liver and kidney.

Echinococcus of the Spleen is associated with similar infection elsewhere. The characteristic hooklets may be recognized in the aspirated fluid. The spleen presents a fluctuating tumor which is distinguished from abscess by the absence of symptoms of sepsis (chills, fevers, etc.) Echinococcus disease may, however, take on a purulent form.

Movable spleen is due to elongation of the gastro-splenic ligament and blood-vessels.

Symptoms.—Absence of the normal splenic dulness, the presence of a movable hard tumor in the lumbar or epigastric regions, accompanied by a dull, dragging sensation in the affected parts may distinguish the condition.

Treatment consists in the application of a pad and an abdominal binder. Prolonged rest in bed is necessary to obtain relief.

SPLENECTOMY.—Splenectomy, or extirpation of the spleen, may be required for rupture of the viscus, and for some forms of enlargement and tumors. It should not be proceeded with if on exposure extensive adhesions are found, since, unless all these can be securely ligatured, fatal recurrent hemorrhage is almost certain to take place. An incision is made either in the left linea semilunaris, or still further to the left, and the spleen having been thoroughly exposed, each adhesion carefully tied, and the organ, if enlarged, drawn out of the wound, the pedicle is then transfixed in several places with strong silk, and the ligatures interlocked and tied. The pedicle is next severed well to the splenic side of the ligatures, the organ removed, the peritoneum thoroughly cleansed, and the abdominal wound united without or with drainage. Great care should be taken not to tear the splenic substance, an accident attended with fearful hemorrhage (Spencer and Gask).

SPLENIC ANEMIA (Splenic Pseudoleukemia).—A chronic anemia characterized by progressive hypertrophy of the spleen, without the glandular enlargement of Hodgkin's disease.

The **etiology** is unknown, but infectious diseases and intestinal infection are believed to be factors.

The **symptoms** and **blood changes** are similar to those of pernicious anemia. These include pallor, dyspnea, palpitation, progressive weakness, enlarged spleen; and later, emaciation, deeper yellow hue of the skin, tendency to hemorrhages, fever, serous effusions, diarrhea. The red blood cells are diminished. The hemoglobin percentage is lowered, but is relatively less than the corpuscles. Later in the disease there is ascites due to cirrhosis of the liver (Banti's disease, *q. v.*). The disease is a protracted one.

Treatment.—Nutritious food, arsenic, iron and bone-marrow are indicated as in other anemias. About 75 percent of recoveries are reported to have followed splenectomy. This operation is contraindicated in profound cachexia. Talma's operation has also been performed in few cases.

SPLENIC EXTRACT.—The substance of the spleen has been recommended in malaria, tuberculosis, typhoid fever, and in various disorders of the blood. The ethereal extract, in the form of an emulsion containing 5 grains to the dram, is the most active preparation. It is given in daily doses up to 4 drams.

SPLENOMEGALY, TROPICAL.—See KALA-AZAR.

SPONDYLITIS (Tuberculous).—Acute osteomyelitis of the spine. A rare infection due to the same causes as osteomyelitis elsewhere. (See under BONE, Diseases.) It is too diffuse and rapid for successful surgical treatment. See SPINE (Caries).

SPONDYLITIS DEFORMANS.—A form of arthritis deformans characterized by a striking rigidity of the spinal column. If not associated with kyphosis it has been called "poker back." It may be accompanied by osteoarthritic changes in the shoulder and hip (Spondylose rhizomelique).

SPONDYLOLISTHESIS.—A slipping forward of the lumbar upon the sacral vertebræ.

SPONDYLOSE RHIZOMELIQUE.—Ankylosis of hip, spine and shoulders, occurring chiefly in old men. See SPONDYLITIS DEFORMANS.

SPONGES.—Marine sponges are especially used in operations on the throat and abdomen—in the

former because mucus adheres, in the latter because the omentum and intestines do not adhere to marine sponges, whereas the reverse is the case with those made of wool or gauze. Owing to the difficulty in preparing and cleaning them, they are not generally used except as above. Marine sponges must first be freed from sand and remains of marine organisms by prolonged soaking and kneading in water. Then they are covered for a day with sulphurous acid 20 percent or 1 in 5, alternatively with hydrochloric acid 8 percent, or with permanganate of potassium 1 in 400, followed by saturated oxalic-acid solution to decolorize. After all acid has been washed away the sponges are placed in a jar covered with 1 in 20 carbolic acid, where they should remain at least a day before use. They may be so preserved indefinitely, merely becoming browner, or the sponges may be counted into linen bags, which are tied, labelled, and then hung up to dry in the air. Such sponges are then ready for use at any time with sterile water. After use, sponges must not be put straight into carbolic acid, but must soak in warm water and be kneaded at intervals for a day or more until all the fibrin of the blood has become dissolved, which it will soon do, unless it has been coagulated by heat or by carbolic acid. When the water in which the sponges are being kneaded remains clear, the sponges are treated with sulphurous acid followed by carbolic acid as above described. But all sponges which have come in contact with infective material should be burnt. (Spencer and Gask.)

SPOROTRICHOSIS.—A subacute or chronic disease affecting chiefly the skin and subcutaneous tissues, due to the sporotricha, which can be identified in culture made from the pus. Nodules or abscesses or ulcers appear which may be mistaken for furunculosis, blastomycosis, tuberculosis, syphilis, etc. Lesions may be found in the bones or joints or the muscles. At times the eyes, nose, throat, or epididymis may be invaded; or the infection may become general, accompanied by pains, fever, and malaise. The affection is curable under iodid treatment in moderate dosage.

SPOTTED FEVER.—See CEREBROSPINAL FEVER TICK FEVER.

SPRAINS.—A sprain is always the result of indirect violence, and is produced when the movements of a joint are carried beyond their physiologic limits, but stop short of a permanent displacement of the articular ends—that is, dislocation. A sprain may be said, therefore, to be the aborted stage of a dislocation. Extensive muscular action may likewise produce a sprain. In many individuals the first injury predisposes to the recurrence of the condition from apparently trivial causes. In the majority of sprains there is a stretching of the capsule of the joint and of one or more ligaments. In severe cases there is a rupture of one or both of these, with consequent laceration of blood-vessels, and often of nerves. Hemorrhage into the joint and the periarticular structure is always present. The ligaments, as a rule, if torn, give way at the point of insertion rather than in their continuity. This is made manifest in milder cases by tenderness at some point above or below the articular line, and corresponding to the point from which the ligament was torn. In the tearing of a ligament from its osseous attachment particles of bone are not infrequently brought away with the detached fibrous structure. In severe cases the bone may be denuded of its periosteum for a considerable distance. In the sprains of childhood and adolescence this condition is not uncommon, owing to the great flexibility of the bone. In adults, on the other hand, the extreme limit of the sprain is the tearing away of a greater or less fragment of bone to which the ligament placed upon the stretch by the trauma has been attached. It is in this way that fractures of the lower end of the radius and of the lower end of the fibula may be considered as severe forms of joint distortion. They are sometimes known as sprain-fractures. In severe sprains the segment of the capsule opposite that which is put upon the stretch may be pinched between the articular surfaces. Thus, in severe sprains of the ankle pain is often felt on both sides of the foot. In very severe cases a rupture of the muscles of the accompanying joints may ensue. This is quite uncommon. When it results, the muscles give way along the line of attachment to the tendon.

The symptoms of a sprain are pain, swelling, ecchymosis, and limitation of joint function. The pain at the moment of accident it often very severe, leading at times to syncope. When an examination of the joint is made, the tenderness will be found most marked over the articular line and over the insertion of the ruptured ligament. The swelling varies greatly in different cases, since it depends upon the hemorrhage within and about the joint. In mild cases it is limited to the periarticular structures, appearing in the form of ecchymoses within the course of two or three days. The ecchymoses, owing to ruptures of muscles, are often found at points considerably removed from the affected joint. The ecchymosis following a sprain is often found at a distance far removed from the joint without rupture of muscle. Often the only ecchymoses seen in sprains of the shoulder appear after the lapse, sometimes, of many days at the point of insertion of the deltoid. As a rule, the swelling attains its maximum within the course of 24 hours. In many cases, however, the hemorrhage into the joint produces a reactional hydrarthrosis, which reaches its maximum in from a week to 10 days. The degree of periarticular or intraarticular swelling depends entirely upon the extent of damage done to the ligaments and the joint capsule.

The frequency with which joints are subject to sprain varies with their nature. The enarthrodial joints, in which the range of movement is widest, are least subject to sprains. On the other hand, joints of the hinge variety are more frequently the seat of such lesions. Sprains occur, therefore, most often in the ankle, the knee, the wrist, and the small joints of the hand.

The clinical history of a sprain varies with the

conditions produced by it. In some cases characterized by the stretching of the ligaments without laceration, the pain and swelling speedily subside, and after a few days or a week the joint functions are restored. In severer cases when hemorrhage into the joint and periarticular swelling indicate extensive laceration, the progress toward recovery is often very tedious, and months may pass before a final restitution to the normal condition takes place. In the severest cases circumscribed tender areas, thickening of the joint capsules, or chronic hydrarthrosis may leave the joint permanently impaired. Atrophy of the muscles is often found to follow upon severe sprain during the first 2 weeks, and is the result of the injury to the articular nerve filaments. This condition is often irreparable.

Extensive hemorrhage into a joint is always significant of a tedious recovery, and frequently renders unfavorable the prognosis, so far as complete restoration of joint function is concerned. In subjects with a tendency to diathetic, and particularly to tubercular, disease, a sprain is often the exciting cause of chronic joint-disease.

Treatment.—In the treatment of sprains absolute rest should at once be secured. Elevation and suspension of the affected limb at a right angle will often relieve the pain at once. This position conduces to the arrest of hemorrhage and, by rapidly depleting the veins, facilitates the absorption of the already effused blood. To further hasten absorption, compression by an elastic bandage may be considered as of prime importance in the treatment of sprains. Cold applications are often of value for the relief of pain. To these may be added the lead and opium wash, or a solution of chlorid of ammonium and opium, or an ichthyol ointment. Internal administration of opiates may become necessary when pain cannot be otherwise alleviated. To secure absolute rest, immobilization of the joint by means of plaster-of-Paris, starch, or silicate of sodium bandages is often indicated. In milder cases strapping the joint with strips of adhesive plaster is often of great value. In sprains of the ankle incasing the joint by well-applied adhesive strips permits the patient to walk within 24 hours. The indiscriminate use of fixed dressings must, however, be condemned, since their unnecessarily prolonged use may lead to irremediable stiffness of the joint. It is preferable to resort to the use of splints, which can be removed daily if required. After the subsidence of the acute symptoms of the sprain, the main object of treatment must be that of the restoration of joint function. Efforts in this direction should never be delayed beyond the second week. The chief agents in attaining this end are passive movements and massage methodically applied. In the severest forms of sprains, in which the intraarticular effusion is not absorbed by this treatment, recourse must be had to aspiration of the joint.

In sprains that are not relieved by one or other of these methods of treatment, singly or combined, counterirritation by means of blisters, or, preferably by ignipuncture, often answers admirably. When there is any thickening under an especially tender point, recourse should be had to free incision. In a few cases hemorrhagic cysts have been drained or granulation masses removed with a curette, thereby permanently relieving the symptoms. Such a subfascial cyst as large as a hazelnut has been successfully drained. It was over the trochanter, and directly under a point that had been extremely tender during two years following a sprain of the hip. See JOINTS (Injuries); ANKLE.

SPRENGEL'S SHOULDER.—Congenital Elevation of the Scapula, Winged Scapula (*scapula alata*). This has been explained as due to an arrested development in the embryonic formation of the shoulder girdle, which prevents the normal shifting of the shoulder girdle from the cervical to the upper dorsal region, the so-called "descensus scapulæ." In fetal life the nerves of the brachial plexus pass out horizontally and the angle of the scapula only reaches the fifth instead of the seventh rib. When thus arrested the muscles—trapezius, rhomboids and levator anguli scapulæ—shorten, and fibrous or bony plates unite the sixth and seventh verte-

CONGENITAL ELEVATION OF THE SCAPULA, SPRENGEL'S SHOULDER.—(*Spencer and Gask.*)

bral spines and the scapula. Thus the upper angle of the scapula has been mistaken for an exostosis.

Treatment.—In early life persistent exercises until the palms meet above the head and the flexor surface of the wrists can be applied to the back of the neck. In later cases a division of contractured muscle and excision of the bony plate may be required before exercises can be carried out (Spencer and Gask).

SPRUE (Psilosis).—A tropical disease, characterized by stomatitis, chronic gastrointestinal catarrh, and atrophy of the liver. Emaciation, tympanites and diarrhea are markedly prominent symptoms. The treatment is chiefly tonic and

dietetic. Rest in bed and an exclusive milk diet should be insisted upon until there is a decided abeyance of the symptoms, then a very gradual return to normal diet. An exclusive meat and beef juice diet is advocated by some clinicians, while others recommend a diet of strawberries.

SPUTUM.—The material discharged from the alveoli of the lungs, bronchi, trachea, larynx, pharynx, and posterior nares.

Characteristics.—The amount of sputum varies both in health and in disease. In certain affections of the lungs, as edema, gangrene, and tuberculosis, the sputum is always increased in amount.

Consistence.—In certain affections, as in early stages of croupous pneumonia, it may be so thick or viscid that in inverting the receptaclei into which it is discharged the fluid may not escape.

The color varies greatly under different circumstances, being at times reddish (pneumonia and pleurisy), greenish (edema and gangrene), blackish (in coal-miners), blood-tinged (phthisis).

Normally, the **odor** is only faintly perceptible, but in putrefactive processes the odor is strong and frequently nauseating.

The specific gravity ranges from 1.015 to 1.026.

Configuration or Character.—(1) Mucoid, (2) purulent, (3) serous, and (4) sanguineous. There may be combinations of these, such as mucopurulent, mucoserous, serosanguineous, sanguinomucopurulent, nummular, etc.

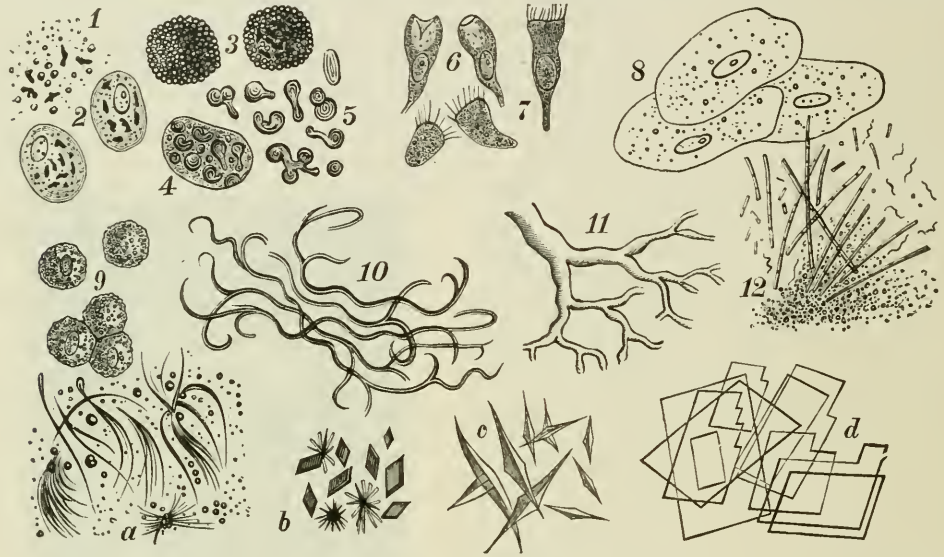
Clinical Significance.—In health the sputum is a transparent, colorless, slightly glutinous liquid, like thin mucilage. It contains mucin, varying quantities of saline matter, and water. The saline matter is abundant in transparent viscid expectoration, deficient in the opaque and less tenacious kind, and least in the actually purulent sputum.

The quantity and viscidity of ordinary mucous secretion is increased in simple catarrhal inflammation of the bronchial membrane. A change occurs when bronchitis has existed for some days, the secretion becoming semitransparent and then opaque, the color changing to a yellow or greenish hue.

The sputum becomes frothy from admixture of air, rusty or prune-juice colored from oozing from the capillary vessels. Fibrinous molds of the bronchial tubes, chalky masses consisting of nspissated and calcified cheesy matter, are sometimes expectorated.

A person having chest complaint, coughing frequently, and expectorating a frothy salivary fluid only may have pleurisy. If the expectoration is glairy, like white of egg, bronchitis may exist. A rusty tinge, like thick gum-water colored with blood, indicates pneumonia. A sudden gush of fetid pus points to abscess or empyema. Purulent expectoration occurs in bronchitis as well as in phthisis, but when long-continued and accompanied by a distinct rhonchus, it invariably comes from a vomica.

In phthisis the expectoration is usually salivary or frothy at first, the result of irritation. Later it becomes viscous, and subsequently dotted and streaked with blood. A pearly aspect next ensues, with whitish opaque spots. These become large, flocculent, and ultimately nummular.



Objects Found in the Sputum.—(*Landois.*)

1. Detritus and dust-particles. 2. Pigmented alveolar epithelium. 3. Fatty degenerated and partially pigmented alveolar epithelium. 4. Alveolar epithelium showing myelin degeneration. 5. Free myelin forms. 6, 7. Desquamated ciliated epithelium, partly changed and deprived of its cilia. 8. Squamous epithelium from the mouth. 9. Leukocytes. 10. Elastic fibers. 11. Fibrinous cast of a small bronchus. 12. Leptothrix buccalis, together with cocci, bacilli, and spirochetæ. *a*. Fatty acid crystals and free fatty granules. *b*. Hematoidin. *c*. Charcot's crystals. *d*. Cholesterin.

Later the expectoration becomes purulent, and just before death is surrounded with a pinkish halo. By the addition of acetic acid, the sputum may be made transparent, and elastic tissue more clearly seen. The experienced eye is the best guide in the selection of those small pinhead-sized flocculi of expectoration in which microscopic particles of lung tissue may be detected.

The existence of carcinoma of the lung may sometimes be detected by the microscope, and from the character of cells found, the same apparatus may indicate the part of the respiratory tract affected and the degree of disease existing.

Treatment may be much guided by a study of the expectoration. An alteration in the nature of the secretion may affect the symptoms, and relieve the cough and dyspnea. If frothy from congestive disorder, warm poultices, turpentine stupes, or hot flannels externally may benefit, while fever may be reduced and irritability lessened by giving salines with antimony or aconite. Lemon-juice, liquor potassæ, and various inhalations give relief if there is a viscid or glutinous expectoration. Iodid of potassium, given with a few drops of wine of antimony, will promote cell and tissue change, and make the secretion less adhesive.

Senega and the gum-resins are indicated when mucopurulent secretion is established. In the form of a lozenge they may be continually used. Benzoin, tolu, and copaiba are of use. Acetic or tannic acid, given in small or frequently repeated doses, reduces the quantity of secretion. Calomel with antimony and guaiac, as in Plummer's pill, is of the greatest service, and calls for much discrimination and care. Inhalation of tar, creosote, or oil of juniper are of benefit to the affected surface of the mucous membranes, while cod-liver oil, iron, and tonics improve the general health.

Macroscopic appearance may present (1) elastic tissue or threads; (2) fibrinous casts, as in pneumonia or certain varieties of bronchitis, diphtheria, etc., Curschmann's spirals, and Charcot-Leyden crystals (see ASTHMA); (3) Dittrich's plugs —yellowish-white or grayish malodorous masses of bacteria, fatty acid crystals and pus found in pulmonary gangrene, follicular tonsillitis, etc.; (4) echinococcus membranes; (5) various concretions or calcareous plugs (broncholiths and lung stones); (6) foreign bodies.

Microscopic Appearance.—The specimen is spread on a glass slide, a cover-glass superimposed; and immediately examined. It may show (1) leukocytes; (2) red blood-cells; (3) epithelial cells; (4) elastic tissue; (5) animal parasites, as echinococcus hooklets; (6) various bacteria.

The chief **bacteria** are tubercle bacillus, pneumococcus, influenza bacillus, actinomycosis, oidium albicans, and aspergillus mycelium. See TUBERCULOSIS.

Crystals in Sputum.—(1) Charcot-Leyden; (2) hematoidin; (3) cholesterin, as in phthisis; (4) fatty acid crystals; (5) tyrosin crystals; (6) crystals of oxalate of calcium and triple phosphate.

Chemically the sputum contains (1) albumins, (2) volatile fatty acids, (3) glycogen, (4) ferments, and (5) inorganic salts.

After examination of the unstained specimen a smear should be made; the preparation should next be dried in the air and stained with Wright's stain for 3 minutes, washed and mounted.

Pathologic Technic.—The following are the principal methods of procuring a concentrated sediment for microscopic examination:

Biedert's Method.—Used in examining sputum that contains few tubercle bacilli. Mix 15 c.c. of the sputum with from 75 to 100 c.c. of water and a few drops of potassium or sodium hydroxid solution. Boil until the sputum is thin. Place in a conic glass vessel, and after two days pour off the supernatant liquid. Stain the precipitated sediment.

Kaatzer's Method.—Mix the sputum with from a 1 to a 3 percent solution of caustic soda or potash. This dissolves the cells and mucus, but preserves the elastic fibers and bacteria. Stain the sediment. Clear the preparation with a dilute solution of acetic acid.

Kühne's Method.—This method is used to overcome the viscidity of sputum and to facilitate the spreading of a thin and even film on the cover-glass. It consists of adding to the sputum an equal volume of a saturated solution of borax. A concentrated aqueous solution of ammonium carbonate will reduce the consistency of less viscid sputum.

Mühlhäusen's Method.—This method is used to render the sputum less viscid. It consists in adding to the sputum from 6 to 8 times its volume of a 2 percent solution of caustic potash.

The resulting mixture may then be centrifuged and examined.

Preserving Sputum. *Savelieff's Method.*—This is a process of preserving sputum for purposes of subsequent examination. Let the patient expectorate in a receptacle containing 95 percent alcohol, in which the sputum may remain for several months, and in which it is hardened by dehydration and coagulation. A few drops of caustic potash solution added to a small lump of the hardened sputum on a slide will liquefy it in a few minutes, and from this the cover-glass preparations are made. When dry, fix the film by passing the cover-glass twice through the flame of a spirit-lamp, wash in water to remove the potash, and then stain according to any of the given methods.

Sectioning Sputum. *Gabritschewsky's Method.*—Place the denser portions of freshly expectorated sputum in Müller's fluid, or some other hardening reagent, and then embed in celloidin. Stain the sections in safranin, alum carmin or hematoxylin eosin. Aronson and Philip treat the sputum first with corrosive sublimate, and, according to Schmidt, it may be embedded in paraffin as well as celloidin.

SQUILL (Scilla).—The sliced dried bulb of *Urginea maritima*. It contains the glucosids—*scillitoxin*, acrid and bitter, the most active principle; *scillipicrin*, acting on the heart; and *scillin*, causing numbness and vomiting; also

sinistrin, a mucilaginous principle. The *scillitin* of the older writers is a complex substance. Dose of the powdered drug, 1 to 5 grains.

In small doses squill is expectorant, in larger doses emetic and diuretic, and in overdoses it is a violent irritant poison, producing nausea, vomiting, purging, gastroenteritis, strangury, bloody urine, perhaps suppression of urine, paralysis and convulsions, with death by paralysis of the heart in systole. Medicinal doses slow the heart, making the pulse stronger and slower, raising the arterial tension, and increasing the flow of urine (like digitalis). Its active constituents diffuse into the blood, and its systemic effects follow on its application to the skin and seem to be exerted upon the lining of the secretory organs, especially affecting the bronchial, gastrointestinal and genitourinary mucous membranes.

Squill is employed in medicine for its expectorant and diuretic effects. It is especially applicable in cardiac dropsy, combined with digitalis or the saline diuretics, and in chronic bronchitis, in which it may be associated with ipecac, ammonia, asafetida, or benzoin. It is used in croup, but is usually combined in this affection with some other emetic, as tartar emetic in the compound syrup, a mixture which may produce very depressing effects and should be used with caution. In whooping-cough and other irritant coughs with tickling sensations in the throat the syrup or vinegar is often of great service.

In dropsy:

℞.	Powdered squill,	gr. x
	Powdered digitalis leaves,	gr. xx.

Make into 10 pills. Give 1 pill after meals.

In subacute bronchitis:

℞.	Wine of ipecacuanha,	ʒ j
	Tincture of squill,	ʒ ij
	Syrup of tolu,	ʒ v
	Water,	ʒ j.

Give a teaspoonful every 3 or 4 hours.

Preparations.—S., **Acetum**, "vinegar of squill," 10 percent in strength. Dose 5 to 30 minims. S. **Flext.** Dose, 1 to 5 minims. S., **Syr.**, has of vinegar of squill 45, sugar 80, water sufficient quantity. Dose, 10 to 60 minims. S., **Syr., Comp.**, fluidextract of squill and fluidextract of senega, each 80, tartar emetic 2, sugar 750, water to 1000. Dose, 10 minims to 1 dram, for children as an emetic; 20 to 45 minims, for adults as an expectorant. Commonly known as Coxe's Hive Mixture. S., **Tinct.**, 10 percent. Dose, 5 to 30 minims.

SQUINT.—See Eye-muscles (Strabismus).

STAINING.—See Pathologic Technic.

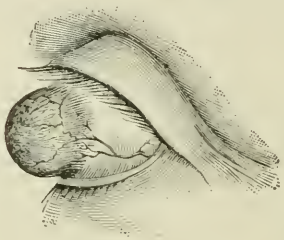
STAMMERING.—See Speech Defects.

STAPHISAGRIA (Stavesacre).—The ripe seed of *Delphinium staphisagria*. Its properties are due to an alkaloid, delphinin, and other extractives. Dose, 1/2 to 2 grains. It is a violent emetic, cathartic, and parasiticide. It lowers the activity of the heart, producing adynamia. It is used internally in asthma and rheumatism, and externally for itch and lice. S. **Fluidextract,** Dose, 1/2 to 2 minims. S. **Ung.**, unof., 1 part of powdered seeds with 2 each of olive oil and lard. **Delphinin**, unof. Dose 1/12 to 1/4 grain.

STAPHYLOCOCCUS.—See Suppuration.

STAPHYLOCOCCUS INFECTIONS have been treated with both sera and vaccines, but with little success, except in furunculosis, carbuncle, and suppurating acne, in which the vaccines have given satisfaction whenever they have been employed. The initial dose is from 50 to 100 million for acne to 300 million for carbuncle. Staphylo-vaccine, as an adjuvant to tuberculin in tuberculous cases of mixed infection, has been of value. A polyvalent staphylo-vaccine, containing the three types of staphylococci (*S. albus*, *S. aureus*, and *S. citreus*), is preferred by some clinicians, and is on the market; but the vaccines of *S. albus*, and *S. aureus* are also furnished separately by the manufacturers.

STAPHYLOMA OF THE CORNEA.—A bulging forward of a corneal scar with an adherent iris. It is caused by the weakening of the corneal tissue, which gives way to the intraocular pressure, pushing the iris and even the lens forward. Secondary glaucoma is not an uncommon complication. The staphyloma may be partial or total. The pain, loss of vision, and repulsive disfigurement associated with this affection render the patient a great sufferer.



Complete Staphyloma.

Treatment.—Unless the condition is only that of a simple prolapse of the iris, the treatment is of no avail. When possible, abscission of the staphylomatous projection, forming a suitable stump for a glass eye, is to be preferred to enucleation, particularly in young children, in whom the presence of orbital contents is necessary for the symmetric growth of the face. If there are signs of infection or internal disease, enucleation is peremptorily demanded.

STAPHYLORRHAPHY.—See Cleft Palate.

STARVATION.—See Fasting.

STATUS EPILEPTICUS.—See Epilepsy.

STATUS LYMPHATICUS (Lymphatism).—A hyperplasia of the thymus, spleen, lymphatic glands and lymph tissues, including bone marrow, occurring usually in children. It is associated with a marked tendency to sudden death, either without tangible cause or subsequent to operation, anesthesia or antitoxin administration. The patient is anemic and the tonsils and thyroid are usually enlarged. In several cases a section of the enlarged thymus has been excised. There may be hyperplasia of the heart and aorta, and rickets.

STENOCARDIA.—See Angina Pectoris.

STERILITY.—In considering the causes of sterility it should be remembered that the husband is at fault in about 30 percent of all sterile marriages. Bilateral epididymitis is a potent factor in male sterility. Imperfect development of the

sexual organs is an important cause of sterility in women. The ovaries may be undeveloped, in which case ovulation is imperfect or absent; the uterus may be very small, or the vagina may be so narrow that complete sexual intercourse is impossible. Obstruction in some part of the genital tract may cause sterility. All cases of atresia of the vagina, cervix, or fallopian tubes would come under this class. The two former conditions are usually congenital, the latter is usually the result of inflammation. Tumors and polypi may act as sources of obstruction, as may also displacements of the uterus. Chronic inflammatory conditions of the tubes and ovaries, uterus, and vagina are frequent causes of sterility. Inflammation of the ovary may prevent ovulation by destroying the glandular substance, or by causing thickening of the capsule, which prevents rupture of the follicle and escape of the ovum. Inflammation of the uterine and vaginal mucous membrane causes sterility mainly on account of the leukorrheal discharge that accompanies it. This is particularly true of inflammation due to gonorrhea. Cancer of the cervix obstructs the cervical canal, and at the same time produces a profuse leukorrhea.

The treatment will, of course, consist in eliminating the cause whenever this is possible. If the condition is due to errors in development, little or no hope of cure can be entertained. Atresia or congenital narrowness of the cervix or vagina may be treated by incisions or dilatation. If displaced, the uterus must be replaced. Tumors and polypi require removal.

Inflammatory conditions require appropriate treatment. If the tubes and ovaries are affected, little good can be accomplished; if the inflammation is confined to the uterus and vagina, treatment is very effective. In a certain small percentage of sterile marriages the sterility is undoubtedly the result of incompatibility. These cases are usually not benefited by treatment.

STERILIZATION.—The condition of rendering sterile, infertile, or incapable of reproducing. In bacteriology the destruction by heat of the spores or mature forms of bacilli, micrococci, or other forms of microscopic life. In most instances a temperature of 100° C. (212° F.) devitalizes not only the mature forms, but the spores as well. The methods of sterilization of instruments, dressings, ligatures, etc., are fully discussed under Abdominal Section (*q. v.*). See also Disinfection, Milk (Sterilized).

STERNUM, INJURIES.—Fracture of the sternum is exceedingly rare, except when there exists injury to other bones connected with it. The fracture may be transverse, oblique, or longitudinal. Such injury with dislocation (most usual at the junction of the manubrium with the gladiolus), is often complicated by laceration of the pleura, pericardium, or other injury to the lung. Attempts at reduction are most difficult, although it has been accomplished by manipulation in a few cases. The prognosis in uncomplicated fracture or dislocation of the sternum is favorable. In complicated cases the mortality is high.

Treatment.—When overriding exists, reduction may be obtained by bending back the body over a firm pillow, and then ordering deep respiration; or reduction may be affected under ether. When corrected, the deformity tends to recur, and the bones often unite in faulty position, with no disastrous sequels. Fragments should not be cut down upon or hooked up unless complications are present. After reduction, adhesive strips may be placed laterally, extending down from the axillary line and running vertically from well above the seat of fracture to the ensiform cartilage. An anterior figure-of-eight bandage may envelop the breast. A circular bandage of the chest, a posterior figure-of-eight, holding back the shoulders, may suffice. A large compress held by adhesive plaster and a broad tight roller may be employed. The erect or semierect position in bed favors easy respiration, and antagonizes the tendency to displacement. When the ensiform cartilage is bent in so as to cause great pain or to injure the stomach, it should be excised.

STERNUTATORIES.—See Errhines.

STERTOR.—The noisy breathing of a person in a state of coma. There exists a paralytic condition of the muscles of the lips, cheeks, tongue, fauces, and soft palate. The latter becomes a flaccid curtain moving to-and-fro with respiration—a similar movement occurring in the cheeks and lips. The tongue falls toward the pharynx, mucus collects in the mouth, and, becoming mixed with air, appears frothy at the mouth. As a result of these conditions, there is a snorting noise.

STETHOSCOPE.—An instrument for ascertaining the condition of the organs of circulation and respiration by their sounds. It consists of a hollow tube, one end being placed over the locality to be examined, the other at the ear of the examiner. A binaural form of the instrument consists of a Y-shaped tube—the flexible branches being applied each to an ear of the listener. By this means not only are all extraneous sounds shut out, but an intensified sound is conveyed to the ear. The Phonendoscope (*q. v.*) is a recent modification. See also Chest (Examination).

STILLINGIA (Queen's-root).—The root of *S. sylvatica*, or "queen's-delight." Its active principle is not known. It is expectorant, diuretic, and sialagog, with reputed alterative properties; in larger doses, emetic and cathartic. It is used with sarsaparilla as an antisyphilitic in the tertiary stage. It is valuable with quinin in intermittent fever. Dose of the powdered root, 10 grains to 1 dram; of the fluidextract, 10 minims to 1 dram.

STIMULANTS.—A term which is used in various senses when applied to medicinal agents. Alcoholic preparations, which are true narcotics, are commonly termed "stimulants," and the same expression is employed to designate any agent which excites even briefly the organic action of any part of the system. All excessive stimulation reacts into depression, and most of the agents which stimulates the nerve centers at first will soon depress and finally paralyze them. In many cases

the action is one of progressive stimulation primarily and progressive paralysis afterward, affecting the centers in the inverse order of their development, the highest or latest developed centers being affected first, the lowest or oldest ones last. These laws are well exemplified in the action of Alcohol (*q. v.*) upon the nervous system. *Diffusible Stimulants* are those which have a prompt but transient effect on the general system, such as alcohol, ammonia, camphor. *Spinal Stimulants* exalt the functions of the cord, as strychnin, picrotoxin, ergot, atropin, phosphorus. *Cardiac Stimulants* increase the action of the heart, as alcohol, adrenalin, strychnin, atropin, and morphin in small doses; also squill, convallaria, cimicifuga and digitalis, which slow but strengthen the cardiac action. *Respiratory Stimulants* directly stimulate the respiratory center, as ammonia, strychnin, apomorphin, belladonna. *Vascular Stimulants*, as alcohol, chloroform, ether (all three in very small quantities), adrenalin, ammonia, strychnin, digitalis, and squill, acting on the vasomotor center; and the nitrites, belladonna, electricity, volatile oils, acting as local dilators of the vascular system. *Cerebral Stimulants*, as alcohol, opium, belladonna, caffein, cocain, cannabis, chloroform, ether, tobacco. *Renal Stimulants*, as the diuretic group. *Stomachic Stimulants*, as the aromatics, volatile oils, vegetable bitters, mineral acids, nux vomica, mustard, capsicum. *Hepatic Stimulants*, as nitromuriatic and nitric acids, and the cholagog purgatives podophyllum, jalap, leptandra, euonymin, iridin. *Intestinal Stimulants*, as mercurials, elaterium, colocynth, jalap, scammony, podophyllum, which effect the glandular apparatus—and belladonna, physostigma, nux vomica, rhubarb, senna, aloes, frangula, cascara, which chiefly affect the muscular fibers and the intestinal nerves. *Cutaneous Stimulants*, as the diaphoretic group, and the rubefacients, mustard, capsicum, turpentine, ammonia. *Local Stimulants* increase common sensibility to the extent of producing pain, chiefly by direct action upon the end-organs of the sensory nerves in the skin, though some act probably by stimulating the local circulation, as in inflammation. The principal members of this sub-division are: heat, cold, faradism, alcohol, ether, chloroform, phenol, cresote, ammonia, mineral acids, volatile oils, acrid essential oils, metallic salts, veratrin (at first), cantharis (at first).

STINGS.—See Bites and Stings.

STOKES-ADAMS SYNDROME.—See Heart Block.

STOMACH, CANCER. Varieties.—(1) Hard cancer (scirrhus); (2) colloid cancer; (3) soft cancer (medullary); (4) epithelioma.

Etiology.—(1) Heredity, (2) adult life, (3) male sex, and (4) ulcer of the stomach are the most common etiologic factors.

Pathology.—Cancer of the stomach is generally a primary affection, and next to cancer of the uterus is the most frequent seat of this disease. It is generally situated at the lesser curvature and pyloric end of the stomach. The medullary variety is very prone to undergo ulceration. In many cases cancer of this organ may be secondary to the disease elsewhere.

Symptoms and Clinical Course.—There are no characteristic symptoms in the early stages. Later it presents the following: Constant and localized pain; dyspeptic manifestations; constipation; rapid emaciation; cachexia; moderate anemia and leukocytosis; hematemesis, causing vomiting of a "coffee-ground" material long after eating; absence of free hydrochloric acid in the gastric contents one hour after a test-breakfast; and the presence of a tumor in the epigastrium.

Diagnosis.—(See also Gastritis (Chronic)).

Prognosis.—The disease is inevitably fatal. The duration is from 1 to 3 years.

Prophylaxis.—Since chronic ulceration has been found to be one of the most frequent causes of cancer of the stomach, early excision of gastric ulcers is advisable.

Treatment is merely palliative. If the stomach is intolerant of food, resort must be had to rectal alimentation, and the best that can be hoped for is to prolong life, which can only be one of suffering.

Any formula for rectal alimentation may be used. See Stomach (Ulcer).

Peptonized milk may also be given. It may be made as follows: Extract of pancreas (5 grains), sodium bicarbonate (15 grains), and a cupful of water; to this add a pint of milk. Heat for 10 minutes at a temperature of 100° F.

℞. Pepsin, ʒ j
Dilute hydrochloric acid, ʒ jss
Syrup, ʒ iij
Water, add enough to make, ʒ ij.
Teaspoonful after meals.

℞. Strychnin sulphate, gr. ss
Solution of iron and ammonium acetate, ʒ vj.
Two teaspoonfuls after meals.

For the pain, morphin (1/4 grain) may be given hypodermically. For the indigestion and similar symptoms, see Gastritis (Chronic).

The operative treatment is discussed under Stomach (Surgery).

STOMACH, CATARRH.—See Gastritis.

STOMACH, DILATATION.—A permanent increase in the capacity of the stomach, due to atony or pyloric obstruction.

Synonyms.—Gastrectasia; gastric atony; myasthenia.

Etiology.—(1) Overeating; (2) beer drinking; (3) rapid fermentation of gastric contents; (4) certain diseases—heart-disease, tumors (cancer) of pylorus, typhoid fever, tuberculosis, tabes dorsalis; (5) it may be secondary to chronic gastritis.

Pathology.—The muscular coats of the stomach are much thinner than normal, and the mucous membrane is in a state of atrophy. There are evidences of hyperplasia of connective tissue of the muscular coat in certain areas. The capacity of the stomach may be equal to 6 pints of fluid.

Cancer of the Stomach.	Tumor of the Liver.	Tumor of the Spleen.	Cancer of the Pancreas.	Tumor of the Colon.
1. Tumor nearly always present in region of pylorus (epigastric region).	1. Tumor usually in right hypochondriac region.	1. Gastric cancers seldom present in area of spleen. History of malaria or symptoms of leukemia.	1. Tumor in region of epigastrium.	1. Tumor in umbilical region.
2. Tumor hard, uneven, and tender.	2. Tumor hard, uneven, or nodular and tender.	2. Tumor hard, usually smooth.	2. Tumor hard, nodular, and tender.	2. Tumor may be hard or soft.
3. Tumor slightly movable.	3. Usually movable. If carcinoma, immovable.	3. Tumor immovable....	3. Tumor immovable...	3. Tumor movable.
4. Dulness on percussion.	4. Increased area of dulness in right hypochondriac region.	4. Increased area of dulness in left hypochondriac region.	4. Increased area of dulness when stomach is collapsed.	4. Increased area of dulness, and separable from the stomach.

Symptoms and Clinical Course.—There is a sense of fulness in the epigastrium, which may be visibly distended; eructation of gas, copious vomiting of liquid material, containing small particles of food and having a very sour odor, are also prominent signs. The appetite is lost, the tongue is coated, the bowels are constipated, and the urine is high colored and scanty. Emaciation and anemia may be quite marked.

Physical Signs.—Inspection may detect the outline of the organ, which distends the abdominal walls. In cases of complete obstruction of the pylorus the peristaltic wave can be traced.

Palpation confirms inspection.

Percussion.—The patient is placed in a standing position; percussion should be made from the lower border of the ribs in the midsternal line downward. A tympanitic note will be detected over the upper area of the stomach, and dulness over the base of the organ on account of the fluid contents gravitating to this position as the patient stands erect. Immediately below this dulness tympany again begins, due to the position of the bowel. If the patient assumes a horizontal position, the contents of the stomach gravitate posteriorly, and tympany will exist where dulness was previously found.

Should the area of the stomach be shown to be below the navel, the organ is considered to be in a state of dilatation. If it is desired to confirm the diagnosis, the organ may be dilated artificially: give tartaric acid (1 dram) dissolved in water (2 ounces), and subsequently sodium bicarbonate (1 1/2 drams) in the same quantity of water. Malignant disease must first be excluded.

Diagnosis depends upon the symptoms and physical signs.

Prognosis.—If due to malignant growth, the prognosis is unfavorable. If due to simple atony, relief may be obtained.

Treatment.—The first indication is removal of the cause if possible. The patient must accustom himself to smaller quantities of food at each meal. A quart of liquid may be allowed in the 24 hours.

Constipation must be treated on general principles: first by correcting the diet, then by giving salines—Epsom salt (2 drams) or Rochelle salt (2 drams)—before breakfast. Fluidextract of cascara (1/2 dram) with an equal quantity of glycerin may be given at bedtime. Lavage of the stomach may be practised every 2 days. See Lavage.

℞. Strychnin sulphate, gr. 1/4
Dilute hydrochloric acid, } each, ʒ j
Pepsin, }
Syrup, ʒ iij
Water, add enough to make, ʒ iij.

Two teaspoonfuls after meals.

℞. Creosote, ʒ j
Compound tincture of cardamom, add enough to make ʒ iij.

Teaspoonful half-hour after meals.

STOMACH, EXAMINATION.—The patient shuld be in the recumbent posture in a strong light.

Inspection detects the outline in very thin persons, and sometimes the peristaltic wave and the presence of tumors.

Palpation.—The hand should be placed flat upon the abdomen, the fingers making gradual pressure, at the same time having a rotatory movement. By this method are detected epigastric pulsation, as in cardiac disease, anemia, aneurysm of aorta, the shape and position of epigastric tumors, and localized pain.

Percussion yields a tympanitic note by which may be detected the correct outline. The upper and right lateral boundary extends along the lower border of the right lobe of the liver; the left lateral boundary to the inner border of the spleen. The stomach has no fixed position, as it is very movable. To determine the lower boundary, percussion should begin in the region of the umbilicus, gradually going upward until an impaired resonance is elicited.

The stomach may be *increased in size* by (1) gaseous distention, (2) large quantity of liquid or food, or (3) tumors.

The stomach is *displaced downward* in (1) emphysema, (2) left pleural adhesion, (3) enlargement of the liver or spleen, (4) tight lacing, or (5) deep inspiration.

The stomach is *displaced upward* in (1) tympanites, (2) ascites, (3) tumors, or (4) during the latter months of pregnancy.

The correct outline of the stomach may be obtained by making separate solutions of sodium

bicarbonate (1 1/2 drams) and tartaric acid (1 dram), each in half a glass of water. The tartaric acid solution should be given first, followed immediately by the sodium bicarbonate. Malignant disease should always be excluded before causing rapid dilatation of the stomach.

Auscultation detects (1) the normal deglutition murmur, and (2) obstruction at the cardiac orifice of the stomach.

1. To obtain the normal deglutition murmur, place the stethoscope over the esophagus and just below the xiphoid cartilage, and allow the patient to drink a small quantity of water. The first murmur in health occurs immediately, and is hissing or spurting in character. Within from 5 to 7 seconds the second sound is heard; it is due to the escape of the water from the esophagus into the cardiac end of the stomach, and has a gurgling, sprinkling, or splashing sound.

2. When there is obstruction at the cardiac orifice of the stomach, the second is delayed in some instances for over a minute. See STOMACH-CONTENTS.

STOMACH, INJURIES. Rupture.—Traumatism seldom causes a laceration except when the stomach is overdistended with liquid or semi-liquid material. It may be severely injured through contusion of the abdominal wall, in which case the rent is found near the pyloric orifice. Laceration of the mucous membrane has been found resulting from lavage of the stomach. In the case of incomplete tears there are hematemesis and severe localized pain, resembling gastric ulcer in its gnawing character, together with symptoms of shock. If the wound of the organ is large, and there is a great extravasation of the stomach-contents, a general peritonitis is produced. If, on the contrary, the wound is small, there is a tendency to form adhesions whereby the inflammatory area will be isolated from the general peritoneal cavity.

Treatment.—Whenever the stomach is perforated, the indication is to explore the parts after abdominal section, and remove all infection that may have taken place in the peritoneal cavity by the extravasation of the intestinal contents. The wound in the stomach is then sewed by means of Lembert sutures, and is closed according to the general rules of antiseptic surgery.

Foreign Bodies.—These generally consist of such substances as have been swallowed accidentally, or of concretion from the constant ingestion of such substances as hair and wool, which finally agglutinate into a mass. The only treatment for such a condition is to open the organ (gastrotomy) and remove the mass; if, however, the foreign body is of small dimensions, such as a coin, it may safely be allowed to pass onward. See STOMACH (Surgery).

Hernia of the Stomach.—The stomach has been rarely found in inguinal hernias and still less frequently in femoral hernias. The diagnosis is not usually made until operation, and fatal results are common. Herniotomy is indicated in such cases, and the stomach should be dealt with by simple reposition or resection of a portion of its wall if damaged beyond the possibility of repair. The stomach may also prolapse in a diaphragmatic hernia.

STOMACH, NEUROSES.—See GASTRIC NEUROSES.

STOMACH, SURGERY.—Gastrolysis, or loosening the stomach from adhesions, has been found necessary in a number of cases in which extensive adhesions have given rise to severe pain and decided disturbance of digestion.

Such adhesions arise most frequently as a result of gastric ulcer, but they may be caused by general peritonitis or inflammatory conditions in neighboring organs, such as the liver, gall-bladder, colon, pancreas, spleen, or abdominal wall. The condition is difficult of diagnosis, as there are no distinctive symptoms, and it is seldom that the cause of the disorder has been determined before operation. The adhesions may be very broad or they may be band-like, in which case there is often danger of constriction of the bowel. Operation by celiotomy and excision of the bands or loosening the adhesions is usually followed by perfect relief. In some cases of very extensive adhesions producing stenosis of the pylorus or partial hour-glass contraction, gastroplasty, resection, or partial gastrectomy may be necessary.

Gastrotomy for the removal of foreign bodies is indicated in cases in which the nature of the foreign body is such that it either cannot pass or can only pass with great risk, or if urgent symptoms arise. More or less sharp or jagged bodies, such as pins, small knife-blades, and bits of glass, have often been well tolerated by the stomach; but in cases accompanied by serious pain and discomfort operation is imperative. Any body the size of which permits it to pass the cardia will usually pass the pylorus, but this is not true of long bodies. Aggregations of small bodies, such as masses of hair, fish-bones, or pebbles, sometimes require removal. In case severe and continued pain or distress is present, with or without nausea, vomiting, and hemorrhage, operation is demanded.

Diagnosis.—Usually the history of the case leaves no doubt as to the diagnosis, and very often the object may be felt through the abdominal wall. In children, insane persons, etc., in whom there is doubt as to the condition, the use of the X-ray will often furnish valuable information.

Gastrotomy for the relief of stricture of the esophagus may be necessary in cases in which it is impossible or undesirable to dilate by means of a bougie passed by the mouth. This is often the case if the stricture is located low down in the esophagus, particularly in cases in which the esophagus becomes dilated or pouched above the stricture. Immediate dilatation by bougies or the fingers may be practiced or the stricture may be divided by Lange's specially constructed knife-blades or by Abbé's bow-string method. In such cases the stomach is immediately closed. If, however, a large portion of the esophagus is constricted and repeated dilatation is required, a temporary gastric fistula may be established,

which will either close spontaneously, or may be closed at a subsequent operation.

Abbé's Bow-string Method.—A string is passed into the esophagus through the mouth, or, better, through an opening into the esophagus in the neck; then it is passed into the stomach and out through the gastric incision: the stricture is made tense by a bougie, and the string, sawed back and forth, will only divide the tense stricture and not the relaxed portion of the esophagus.

Exploratory gastrotomy has been performed in a number of cases in which no positive diagnosis could be reached by any other means; discovery has thus far followed in every case, and in most cases pathologic conditions have been found and successfully treated. The slight danger from the operation and the facility which it offers for correct diagnosis in cases of hemorrhage arising from erosions or small ulcers, symptoms due to incipient carcinoma, polypi of the mucous membrane, and other obscure conditions, makes the operation thoroughly justifiable.

Exploratory operations are strongly indicated "in cases of rapidly developing cachexia and emaciation with the symptoms of chronic gastritis and absence of HCl. Tentative treatment should not be prolonged over three weeks. It is not nearly so serious a fault to have caused the opening of a stomach and found nothing operable, as to permit a case to continue and find out at the autopsy only that it was a circumscribed carcinoma, the removal of which might have prolonged life for years." (Hemmeter.)

The Operation of Gastrotomy.—Before anesthetizing the patient for operation, it is desirable to wash out the stomach, and 8 or 10 ounces of some innocuous fluid may be left to aid in finding the stomach. The distention of the stomach by large quantities of gas, as has been suggested by some surgeons, is not without its danger of infecting the peritoneum, particularly if the stomach-wall is ulcerated, nearly perforated by a foreign body, or rendered friable by disease. If stricture of the esophagus is present, this lavage is, of course, impossible. The incision may be made parallel to the left costal margin, or, if the foreign body is large, in the median line. Before opening the stomach, it should be brought out of the abdominal cavity, if possible, and carefully examined to make certain that the stomach and not the transverse colon is being dealt with; the colon is recognized by its longitudinal muscular bands. It is then walled off with iodoform gauze to avoid contamination of the peritoneum. Stay loops may be passed through the serous and muscular coats to aid in holding the organ. The line of incision in the stomach-wall is perhaps best made parallel to the course of the vessels—that is, transversely to the curvatures—but it will depend much upon the object of the operation; after this is attained the opening is closed by Lembert's or Halsted's mattress sutures, and the abdominal wound is sutured without drainage.

Gastrostomy is the establishment by operation of a fistula through the abdominal and gastric walls, for the purpose of introducing nourishment.

Indications.—The reason for the operation exists in some insuperable obstruction in the digestive tract above the stomach, which prevents the introduction of food: to prevent death by starvation. Perhaps the most common source of obstruction is malignant disease of the esophagus or cardia; other causes are: Syphilitic stricture, diverticulum of the esophagus, congenital closure, cicatricial contraction, chemic or traumatic destruction of the walls of the esophagus, obstruction by the pressure of growths outside the esophagus, and malignant disease of the pharynx and mouth.

Epithelioma is the most common variety of malignant growth affecting the esophagus, and it occurs more frequently in males after middle life. **Fibrous stricture** is usually a sequence of ulceration caused by swallowing very hot water or caustics, or, in at least two recorded cases, as a sequel of typhoid fever. It may be due to constant traumatic irritation or injury, as sword swallowing. Benign tumors outside the esophagus, taking their origin in its walls, are rarely a cause of obstruction; this is also true of growths in the neck or thorax, such as aneurysms of the aorta or innominate artery, tumors of the larynx, etc.

Diagnosis of Esophageal Obstruction.—The most important subjective symptom is difficulty in swallowing, which gradually increases until there is absolute inability to swallow first solid food and later food of any sort. Pain at the part affected radiating to the stomach and mouth is frequent. There may be tenderness on pressure. Food is regurgitated, in some cases mixed with mucus, pus, and blood. There is digestive disturbance, and loss of strength and weight. Objective signs are obtained by passing the esophageal bougie and by auscultation. The bougie should be soft and flexible and must be passed with great care, as deaths have been reported from the rupture of aneurysms, perforation of the pleura and of the esophagus itself, even by skilled surgeons. Considerable familiarity with the sounds of deglutition in normal and diseased conditions is necessary for satisfactory diagnosis by this means.

The operation of gastrostomy has been performed by various methods, the object aimed for in most of them being the avoidance of leakage of the gastric contents and subsequent excoriation of the skin, which followed the earlier operations in which the stomach was fixed to the abdominal wall and opened directly.

The operation which was devised independently by **Ssabanejew and Frank** avoids leakage and the necessity for wearing a tube, and is generally to be preferred. According to this method an incision is made along the left costal border, and the stomach is drawn out into a cone above 1 1/2 inches (3.9 cm.) long. A second incision is made an inch (2.5 cm.) above the costal border; the skin between the two incisions is undermined; the apex of the cone of the stomach, which has already been fixed by suture at the first incision, is drawn out through the second incision, passing under the bridge of

the ensiform cartilage. The cut is about 4 inches long and may be enlarged by a transverse section of the rectus.

The small intestine is exposed by pulling the omentum upward and to the left. The jejunum is then to be found; the loop of gut is emptied and clamps are applied.

On the lowest possible point of the anterior wall of the stomach a spot is selected for the stomach opening. This portion of stomach and the loop of jejunum are pulled out of the belly and the cavity protected with gauze pads. An anastomosis is made between the stomach and the jejunum, using either sutures or the Murphy button. The method of making the anastomosis is identical with that of enteroenterostomy (lateral anastomosis).

The field of operation is cleansed, all instruments which have touched the mucosa are put aside. The line of union is inspected, and if necessary, reinforced with a few Lembert sutures. If the point of union causes the intestine to kink sharply, this may be remedied by a few stitches uniting to the stomach a little more of the afferent or efferent portions of gut or of both. The wound is closed.

The after treatment is very important. As soon as the patient has recovered from the anesthetic he should be placed in the semierect position, as this facilitates the passage of fluid through the anastomotic opening and also tends to prevent pulmonary congestion. In treating these patients Mayo begins to give them one ounce of hot water by mouth at the end of sixteen, eighteen or twenty hours. If it is well borne, the quantity is rapidly increased. At the end of 36 hours he allows liquid food.

Pylorectomy.—By this term is understood the removal not only of the pylorus, but with it as much of the duodenum and stomach as is diseased.

Indications.—The operation is performed almost entirely for carcinoma of the pylorus, although it has been practised in a number of cases for ulcer and cicatricial stenosis of this region. Whether the operation is undertaken or not depends upon the extent of the growth; the amount of adhesions to other organs, and the extent of involvement of glands. In the present state of medical knowledge it is impossible to determine absolutely the existence of carcinoma in its incipiency; but if operation is to be more than palliative, it must be undertaken early. Considering the harmlessness and simplicity of exploratory celiotomy and the fatal consequences of delay, it seems justifiable that, in cases of obstinate gastric disturbances that do not yield to medical means, exploratory operation should be undertaken even in the absence of a palpable tumor. Factors that are of aid in the diagnosis are the existence of dilatation of the stomach, cachexia, an excess of lactic acid, hematemesis, the presence of the Oppler bacillus, absence of free hydrochloric acid, age past 40, and a diminished amount of hemoglobin and number of red blood-corpuscles.

The Operation.—The preparation is the same as for gastroenterostomy. Various methods have been employed. Billroth resected the tumor, and as the opening in the stomach is so much greater than that in the duodenum, the stomach wound was partially closed by suture until it reached a size sufficient for end to end anastomosis with the duodenum. The anastomosis is best made lower than the upper end or middle of the gastric opening, to facilitate emptying the contents of the stomach. Kocher closes both the stomach and duodenum and makes a posterior end to side anastomosis by insertion of the duodenum in the posterior wall of the stomach, with or without Murphy's button. Czerny first performs posterior gastroenterostomy with Murphy's button, and then, after resection of the tumor, closes the stomach and duodenum. Forceps may be used to good advantage.

The average mortality of the operation as now done by skilful surgeons is probably from 20 to 25 percent. Some have reported series of cases with a considerably lower death rate than this, Mayo for instance, having done 100 operations with a mortality of 14 percent and Kocher 58 with a mortality of 15 percent.

Pyloroplasty is the term applied to operative enlargement of a stenosed pylorus. It has fallen into disfavor with the majority of surgeons, although a few still practise it. Mayo states that it failed to give relief in 30 percent of his cases and that another operation had to be resorted to.

The Heineke-Mikulicz operation was devised and performed independently by the surgeons whose names it bears in 1886–87. A longitudinal incision is made at the seat of constriction, the incision is then stretched at its middle at a right angle to the incision, so as to dilate the strictured pyloric opening, and the margins of the opening are sutured in this new position.

Gastroplication or Gastrorrhaphy.—The former is the preferable term. It is used to designate the operation of making a fold in the stomach-wall and suturing it.

Indication.—The operation has been performed chiefly in the treatment of dilatation of the stomach, although its use has been suggested in threatened perforating ulcer. In case the dilatation is due to malignant pyloric stenosis, pylorectomy or gastroenterostomy is the preferable operation.

The Operation.—After opening the abdomen the greater curvature of the stomach is lifted up to the lesser curvature, thus folding the anterior wall on itself, and the fold is held in place by two rows of sutures. A similar result has been attained by certain operators by the use of purse-string sutures.

The permanent results of the operation are not yet definitely determined, for as yet sufficient time has not elapsed to form judgment. Sixteen operations have been reported with but one death. The almost unanimous conclusion of those who have performed the operation is in its favor.

Gastropexy is the name applied to the operation of suturing the stomach to the anterior abdominal

wall. The operation has been performed for the relief of gastroptosis or sagging of the stomach, which is with difficulty distinguished from dilatation. The condition present is usually one of general visceral ptosis, hence the operation is commonly futile (Binnie).

Gastroplasty, Gastroanastomosis, and Gastrogastrostomy are performed for hour-glass stomach. In gastroplasty a longitudinal incision is made in the constricted portion between the two pouches of hour-glass stomach; the incision is stretched at a right angle, and sutured as in the Heineke-Mikulicz operation of pyloroplasty. The operation has been performed successfully in 7 cases. In gastrogastrostomy an opening is made in each of the two gastric pouches, and a free communication is established between them by anastomosis of the two openings. The operation has been performed in 5 cases with 1 death. Gastroanastomosis has also been successfully performed by Watson, as follows: The pouches were folded over on the constricted portion between the two as a hinge; the anterior wall of the stomach was incised, to give access to the double septum between the pouches; an opening was made in this double septum and sutured, and the incision in the anterior stomach-wall was closed. This method would be impossible if there were adhesions fixing either pouch.

The three operations seem equally successful, and the one selected would depend upon the mechanic conditions of each case. Hour-glass stomach may be congenital, but usually does not develop until adult life. The most common cause is adhesions following gastric ulcer. It is with great difficulty that a differential diagnosis can be made between this condition and obstruction due to pyloric stenosis. If severe disturbances of digestion arise, as is often the case, one of these operations would be indicated.

Surgical Treatment of Gastric Ulcer.—See STOMACH (Ulcer).

Gastrectomy.—The operation may be either partial or complete. In partial gastrectomy, only a portion of the stomach-wall is removed pylorectomy is an example of partial gastrectomy. This operation is indicated in cases of tumors of the stomach and in certain perforating or perforated gastric ulcers. Complete gastrectomy is the removal of the entire stomach. It has been believed possible to distinguish between the epithelial layers of the mucous membrane of the esophagus and of the stomach, but recent investigations seem to indicate that no well-marked boundary-line exists, so it is difficult to say absolutely when the entire organ is removed. Sufficiently extensive operations to deserve the name of total gastrectomy have been performed in 10 cases, with 4 recoveries from the operation. Two of these patients have since died from recurrence of the growth.

Indications.—The operation may perhaps be considered indicated in case of extensive malignant growths of the stomach which have not caused metastasis or become extensively adherent to neighboring organs, but the operation should certainly be performed only in the rarest and most unusually favorable cases, by surgeons of exceptional skill and wide experience in abdominal surgery.

STOMACH, ULCER. Synonyms.—Peptic ulcer; simple or round ulcer; gastric ulcer.

Etiology.—(1) Traumatism; (2) hemorrhagic infiltrations; (3) hyperacidity; (4) anemia; (5) heart-disease; (6) nephritis; (7) chronic catarrh. Both gastric and duodenal ulcers result from the same causes.

Pathology.—Generally, the ulcerative spot is round in contour and is situated on the posterior wall of the lesser curvature of the stomach. The edges are usually clean-cut, and from above downward are cone-shaped, with the base resting on the peritoneal coat of the organ. In some instances a perforation occurs, leaving a "punched-out" appearance. The duodenal ulcer is usually situated at the upper portion of the bowel. In many cases there is a series of ulcers scattered over the mucous membrane of the stomach.

Symptoms and Clinical Course.—There are localized pain, vomiting, hematemesis, gradual loss of flesh and strength, dyspepsia, grave anemia, and excessive secretion of hydrochloric acid. The hemoglobin may be reduced to 50 per-cent and the red cells are proportionately decreased. The leukocytes in some cases are decreased; other cases show leukocytosis.

The pain is very characteristic, being always localized and made worse by pressure or ingestion of food. It is of a burning, sharp, or acute character.

Hematemesis is possibly the most marked objective symptom of the disease. It may come on either while taking violent exercise or during the period of rest, and has occurred during the night hours. Hematemesis occurs in about 50 percent of the cases of gastric ulcer.

Complications.—(1) Perforation, giving rise to peritonitis; (2) death from hemorrhage, perforation, or exhaustion; (3) cicatricial contraction, causing obstruction.

Diagnosis.—See GASTRITIS (Chronic).

Prognosis is guardedly favorable.

Treatment.—For the first few weeks after the ulcer has been detected absolute rest in bed should be enjoined, and only a liquid diet allowed. In most cases, perhaps, it is best to give the food by the rectum for the first few days, continuing as long as the digestive powers maintain the strength of the patient.

Rectal Alimentation.—Before giving a nutritive enema the bowels should always be irrigated with a quart of lukewarm water, or normal saline solution, given as a high enema. Peptonized milk is the best nutrient (Tyson).

Boas recommends the following nutritive enema; 8 ounces of milk; the yolks of 2 eggs; 1 dram of sodium chlorid; 1 ounce of claret wine; and a tablespoonful of aleuronat flour. These ingredients to be thoroughly beaten together, subsequently warmed for a few minutes at a temperature of 99° F., and then slowly injected by means of a fountain syringe.

Ewald recommends the following: From 3 to 5 eggs are beaten up with 5 ounces of a 15 percent solution of glucose, to which a small amount of starch-water has been added. Also this: Boil flour (1/2 dram) in half a cupful of a 20 percent solution of glucose and add a wine-glassful of claret. To this are afterward added 2 or 3 eggs, well beaten in a tablespoonful of water.

Later in the treatment milk may be given by the mouth, together with a small amount of soup made from beans or potatoes. No solid food should be given for at least 3 weeks from the time the disease is diagnosed, and then only the lightest articles of diet.

Hematemesis.—Absolute rest must be enjoined, the patient not being allowed to sit up to take food or medicine or to defecate or urinate. If possible neither solids nor liquids should be given by the mouth for at least 2 days. To assuage thirst, the lips and tongue may be sponged off with ice-water containing a very small amount of glycerin.

An ice-bag or cloths dipped in ice-water or the ice-coil may be placed over the affected area. Pieces of ice may be swallowed. Copious enemata of hot water are advocated by Tripier. If the hemorrhage is severe, ergotol (20 minims) may be given hypodermically, together with morphin (1/4 grain). At the present time, however, preference is given to adrenalin chlorid in repeated doses of 10 drops of the 1 to 1000 solution, given in 1 dram of water.

Two weeks after the hemorrhage has occurred, Fox recommends the best treatment, a glass of laxative mineral water daily, with a light diet, and hot applications to the epigastrium. Nitrate of silver (1/4 grain) may be taken in a glass of water before meals.

Bismuth subnitrate in doses of 90 to 120 grains daily has proved most efficient in promoting healing of the ulcer. Local applications may relieve the pain; morphin should be avoided if possible.

The Lenhartz Treatment.—The patient is put to bed for 3 to 4 weeks and for the first 2 weeks is given a diet rich in albumen. Ice-cold food is given slowly by the mouth in small amounts at short intervals, beginning with 2 drams of egg and 4 drams of milk every hour for the first day, the intervals being 1 hour from 7 A. M. to 9 P. M. for the first 10 days. Lembert has suggested feeding the mixture of egg and milk, instead of each singly every hour, and adding sugar after the third day. For the effects of hemorrhage, enteroclysis is practised, and iron and arsenic are given for the anemia.

Surgical treatment may be indicated in non-perforating or in perforating gastric ulcers. The more remote effects of gastric ulcer have been discussed and their treatment has been considered under gastrolysis, gastroenterostomy, pyloroplasty, resection of the stomach, and the operations for hour-glass contraction of the stomach. See STOMACH (Surgery). Acute perforating ulcer indicates operation in case of dangerous and repeated hemorrhage, extremely severe pain, and intractable vomiting and indigestion; or when there is a suspicion of malignant degeneration. In such cases the ulcer may either be excised and the gastric wall sutured, or gastroenterostomy or pyloroplasty may be performed to put the ulcer at rest. Gastroenterostomy has been combined with excision in certain cases, with advantage.

Perforated Gastric Ulcer.—Usually, perforation occurs very suddenly, without any apparent cause, although violent exertion or traumatism has sometimes been the immediate cause. There is intense pain, generally localized in the left hypochondrium; there may be nausea and vomiting, perhaps vomiting of blood; soon after this symptoms of peritonitis set in; the abdomen becomes distended, tympanitic, and tender; and liver dullness is obliterated. The other constitutional symptoms develop as the peritonitis progresses.

Treatment.—All food should be withheld and preparations should be made for immediate operation. The incision may be made in the median line above the umbilicus or to the left of the median line. When the diagnosis is absolutely certain, the incision may be made with advantage parallel to the border of the ribs, as a large proportion of gastric ulcers perforate near the cardia and lesser curvature. A careful search should be made, first of the anterior wall of the stomach, beginning near the cardia, taking next the pylorus, and, finally, the posterior wall, the positions named being given in order of the relative frequency of perforation. The edges of the ulcer are inverted and the stomach-wall is sutured by one or two rows of Halsted or Lembert sutures. Great care should be taken that the entire ulcer is inverted, and careful search should be made for a second perforation or for a threatened perforation. Needless fatalities have resulted from the neglect of both of these precautions. If it is impossible to invert the edges of the ulcer, they may be brought into contact by suture, as if a cutaneous wound were being dealt with; and in case of possible insecure suture, the application of an omental graft would be an additional safeguard. If neither of these procedures is possible, the abdominal cavity may be walled off by iodoform gauze and a tube may be introduced down to the ulcer. The fistula that will result usually closes spontaneously or it may be closed later by a plastic operation. Great care should be taken in cleansing the peritoneal cavity. It should be thoroughly flushed with warm sterile salt solution and any suspicious spots wiped clean; if necessary, counteropenings may be made, and it is usually desirable to drain, not only at the seat of operation, but also from the pelvis. Success depends mainly upon early diagnosis and operation; patients operated upon within 12 hours from the time of perforation have excellent prospects for recovery, the mortality being only about 16 percent since 1896. Other features of importance are the amount of food contained in the stomach at the time of perforation, the condition of the patient, and the skill of the operator. A few years ago the mortality in a series of cases carefully collated was

about 53 percent. Moynihan has recently estimated it to be from 35 to 40 percent.

STOMACH-CONTENTS, EXAMINATION.—For purposes of examination, the contents of the stomach should be obtained through the stomach-tube, as vomited contents contain so much buccal and esophageal mucus that the examination is rendered difficult and imperfect. See LAVAGE. The gastric contents are examined as to color, amount, odor, consistency, individual food elements present and their state of disintegration and solution; also as to the presence of mucus, blood, pus, fragments of mucous membrane, or foreign bodies. This macroscopic investigation is followed by chemic analysis and microscopic examination.

Test-meals.—The contents are usually examined after a test-meal. One of the following test-meals is usually employed:

1. Ewald-Boas test-breakfast consists of 1 or 2 rolls and a cup of water. The examination is made 1 hour after eating.

2. Leube-Riegel test-dinner consists of soup, meat, potato and roll. Examination is made 3 or 4 hours afterward.

3. A meal consisting of 1 or 2 broiled finely chopped beef-balls, 1 or 2 ordinary slices of dry stale bread, and a cup of water (hot or cold). This is eaten at 9 o'clock in the morning, and the stomach is examined at 12 o'clock noon. No breakfast is allowed before 9 o'clock in the morning.

If possible, the stomach-contents are obtained undiluted, a feat quite readily accomplished by the Ewald expression method, which consists of voluntary contraction of the patient's diaphragm and abdominal muscles, thereby compressing the stomach and forcing a portion of the contents upward through the tube. Usually from 40 to 100 c.c. are thus obtained, and then filtered, and examined for hydrochloric acid. Before filtration, however, the contents may be tested for free acid by Congo paper, which changes from red to blue.

The chief tests for free hydrochloric acid are Günzburg's, Boas', and Toepfer's.

Günzburg's reagent is composed of phloroglucin (2 gm.), vanillin (1 gm.), and absolute alcohol (30 c.c.); it is unnecessary to use absolute alcohol, as ordinary pure alcohol will do as well. This solution is changed by the light, and should be kept in a colored-glass bottle. A porcelain capsule is overlaid with gastric filtrate, and 3 or 4 drops of the reagent added; the capsule is agitated to insure thorough mixture, and evaporated to dryness slowly over a Bunsen burner or an alcohol lamp. In the presence of free hydrochloric acid a beautiful rose-red color appears.

Boas' reagent consists of resorcin (5 gm.), white sugar (3 gm.), and alcohol (100 c.c.), and gives, with free HCl, a bright-red color, the test being conducted in the same manner as with the phloroglucin vanillin solution.

Toepfer's reagent is a 0.5 percent alcoholic solution of dimethylamidoazobenzol. It must be kept in a colored bottle. In the presence of free HCl it strikes a bright cherry-red without the use of heat. To 5 c.c. of the gastric filtrate add 1 or 2 drops of the reagent, and the whole turns red. This is a delicate, convenient, and valuable test, and is quickly made. It reacts to large (unusual) amounts of lactic or other organic acid, but in ordinary work this objection has no force. Friedenwald thinks highly of the test; Einhorn considers it somewhat unreliable; Hemmeter gives it front rank; and by others it is valued greatly.

Not only is Toepfer's reagent useful in the qualitative detection of free HCl, but also its quantitative estimation. Thus 10 c.c. of the gastric filtrate reddened by the addition of the reagent are treated by a decinormal sodium hydrate solution from a buret until the red gives place to a yellow color, and the number of cubic centimeters of soda solution required to neutralize the free HCl is taken as the multiplier of 0.00365. For example, 3 c.c. of soda solution are used and $0.00365 \times 3 = 0.1095$ percent.

For the determination of the amount of free HCl, organic acids, and acid salts, a 1 percent aqueous solution of alizarin may be used. To 10 c.c. of the gastric filtrate add 1 or 2 drops of the alizarin solution, and neutralize with decinormal sodium hydrate solution; a violet color results.

It is important to know the **total acidity** of the gastric contents, which is obtained as follows: To 10 c.c. of the gastric filtrate add 1 drop of the 1 percent alcoholic solution of phenolphthalein, and neutralize with decinormal sodium hydrate solution added slowly from a buret; a cherry-red color results. The number of cubic centimeters of sodium hydrate solution required to neutralize 10 c.c. of gastric filtrate is expressed as if 100 c.c. of the filtrate were used. The normal total acidity after a test-breakfast is from 40 to 65 percent—*i. e.*, 4 to 6.5 c.c. of soda solution are required to neutralize 10 c.c. of the gastric filtrate.

Lactic Acid.—For the detection of lactic acid Uffelmann's test is commonly used: Ten c.c. of a 4 percent solution of carbolic acid are diluted with 20 c.c. of distilled water, and 1 drop of ferric chlorid solution is added, which gives rise to an amethyst-blue color. The gastric filtrate is added, and if lactic acid is present, a canary-yellow color is produced. Alcohol, phosphoric acid, and glucose also give the reaction.

Butyric Acid.—Fatty acids may usually be detected by the odor. As they are volatile, the vapor arising from a test-tube in which the gastric filtrate is boiling reddens blue litmus paper held at the mouth of the tube.

Acetic acid may be detected by its odor, but it is better to extract with ether, evaporate, make an aqueous solution of the residue, neutralize with soda solution, and add a weak ferric chlorid solution, which gives a dark red color if acetic acid is present.

The Digestion of Proteids.—The hydrochloric acid of the gastric juice combines with albuminoids to form first syntonin or acid albumin. Pepsin hydrochloric acid digestion then results in the formation of proto- and heteroalbumose.

Following this change deuteroalbumoses are formed, and, finally, peptones. These albumoses are grouped under the name of propeptone, and though by elaborate tests they may be separated and differentiated, it suffices that propeptone is precipitated by adding an equal part of a saturated solution of sodium chlorid and acidulating with acetic acid; it dissolves on heating, and precipitates again on cooling. Peptone yields a purplish-red color upon the addition of Fehling's solution to the filtrate, as also does propeptone.

Rennet Ferment.—Add about 4 drops of the filtrate to 5 c.c. of fresh milk, and place in warm water (100° F.). In 15 minutes coagulation should take place. In case the milk is not curdled in half an hour, add 2 or 3 drops of a 1 percent solution of calcium chlorid, and if coagulation takes place, it indicates the presence of rennet zymogen.

Starch Digestion.—The action of saliva upon starchy foods is continued in the stomach to the formation of erythrodextrin, achroodextrin, and maltose. Tested with Lugol's solution, erythrodextrin strikes a reddish-brown color, while achroodextrin and maltose give no color change.

The microscopic examination of the gastric contents is important. In cases of hyperchlorhydria unchanged starch granules are often present in large numbers; while in cases of deficient gastric secretion undigested muscle-fibers are more numerous than under normal conditions. With benign pyloric stenosis, gastrectasia, and food stagnation, sarcinæ and yeast-cells are often found. They may be stained with methyl-blue, which also stains the so-called "Faden" bacillus —the Oppler-Boas bacillus—found with carcinomatous pyloric stenosis, and so significant of the disease. This is a very long, delicate, thread-like bacillus. Sarcinæ and yeast-cells are also found in the stagnating contents of carcinoma ventriculi, but not so frequently as in benign stenosis.

Pus-cells are rarely found. Red blood-corpuscles may be present. Mucus, epithelium, and mucus-corpuscles are commonly seen, especially in gastric catarrh. Many bacteria are present, among which may be a number that give rise to the formation of lactic acid. Small fragments of mucous membrane are sometimes found in the washings from the stomach, and they have been especially studied by Boas, Einhorn, and others. They have been found in cases of gastric erosion. They should be hardened, stained, and mounted, as atrophy of the glands or mucoid or cancerous degeneration may thus be discovered.

STOMATITIS, APHTHOUS (Herpetic Stomatitis; Vesicular Stomatitis).—This form of stomatitis is more common than the simple catarrhal form. It is characterized by a hyperemia of the mucous membrane of the mouth, and by the formation upon it of small, yellowish-white vesicles of a herpetic character. Children from 6 to 18 months of age are the most commonly affected.

Etiology.—The direct cause is uncleanliness of the mouth, improper and poorly prepared food, and dentition. The predisposing causes are malnutrition, unhygienic surroundings, digestive disturbances, and the tubercular diathesis.

Symptoms.—Quite characteristic symptoms are noticed in this affection. The child is dull, fretful, and feverish, does not wish to be disturbed, and refuses nourishment. The mouth is hot and painful, and the saliva, running over the chin and neck, causes these parts to be irritated. On inspecting the mouth, small vesicles are found under the tongue, on the gums, or upon the inner side of the lips. The vesicle soon disappears, but a small shallow ulcer remains for 4 or 5 days. These herpetic spots may be discrete or diffuse, covering more or less of the mucous membrane.

Treatment.—This affection is evidently self-limited. Recovery without treatment, as a rule, would probably take place in the course of a week or 10 days. As recommended in catarrhal stomatitis, however, in all cases the diet should be carefully regulated, the bowels gently acted upon with a laxative, the hygienic conditions, if faulty, improved, and the mouth and the nursing-bottle kept clean. In any form of stomatitis the following is an excellent mouth-wash:

℞. Salicylate of sodium, ʒ ij
Water, ʒ j.
Apply 5 or 6 times a day.

If the ulcers heal slowly, they should be touched with a stick of nitrate of silver.

STOMATITIS, CATARRHAL.—A simple catarrhal inflammation of a portion or of the entire surface of the mouth. It occurs most commonly during the period of first dentition.

The causes are uncleanliness of the mouth and of the nursing-bottle, etc., the ingestion of irritating or overheated food, and the eruption of the teeth. It may be secondary to gastrointestinal disturbances or to the exanthems.

Symptoms.—The mouth is red and is at first dry and hot; later, there is an increased salivary flow, which becomes acid and excoriates the skin around the mouth as it is dribbled. The tongue is coated, and the child is restless, feverish, and thirsty; the appetite is diminished, and the bowels usually are constipated.

Sucking causes pain, which is shown by the fact that the child drops the nipple with a cry as soon as its hunger is partly satisfied. The course of this form of stomatitis is usually acute, an attack lasting about a week.

Treatment.—Attention to the proper hygiene of the mouth will usually prevent it from becoming sore. The nursing-bottle and nipple should be kept scrupulously clean; the fingers should not be introduced into the child's mouth before being thoroughly cleansed; and, before and after feeding, the infant's mouth should be washed with plain boiled water or with borax and water on a clean, soft cloth. Careful regulation of the diet, a mild laxative, such as small doses of calomel (1/12 grain every 2 hours) or calcined magnesia (10 or 20 grains); and a mild alkaline mouth-wash,

such as the following, will usually be sufficient to cure the condition:

℞. Borax, ʒ j
Glycerin, ʒ ij
Rose-water, ʒ ij.

Use every 1 or 2 hours with a swab, gently washing the mouth. (Older children will be able to wash their mouths without the swab.)

STOMATITIS, GANGRENOUS (Noma; Cancrum Oris).—A rare affection, consisting of a gangrenous destruction of the tissues of the cheek, and possibly of the adjoining structures as well.

Etiology.—It is supposed to be microbic in origin. The most frequent predisposing causes are the exanthems or any disease which leaves the child weak and debilitated. In nearly all cases it is seen in those who are subjected to the worst possible hygienic and sanitary surroundings.

Symptoms.—There will be noticed at first an inflamed spot on the inside of one cheek near the corner of the mouth. This spot is at first hard, but soon ulcerates, and the cheek becomes swollen and edematous. From the first the breath has a gangrenous odor, and later the fetor becomes intense.

The gangrenous process spreads rapidly, perforating the cheek, and death will be caused by septic pneumonia or by a general systemic poisoning. Many cases die as early as the first 3 or 4 days, while others linger 2 or 3 weeks: recovery is extremely rare.

Treatment.—Strict cleanliness of the mouth in children whom debilitating diseases render liable to this affection is of prophylactic importance. When the gangrenous condition has commenced, however, the only treatment that offers any hope is free excision of the affected areas.

STOMATITIS, PARASITIC (Thrush).—An affection of the mouth characterized by a catarrhal condition and by the presence on the mucous membrane of white, flake-like patches. It occurs usually in young infants, and is caused by a vegetable parasite (one of the mold fungi) variously known as oidium albicans or saccharomyces albicans.

Etiology.—Uncleanliness of the mouth, giving rise to acid fermentation, is the principal indirect cause. It may be transmitted from one child to another by the nursing-bottle, spoons, etc. Dirty nipples and long nursing-tubes offer a fertile soil for the propagation and growth of the parasites.

Symptoms.—The fungus appears on the inside of the lips, on the gums, tongue and hard and soft palates, and may be limited to a small area of these parts or may extend to the pharynx or esophagus. It is white or gray in color, and has the physical appearance of curdled milk, for which, upon superficial examination, the spots might be mistaken; it will be found, however, that they are adherent to the mucous membrane.

The general symptoms are those of catarrhal stomatitis, by which it is accompanied. Microscopic examination of the deposits will make the diagnosis certain, if any doubt exists.

Treatment.—Absolute cleanliness of the child's mouth, and of the feeding apparatus and everything that may be brought in contact with it, is essential.

The diet must be appropriate and carefully regulated and prepared, and the general hygienic conditions must be made as good as possible, as this is essentially a filth disease. The mouth should be carefully washed every 1 or 2 hours when the child is awake, and before and after each feeding. The cloths that have been used to wash the mouth should be burned, and care should be taken to keep all articles that may have been in the mouth away from other children, as thrush may be conveyed from one to another.

The following formula is an efficient mouth-wash for this condition:

℞. Listerine, ʒ j
Dobell's solution, ʒ ij.

Dilute with an equal quantity of water and wash the mouth frequently.

STOMATITIS, ULCERATIVE.—This form of stomatitis consists of an inflammation and ulceration of the mucous membrane of the gums principally, though the tongue and cheeks may also be affected. It may occur at any time after dentition commences, but is most common between the ages of 3 and 10 years.

Etiology.—Ulcerative stomatitis is a prominent symptom of infantile scorbutus; it is also seen following the acute infectious diseases, and it is caused by salivation from the administration of mercury. Unhygienic conditions, malnutrition, etc., are common predisposing causes.

Symptoms.—Constitutional symptoms, such as slight fever, restlessness, anorexia, and thirst are usually present. The edge of the gums over the teeth—usually the lower incisors—is first seen to be reddened and swollen. The pain and salivation are more marked than in aphthous stomatitis, and the saliva is acrid, irritating, and of an offensive odor. The mucous membrane soon becomes purplish in color, spongy, and congested, and hemorrhages from it occur on the slightest pressure. The tongue is coated, the breath foul, the appetite lost, and the child rapidly becomes weak and emaciated. Under favorable conditions and proper treatment the affection usually disappears in 1 or 2 weeks. When caused by a cachectic condition or by constitutional disorders, such as scorbutus, the course will be governed by these conditions. In protracted cases the ulcerations may become gangrenous, and necrosis of the jaw may ensue.

Treatment.—The sanitary surroundings should, if faulty, be improved, and fresh air and sunlight are essential. Nourishing liquid diet should be given, and cool drinks to satisfy the thirst. If there is any constitutional disease that is the possible cause of the stomatitis, it should be properly treated.

Chlorate of potassium is a specific in this form of stomatitis. It should be given internally (as it is eliminated by the salivary glands) and as a mouth-wash. A child under 1 year of age may safely

be given from 10 to 20 grains in the course of 24 hours, and it is best given in small doses, frequently repeated. A convenient method of administering this remedy is to dissolve 1 dram in half a glass of water, giving from 1/2 to 2 teaspoonfuls, according to the child's age, every 1 or 2 hours. The mouth should be frequently washed with the same solution or with a solution of borax or salicylate of sodium. A teaspoonful of dioxid of hydrogen to the ounce of water also makes an effective wash.

STONE.—See Bladder (Stone), Gall-bladder (Diseases), Kidney (Stone).

STOOL.—See Feces.

STOVAIN. — Benzoylethyldimethylaminopropanol hydrochlorid. It is more stable than cocain, and is less than one-half as toxic as cocain, though equally powerful as an anesthetic, and has the great advantage of being a vasodilator, cocain being a vasoconstrictor. As a substitute for the latter it is used with great satisfaction for local and spinal anesthesia. Locally it may be used in the eye in 4 percent solution and applied to other mucous membranes, in 5 to 10 percent solution. For hypodermic injections for local anesthesia it can be used in 0.75 to 1 percent solution. For spinal injection, 1/2 to 5/8 of a grain is used (Badcock) in the spinal fluid, the alkalinity of which necessitates the addition of sodium chlorid in the proportion of 5 percent. See Intraspinal Anesthesia.

STRABISMUS.—See Eye-muscles.

STRAMONIUM (Thorn-apple).—The dried leaves of *Datura stramonium*, the well-known Jamestown or jimson-weed. It contains the alkaloids *atropin* and *hyoscyamin*, also some *hyoscin*, and a volatile oil containing daturic acid. *Daturin* is the name of the mixed alkaloids. Dose, 1/2 to 3 grains. See Belladonna. It has the general properties of belladonna, but is more powerful. Stramonium has held a high position as a local remedy in spasms of the glottis and in asthma. The smoke from the burning leaves may be inhaled. A convenient means of using it is to draw the fumes into the lungs through a pipe filled either with the pure leaves or with a mixture of the same with tobacco. The impression is ordinarily combined with that of nitrate of potassium. The effect should be carefully watched, since the poisonous properties of the drug may easily be induced. The smoke from about a half ounce of the leaves may be inhaled at a single sitting. The number of sittings is determined by the attendant circumstances. A sensation of heat in the lung, of fulness about the head, or of nausea is an indication that a maximum has been reached.

Preparations.—**S., Ext.** Dose, 1/8 to 1/2 grain. **S. Flext.** Dose, 1/2 to 3 minims. **S., Tinct.,** 10 percent strong. Dose, 5 to 15 minims. **S., Ung.,** contains of the extract 10, water 5, benzoinated lard 85 parts. **Daturin** is the alkaloid. Dose, 1/200 to 1/80 grain.

STRANGULATION.—See Asphyxia, Hernia, Intestinal Obstruction, Neck (Injuries).

STRANGURY.—Painful, scanty urination. It is a most prominent feature of poisoning by turpentine or cantharides, being induced even by the action of a blister. In various inflammatory conditions and morbid growths of the bladder and prostate gland it is also present, and is a constant symptom of acute posterior urethritis.

Treatment.—As a rule, hot baths and morphin are the most efficacious remedies. Free saline purging and the administration of belladonna are recommended. Barley-water, effervescing waters, milk, and other bland drinks are to be freely taken when the attack exists. Thirst may be slaked by iced drinks.

If there is overdistention of the bladder, catheterization may be necessary. See Urine (Retention).

STREPTOCOCCUS.—See Serum Therapy and Vaccine Therapy; Suppuration.

STREPTOCOCCUS INFECTIONS.—Denys (1896) succeeded in obtaining a streptococcus serum, and explained the mechanism of its action. He showed that it contained bacteriotropins (opsonins), and promoted phagocytosis when tested by animal experiment or in a test-tube. Marmorek maintains that all streptococci produce the same toxin, and that the serum of animals immunized against one form of streptococcus is effective against the toxins of all varieties. Other observers generally disagree with him in regard to these contentions, and are endeavoring to produce a serum which will be as polyvalent as possible, by immunizing with many species of streptococci. It is generally conceded that this serum is harmless, and that in cases of pure streptococcus infection it will destroy the organisms and control the symptoms caused by their toxin, unless used too late for any remedy to be effective. Some authorities consider it neither bactericidal nor antitoxic in its action.

Antistreptococcus serum has been employed successfully in erysipelas, puerperal fever and several forms of septicemia and pyemia due to streptococcus infection. Marmorek treated 411 cases of erysipelas with his serum, and reported a mortality of only 3 1/2 percent. He used it also in 16 cases of puerperal fever, of which seven, due to streptococcus infection, recovered; one, due to bacterium coli, died; and among eight of mixed infection with streptococcus, bacterium coli and staphylococcus, five died. Williams reported 14 cases of severe puerperal septicemia treated with this serum, and 2 deaths. Reports of 70 cases so treated by various physicians show only 2 deaths; among them being 29 of erysipelas, 15 of puerperal septicemia, 11 of infected wounds, and smaller numbers of septic cellulitis, cerebrospinal meningitis, scarlet fever, septic measles, pyemia, and acute gangrene. Packard and Wilson found records of 117 cases treated with antistreptococcus serum during 1901–2, of which 114 showed either a marked temporary improvement or a prompt recovery. These cases included puerperal septicemia, erysipelas, tuberculosis with pyogenic infection, general pyemia, local streptococcus infections, and a few cases of simple and pernicious anemia which seemed to be decidedly improved by injections of this serum. A combination serum, obtained from animals im-

munized by injections of both diphtheria toxins and streptococcus cultures, is used in advanced cases of diphtheria with double infection.

The treatment of articular rheumatism by antistreptococcus serum has been advocated by many clinicians, especially by Menzer, who showed that the action of this serum is bacteriotropic (opsonic), and claimed that it effects a cure or improvement even in cases which have become chronic. Other observers state that its true field includes the subacute and chronic cases without the stationary formation of new tissue. It has proved effective in endocarditis and in severe tonsillitis.

A streptococcic vaccine (strepto-bacterin) has given very satisfactory results in the same class of cases as the serum, also as a preventive and curative treatment in scarlet fever. Whether the serum or the vaccine is the most valuable therapeutic agent has not yet been definitely established (Potter).

STRICTURE.—See Esophagus(Stricture), Rectum (Stricture), Urethra (Stricture), etc.

STRIDOR.—A peculiar, harsh, vibrating sound arising from some obstruction in the throat or in the larger respiratory tubes. It is most commonly due to compression of the trachea by some extraneous growth, or to spasm or paralysis of the vocal bands.

STROKE.—See Brain (Hemorrhage), Heatstroke.

STRONTIUM.—This metal is represented in medicine by its salts, the bromid, iodid, salicylate (see Bromin, Iodin, Salicylic Acid) and the lactate. They are believed to be much less irritating to the stomach and less prone to cause eruptions than the sodium and potassium salts, though at the same time they are less powerful than the latter. Elimination, too, is more rapid and more complete.

The lactate in doses of 5 to 30 grains has been successfully employed in diabetes and in albuminuria. It diminishes the amount of albumin in Bright's disease, in the parenchymatous nephritis of rheumatic and scrofulous subjects, and in the albuminuria of pregnancy; for which purpose it should be given in full doses (gr. xxx) thrice daily. It is contraindicated when there is scanty urine or symptoms of uremia.

STROPHANTHUS.—The ripe seed deprived of its long awn, of *Strophanthus Kombé*, an African climbing plant from which the natives extract a toxic preparation known as the Kombé arrow-poison. It contains a crystalline glucosid, named *strophanthin*, the active principle, which is an agent of great energy, the frog being killed by a solution of 1 part in 10,000,000. Dose of strophanthus, 1/2 to 2 grains. In medicinal properties it closely resembles digitalis, producing loss of reflex sensibility and of voluntary motion, but not causing contraction of the arteries to the same degree. Strophanthus is undoubtedly a valuable cardiac stimulant, from the rapidity and permanence of its action, as well as from its noninterference with the caliber of the peripheral vessels. It promptly relieves cardiac dyspnea, often modifies the pulse-rate in less than an hour, while the influence of a single dose upon the circulation persists for a long time. It may replace digitalis in the treatment of chronic nephritis and valvular lesions of the heart, when it is important that the work of the heart should not be increased by any additional resistance in the arterial system. It has been reported as useful in the treatment of dyspnea, orthopnea, dropsy, and uremia, also in mitral insufficiency, with great anasarca and dyspnea; in palpitation, exaggerated cardiac action, and in weak heart, and for exophthalmos, with tumultuous action of the heart; also in pulmonary edema, due to valvular lesions or to pneumonia. It is useful in endocarditis, also in atheroma of the arteries; in reflex palpitation of neurasthenia, hysteria, and chlorosis, and for rigors due to catheterization or operations on the urethra. Dose of the tincture, 5 to 10 minims; of strophanthin, 1/300 to 1/100 grain.

STRUMA.—See Scrofula.

STRYCHNIN.—$C_{21}H_{22}N_2O_2$. A poisonous alkaloid in the fruit of *Strychnos nux vomica* and found in St. Ignatius' bean. It crystallizes in four-sided prisms, melting at 284° C., and possessing an extremely bitter taste. See Nux Vomica.

STUMP.—See Amputation.

STUTTERING.—See Speech Defects.

STYE (Hordeolum).—A furuncular or phlegmonous inflammation near the hair follicles or margin of the lid. Eye-strain is a common cause.

Symptoms.—It begins with a pricking pain, soon followed by swelling of the affected lid. A tender, hard spot is easily located by palpation, and may be inspected by raising the lid away from the eyeball, when a yellowish point will be seen.

Treatment.—If pus is seen, it should be released; and, as a rule, the symptoms will usually immediately subside. The pointing of the stye is hastened by the application of hot compresses for 15 minutes every 2 hours. To prevent recurrence, cleanliness and disinfection with a lukewarm bichlorid solution (1:5000) are demanded. A 10 percent sulphur ointment may be used. Recurrence of styes is suggestive of refractive error or of constitutional disorder, and the ametropia should be corrected and the general health improved.

STYPTICIN.—The hydrochlorid of cotarnin, a base produced by the oxidation of narcotin. It has been used with good results as a styptic and sedative in a number of cases of uterine disease, the dose being from 1 to 5 grains by mouth or hypodermically, four or five times a day.

STYPTICS.—See Hemostatics and Styptics.

STYRACOL.—Guaiacol cinnamate. Styracol is an intestinal antiseptic and is claimed to combine the antituberculous actions of guaiacol and cinnamic acid. It is said to liberate in the intestinal canal a larger proportion of its guaiacol (up to 85 percent) than other synthetic preparations of that substance. Dose, 15 grains.

STYRAX (Storax).—A balsam obtained from the wood and inner bark of *Liquidambar orientalis*, or oriental sweet-gum. It contains a volatile oil (styrol), a crystalline solid (styracin), several resins, and cinnamic acid. It is a stimulant

expectorant, an antiseptic, and disinfectant, acting like benzoin and tolu, and is used in bronchial affections and in catarrh of the urinary passages. Externally, it is an antiseptic and parasiticide. It is a constituent of Friar's balsam. Dose, 5 to 20 grains.

SUBARACHNOID INJECTION.—See INTRASPINAL ANESTHESIA.

SUBINVOLUTION.—Failure or delay on the part of the uterus to return to its normal condition after labor. See INVOLUTION.

SUBLAMIN.—A combination of mercuric sulphate and ethylene diamin, containing 43 percent of mercury. It is insoluble in alcohol, but freely soluble in water, and is used in 1:500, or 1:1000 solution for disinfecting hands and instruments.

SUBLIMATE.—See MERCURY.

SUBMERSION.—See DROWNING.

SUBUNGUAL EXOSTOSIS.—See NAILS (Diseases).

SUCCUSSION.—The shaking of the individual from side to side for the purpose of determining the presence of fluid in a cavity or hollow organ of the body. **The succussion sound** or **splash** is the peculiar splashing sound heard in hydropneumothorax or pyopneumothorax when the patient's chest is slightly shaken. It is due to the combined presence of air and fluid in a closed cavity. It was first described by Hippocrates, and hence is also known as the "Hippocratic sound." The sound may also be obtained in the presence of a dilated stomach partly filled with fluid. See CHEST (Examination).

SUDAMEN.—See SWEAT GLANDS.

SUDDEN DEATH.—See DEATH (Sudden).

SUDORIFIC.—See DIAPHORETICS.

SUFFOCATION.—See ASPHYXIA.

SUGAR.—See DIABETES, URINE (Examination).

SULPHOCARBOLATE.—The old name for phenolsulphonate. A salt of phenolsulphonic acid (sulphocarbolic acid). See PHENOLSULPHONATE.

SULPHONAL.—Sulphonmethane. Acetone diethysulphone. It is soluble in 100 parts of water at 16° C., in 20 parts at 100° C., and readily soluble in alcohol; it crystallizes in colorless leaflets or plates that melt at 126° C., and is odorless and tasteless.

Therapeutics.— As a hypnotic sulphonal acts admirably in many instances, if administered in hot fluids and about 2 hours before its action is required; but its efficacy decreases with use, and it is of no value whatever against insomnia due to pain. The average hypnotic dose is about 20 grains for a woman and 30 grains for a man. The dose is to be administered only once daily, and should be discontinued at the first sign of toxic action. In no case should its administration be continued over any great length of time. In cases of insomnia due to neuralgia and nervous excitement, the dose of sulphonal may be advantageously combined with a small dose of morphin, in proportion to suit individual cases, the mixture forming a safe and efficient hypnotic. An excellent hypnotic combination is made by mixing together 10 or 15 grains each of sulphonal and trional, to be taken in some hot liquid at bed-time. The trional producing early sleep and the sulphonal effects being manifested later, the patient will usually obtain a more prolonged result from the small dose of each agent administered together than from a larger dose of either alone. See TRIONAL.

Poisoning.—The prolonged use of sulphonal may give rise to such minor toxic effects as noises in the ears, headache, vertigo, weakness, and incapacity for mental or physical exertion. The patient may next pass into a condition of drowsiness or stupor and even death, or he may suffer from difficulty of speech; ptosis, edema of the eyelids, and cyanosis may occur. The stopping of the drug in subjects of sulphonism is followed by vertigo, motor disturbances, general weakness, digestive disturbances, etc., a condition resembling that in morphinism when the morphin is suddenly cut off (Lepine). In one reported case a dose of 20 grains nightly for 15 months was accompanied by complete cessation of menstruation (Potter). It has produced persistent skin eruptions in some cases and severe functional disturbances in others. The chief characteristics of chronic poisoning by this drug are as follows: Disturbances of digestion, shown by vomiting and diarrhea or constipation; disturbances of the nervous system, as ataxia and feebleness of the limbs, ptosis, and ascending paralysis; also ischuria and oliguria, sometimes albuminuria, or the presence of hematoporphyrin (Karst). Recovery follows rapidly if the entire alimentary tract is thoroughly purged; and as long as this is kept free, and the kidneys act efficiently and normally, the drug may be considered harmless (Fuerst). In order to secure elimination and to guard against cumulative action and consequent toxicity, its administration should be interrupted from time to time. Anorexia, vomiting or pains in the stomach may be regarded as indications for immediate discontinuance (Karst).

SULPHUR (Brimstone).—S = 32; quantivalence II, IV, VI. Sulphur is official in three forms:

Sulphur Sublimatum, *Sublimed Sulphur,* prepared from crude sulphur by sublimation and condensation. It is a fine citron-yellow powder, of faintly acid taste and acid reaction, insoluble in water or alcohol. Ignited it burns with a blue flame, forming sulphurous acid gas, and leaving no residue or only a trace. Dose, 10 grains to 2 drams.

Sulphur Lotum, *Washed Sulphur,* prepared by digesting sublimed sulphur with dilute water of ammonia, thoroughly washing with water and passing through a sieve. Solubility and dose same as for sulphur precipitatum.

Sulphur Precipitatum, *Precipitated Sulphur, Lac Sulphuris, Milk of Sulphur,* prepared by boiling sublimed sulphur with slaked lime and water. It is a very fine, yellowish-white, amorphous powder, odorless and almost tasteless, insoluble in water or alcohol, but completely soluble in carbon disulphid or in a boiling solution of soda. By heat it is completely volatilized. Dose, 10 grains to 2 drams.

Sulphur is chiefly used as a laxative when pultaceous rather than liquid stools are required,

as in hemorrhoids and anal fissure, also in constipation. Scabies has long been treated by its local and internal use, but sulphur alone does not kill the itch insect. The older sulphur ointments were made with sublimed sulphur, and probably contained a considerable amount of sulphurous acid, on which their parasiticide property depended. The later ointments, made with purified sulphur, all contain an alkaline ingredient and develop sulphids, which are powerful insect poisons. Sulphur fumigations are practically applications of volatile sulphurous acid, while most of the sulphur baths and sulphurous mineral waters are solutions of sulphuretted hydrogen or of the alkaline sulphids. They are of value in lead poisoning to favor the elimination of that metal, in chronic constipation, chronic rheumatism and sciatica and many skin diseases, especially chronic psoriasis, eczema, pityriasis and prurigo. The ointment is used in scabies.

Preparations.—**S. Dioxid,** SO_2, a colorless gas of irritating odor, formed by the combustion of sulphur; and in the presence of moisture acting as a powerful bleaching and disinfecting agent. As an insecticide it is unexcelled. See DISINFECTION. **S. Iodidum,** I_2S_2, used as an ointment, 30 grains to 1 ounce. **S. Ung.,** washed sulphur 15, benzoinated lard 85 parts.

SULPHURIC ACID.—H_2SO_4. Oil of vitriol, a heavy, oily, corrosive acid, consisting of not less than 92.5 percent sulphuric anhydrid and 7.5 percent water. Its uses and actions are the same as those of most other mineral acids, particularly hydrochloric acid. In lead-poisoning it forms an insoluble sulphate. It is used as a remote astringent in diarrhea, hemorrhoids, hemorrhages, night-sweats, and in mucous discharges. It does not increase the acidity of the urine. In **poisoning** by sulphuric acid water is to be avoided. Alkalies—such as sodium carbonate or bicarbonate, magnesia, chalk, soap, whiting, and wall plaster—are antidotes. Albumin, flour, milk, starch, and olive oil will protect the mucous membranes. Of antagonists, opium, ammonia (intravenously), and alcohol may be given to combat the depression of the vital powers.

Preparations.—**Acid, Sulph. Aromatic.,** contains 20 percent (by weight) acid, diluted with alcohol and flavored with cinnamon and ginger. Dose, 5 to 15 minims, well diluted. **Acid., Sulph. Dilut.,** contains 10 percent strong acid to 90 of water. Dose, 5 to 40 minims, well diluted.

SULPHUROUS ACID.—H_2SO_3. A colorless acid containing about 6 percent sulphurous anhydrid in 94 percent water. The gas, SO_2, is a very valuable disinfectant. The acid is used as a spray or lotion in diphtheria and stomatitis, and as a wash for indolent and syphilitic ulcers. The various hyposulphites are mainly valuable in that they decompose and give off sulphur dioxid. Dose, 5 minims to 1 dram. See MAGNESIUM, POTASSIUM, and SODIUM.

SUMBUL.—The dried rhizome and root of an undetermined plant. It contains *angelic* and *valeric acids*, also a volatile oil, balsamic resins, and a bitter principle. Dose, 10 to 60 grains.

Sumbul is an efficient nerve tonic, having qualities closely resembling musk and valerian. It is used by the Russian physicians in very many morbid conditions and seems to be a favorite remedy in that country for almost any disease. It is probably of some value in hysteria and other nervous derangements of delicate females, and may be used as a substitute for musk in typhoid conditions and fevers, asthma, delirium tremens and perhaps in epilepsy.

Extractum S. Dose, 1 to 10 grains. **Fluidextractum S.** Dose, 10 to 60 minims.

SUMMER COMPLAINT.—See CHOLERA INFANTUM, CHOLERA MORBUS.

SUNBURN.—The superficial local effects of exposure to the sun's rays. In slight cases little or no treatment is required. Powdered starch, zinc oxid, bismuth or boric acid, or mere sprinkling with elder-flower water or rose-water may suffice. A solution of ammonium acetate may be pleasant. Severe cases require lead lotion, with morphin or cocain. Subacetate of lead with glycerin and elder-flower water or rose-water makes a good application. Preventive treatment consists in protecting exposed parts from the sun's rays. Sunshades, veils, and masks are useful but inconvenient. The greased paints used by actors may be employed in sea-bathing. Pigments mixed with glycerin of starch are better than those compounded with grease. For the freckles following sunburn, lotions of mercuric chlorid or boric acid—especially when made with almond water in emulsion by the use of glycerin—or the juice of cucumber may have a beneficial effect. See FRECKLES.

SUNSTROKE.—See HEAT-STROKE.

SUPERIMPREGNATION.—Two varieties of superimpregnation are described: (1) Superfecundation and (2) superfetation.

Superfecundation is the fecundation of two or more ovules at or near the same period of time. It occurs in one variety of twin pregnancy.

Superfetation is the production of conception while an embryo already exists in the uterus. Some remarkable cases have been reported that would seem to prove the possibility of its occurrence. That it can occur after a long interval is doubtful, however, since there is no proof of ovulation during pregnancy.

SUPERINVOLUTION.—An exaggeration or abnormal prolongation of that process by which the uterus regains its normal condition after labor. See INVOLUTION.

SUPPOSITORY.—A solid, medicated compound, designed to be introduced into the rectum, urethra, or vagina. Its consistency is such that, while retaining its shape at ordinary temperatures, it readily melts at the temperature of the body. The basis of most suppositories is oil of theobroma. For urethral suppositories a mixture of gelatin and glycerin is used. It is generally molded into a conic shape, but is sometimes cylindric or spheric. According to the directions in the U. S. P.: *Rectal suppositories* should be cone-shaped or spindle-shaped, and when made from oil of theobroma should weigh about 2 grams.

Urethral Suppositories (*Bougies*) should be pen-

cil-shaped, pointed at one extremity, and either 7 cm. in length, weighing about 2 grams, or 14 cm. in length weighing about 4 grams, when made with glycerinated gelatin. If prepared with oil of theobroma, they should weigh about one-half the above quantities.

Vaginal Suppositories should be globular or oviform in shape and weigh about 10 grams if made with glycerinated gelatin, and about 4 grams if made with oil of theobroma.

There is one official suppository, the glycerin suppository, containing glycerin, monohydrated sodium carbonate, stearic acid, and water.

Anodyne suppository:

℞.	Extract of opium,	gr. j
	Extract of belladonna leaves,	gr. ss
	Extract of hyoscyamus,	gr. ij.
	Cacao-butter, a sufficient quantity to make 6 suppositories.	

Use one in the rectum morning and night.

SUPPRESSION OF URINE.—See URINE (Suppression).

SUPPURATION.—By this term is meant the production of pus. While it is true that experimentally (as by the hypodermic injection of nitrate of silver, calomel, turpentine, abrin and ricin) suppuration can be produced without the presence of pyogenic bacteria, yet it may be laid down as a broad general principal that where there is pus there also are found the bacteria or the poisons that produce it.

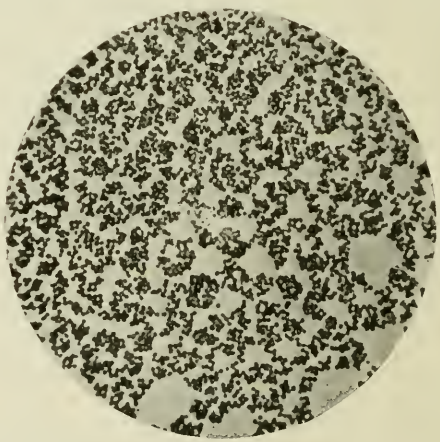
Pus from an acute abscess in an otherwise healthy person is a thick, creamy, opaque, yellowish-white, slightly alkaline fluid, with a faint odor, salty taste, and a specific gravity of about 1030. If a drop is examined under the microscope, it is found to consist of a fluid (the liquor puris) and corpuscles (pus-cells). Some of these corpuscles are globular, slightly granular, and measure 1/2400 inch in diameter, while some contain two or three nuclei, which are made more evident on the addition of acetic acid to clear up the granular matter. Among them may be seen other corpuscles, indistinguishable from leukocytes, and exhibiting, when examined on a warm stage, ameboid movements. The latter are living leukocytes and tissue cells; the former, leukocytes and proliferated tissue cells that have undergone death and degeneration. The proportion of dead to living pus-cells varies with the duration of the inflammation. The liquor puris consists of water, albumin, and salts, of which chlorid of sodium is the chief. It coagulates on boiling. Though probably derived in chief part from the exudation of the serum through the vessels, it differs from serum in that it does not coagulate spontaneously. In acute abscesses the pus contains granular material, derived from the rapid degeneration of the tissues, and various species of microorganisms, usually cocci. If allowed to stand or decompose in an imperfectly drained abscess cavity, the pus will be found, moreover, teeming with the bacteria of putrefaction.

Varieties of Pus.—*Normal, healthy* (formerly called *laudable*) pus is best illustrated by that which is found in staphylococcic infections; it tends to remain localized, and the tissues from which it comes quickly recover after thorough drainage has been established. It is a greenish-white, creamy fluid, without odor, alkaline in reaction, and of a specific gravity of 1030. *Sanious* pus is mixed with blood, and is sometimes seen in caries and carcinoma. *Malignant or ichorous* pus is watery, acid, and very irritating to the tissues. *Blue* pus is due to the bacillus pyocyaneus, *orange* pus to hematoidin crystals the result of degeneration of red blood corpuscles, and *stinking* pus to the bacteria of putrefaction or the bacillus coli communis. *Concrete or fibrinous* pus contains flakes of lymph; *serous* pus, a large quantity of serum; and *muco-pus*, mucus. *Gas producing* pus is due to the bacteria of putrefaction, bacillus of malignant edema, bacillus aerogenes capsulatus, bacillus coli communis, or to communication with one of the air-containing viscera.

Tuberculous, scrofulous, caseous, or curdy pus, found in tuberculous processes, and *gummy* pus, the result of a degenerating gumma, are not, strictly speaking, pus.

The microorganisms that are most active in this process are the staphylococcus, the streptococcus, the gonococcus, and the bacillus pyocyaneus.

The Staphylococcus Pyogenes.—The varieties are staphylococcus pyogenes aureus, staphylococcus pyogenes citreus, and staphylococcus pyogenes albus. The staphylococcus pyogenes



STAPHYLOCOCCUS PYOGENES AUREUS, PURE CULTURE. × 1000.—(*Williams.*)

aureus is the one most commonly found in all cases of localized suppuration. The arrangement of the growth is in the shape of a bunch of grapes; hence the name "staphylococcus." These varieties of the staphylococcus grow upon artificial culture media, and from their chromogenic properties in this respect produce various colors: "aureus," orange or golden color; "citreus," lemon color; "albus," white color. The different forms are not motile and are without spores.

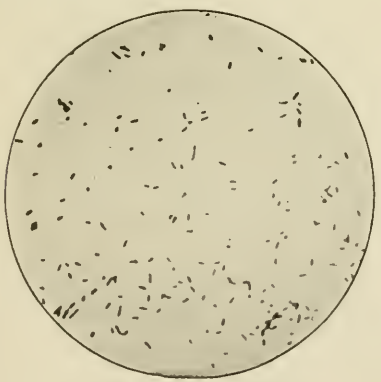
They stain with the ordinary watery or alcoholic solutions of anilin dyes and by Gram's method.

Streptococcus Pyogenes.—In this variety of pyogenic cocci the arrangement of the organism in its growth is in the shape of chains; hence the name "streptococcus." While in the case of the staphylococcus the tendency is to produce a local-

STREPTOCOCCUS PYOGENES, FROM A PURE CULTURE. × 1000.—(*Williams.*)

ized abscess, the streptococcus produces a suppurative process having a tendency to spread throughout the tissues. It is supposed to be one of the causes of erysipelas. The microorganism is not motile, and does not contain spores. It grows upon artificial culture media and stains with ordinary watery or alcoholic solutions of anilin dyes and by Gram's method.

The streptococcus erysipelatis is described under ERYSIPELAS (*q. v.*).



BACILLUS PYOCYANEUS.—(*Kolle and Wassermann.*)

The gonococcus was discovered by Neisser, in 1879, and is the cause of gonorrhea. These small hemispheric microorganisms are not motile, like other forms of cocci, and have no flagella and no spores. For many years attempts to cultivate this variety of bacteria upon artificial culture media proved futile, but after very painstaking effort it has been grown upon a mixture of human blood-serum and agar-agar. In the gonorrheal pus the microorganism is nearly always found in pairs within the epithelial cells. It stains best with rather weak, watery solutions of anilin dyes, but not by Gram's method. See GONORRHEA.

The bacillus pyocyaneus is a short, delicate bacillus of small size, frequently united in chains of 4 or 6. It has round ends, is actively motile has one terminal flagellum, does not form spores, and is almost purely aerobic. It stains well with ordinary solutions, but does not retain the color by Gram's method. It is found in pus of a peculiar bluish or greenish color.

Method of Staining for Staphylococci, Streptococci, and Gonococci.—Upon a perfectly clean cover-glass place a drop of the pus to be examined, and upon this place a similar cover-glass. Separate them horizontally, and dry in the air. With a pair of forceps grasp one edge of the cover-glass and pass through the flame of an alcohol lamp or Bunsen burner 3 times, each time allowing the specimen to occupy about 3 seconds in its passage through the flame. Upon this specimen then pour, by means of a pipet, a saturated aqueous or alcoholic solution in the case of streptococcus or staphylococcus pyogenes, but a weak, watery solution in case of gonococci of one of the anilin dyes, preferably methylene-blue, and allow it to remain for from 1/2 to 2 minutes; then rinse in water and mount in Canada balsam.

Gram's Method of Staining Bacteria.—Fix the specimen on a cover-glass. Instead of using the ordinary anilin dyes in alcoholic or watery solution, the following is used. It should always be freshly prepared (Ehrlich's solution):

Pure anilin,	4 gm.
Saturated alcoholic solution of gentian-violet,	11 gm.
Water,	100 c.c.

Grasp the prepared specimen with a pair of forceps, and pour upon it a few drops of the above solution and warm over the flame for from 2 to 5 minutes, constantly adding the solution. Remove and place in:

Iodin crystals,	1 gm.
Potassium iodid,	2 gm.
Water,	300 c.c.

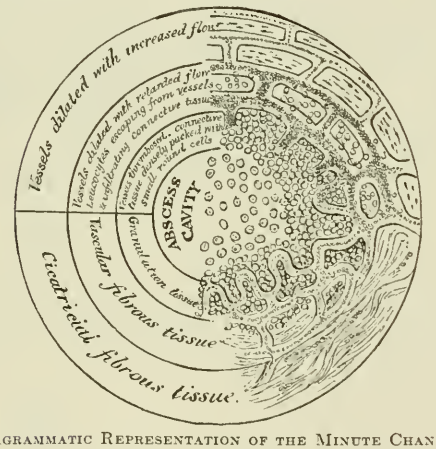
Allow the specimen to remain in this solution for from 2 to 5 minutes, wash in 95 percent alcohol, and counter-stain with eosin or Bismarck brown.

Circumscribed Suppuration or Abscess.—An abscess is "a circumscribed cavity of new formation containing pus." According to location, abscesses are named *dorsal, iliac, mammary, ischiorectal, perityphlitic, retropharyngeal, urethral*, etc. Abscesses are also known as superficial, deep-seated, acute or phlegmonous, chronic, common, specific, and residual.

An acute abscess is one that runs its course rapidly, and is always accompanied by well-marked inflammatory symptoms. It is, from its great frequency, one of the most important of surgical diseases. When an inflamed part becomes

more heated and more swollen; when the skin assumes a dusky hue, and becomes glossy and shiny; when the pain, which has been of a dull, heavy nature, becomes persistent, steady, and throbbing, and when the skin over the swelling is edematous, then there can be no doubt that an abscess has formed.

Pathology.—In the formation of an abscess the first phenomena are those of inflammation, which have been described; when the production of embryonic tissue has been reached, if it stops at that point, resolution is established and recovery ensues; but should the new "cellular infiltrate" be invaded by any microorganism of suppuration, and a suitable soil for its nidus and growth be found, their excreta, known as ptomains, peptonize the fibrin and change the embryonic tissue to a liquid, which is pus. The changes here described begin in the lymph spaces, so that an abscess never has its commencement at a single focus; the accumulation of liquid and of cells causes the lymph spaces to be greatly distended; the fibrous tissues separating these spaces are widely pressed asunder, causing their supply of blood to be cut off, sloughing being the result; moreover, the living pus-cells find in these fibers a source of nourishment, and they are thus destroyed; hence the lymph spaces become converted into a single cavity, and an abscess is formed.



Diagrammatic Representation of the Minute Changes in the Formation and Healing of an Abscess.

The upper half shows abscess enlarging; the lower half abscess healing.—(*Walsham.*)

From the periphery to the center of an abscess all stages of inflammation are presented, from the first, which is the stage of congestion, to the last, which is the period of the formation of pus. Between these two conditions there is a middle point, when the inflammatory process has reached only the formation of embryonic tissue; and hence it is that the cavity of an abscess is always circumscribed by a tissue of new formation. Not only does an abscess extend in various directions, but all abscesses tend to empty themselves at the point of least resistance; they approach the surface, where they spontaneously evacuate themselves, their tendency being toward the skin. The abscess discharges itself by a small opening, which is due to the death of a limited portion of the skin. The contents of an acute or phlegmonous abscess are pus, micrococci, and some shreds of dead tissue. In some cases the abscesses contain air, when the contents are extremely fetid.

Phlegmonous abscess occurs in all periods of life and in all classes of persons; it varies in size, and is frequently found in subcutaneous connective tissue, in the muscular tissue, around the lymphatic glands, and around the bones. Its most common sites in the viscera are the liver and the brain.

Chronic Abscess.—The effect of the bacillus of tuberculosis on tissue is to produce a chronic inflammation, which results in the production of granulation tissue; this is the so-called pyogenic membrane of old authors, and acts as a protective wall to the surrounding tissue. The degenerative changes that take place are caused by local anemia and by the chemic action of the ptomains of the tubercle bacilli; they consist of caseation and liquefaction of the cheesy material. This purulent material has hitherto been looked upon as pus; it is now known to be tissue that has undersgone metamorphosis. Pus is never present in a tubercular process unless the microorganism of suppuration is present, when there will be a mixed or double infection.

If the bacillus meets with a double resistance from the surrounding tissue, it exhausts the nutritive material in the granulations and dies; or it remains in a latent condition; the granulation is converted into a cicatricial tissue, and the local lesion is cured. This is designated spontaneous cure. The liquid may also be absorbed, when a similar favorable termination is possible. If the cavity is opened under antiseptic precautions, cure is accelerated; if, however, secondary infection with pus microbes takes place, the patient is in danger of septic infection as well as of local and general dissemination of the tubercular process.

Treatment of Abscess.—The chief indications are to remove the pus with as little injury to the tissues as possible, to insure sufficient drainage, and to maintain the parts in an aseptic condition. When it is evident that suppuration must ensue, it should be promoted by moist warmth in the form of a large boric acid poultice sprinkled wih opium or hot poppy fomentations. As soon as fluctuation is detected, the abscesses should be opened by making a free incision in the most dependent part or where it is pointing, of course taking care to avoid blood-vessels or other important structures in the neighborhood. The pus should generally be allowed to flow out of its own accord. To insure thorough drainage, and to prevent any tension from reaccumulation, the opening should be free and a drainage-tube should be inserted. If the abscess is large, a counteropening may be necessary, or the abscess cavity may degenerate into a sinus. If the drainage is efficient, no harm will ensue if a poultice—the favorite treatment of the older surgeons—is applied; but if the abscess is deep and the aperture small, and there is thus danger of the pus being retained and undergoing

decomposition, antiseptic dressings or boric acid fomentations should be used, as under these circumstances the retained discharge will probably be under some degree of tension, and the granulation walls of the abscess hence inefficient to prevent absorption. Although it is a rule in surgery to open an abscess as soon as fluctuation clearly shows that pus has formed, there are some instances in which this is especially imperative. Thus, an abscess should be opened at once when it is situated in the perineum, in the abdominal or thoracic walls, in the sheath of a tendon, under a deep fascia or the peritoneum, in the orbit, near a joint, and in the neck if attended by dyspnea; when obstructing some passage; when caused by the infiltration of urine, feces, etc., and when a spontaneous opening would produce deformity.

Hilton's method, as it is called, of opening an abscess is very useful when the abscess is situated deeply and among important structures, as at the root of the neck or in the axilla. It consists of making an incision through the skin and fascia and then working gently in the direction of the pus with a director. As soon as pus presents, a pair of dressing forceps are slid along the groove of the director into the abscess cavity, the director is removed, and the blades of the forceps are separated so as to stretch the opening and make a free exit for the pus.

The complications of acute abscess are: (1) Hemorrhage from the involvement of a large vessel; (2) the implication of some important part, as the peritoneal cavity, the interior of a joint, etc.; (3) degeneration into a sinus or fistula; (4) blood-poisoning (sapremia, pyemia).

The chronic abscess must not be allowed to open itself spontaneously. This precaution is to be particularly borne in mind when the glands of the neck are affected. Open the abscess in the most dependent portions, using a straight, sharp bistoury for the purpose; press out the accumulated material; scrape out the abscess thoroughly; wash it with an antiseptic solution of bichlorid of mercury, then bring the opening together by means of a suture; insert a drainage-tube and place iodoform gauze upon the outside. Before opening an abscess of large size, and after ether has been administered, give 1/6 grain of morphin, hypodermically, and also administer 1/6 grain of opium every 8 hours. The effect of opium is to prevent capillary hemorrhage after the removal of pressure.

Constitutional Treatment.—When the suppuration is profuse, tonics—such as iron, quinin, and strychnin—together with good, nutritious diet, milk-punch, etc., and change of air, must be insisted upon.

To repair waste from suppuration:

℞. Syrup of iron, quinin, and strychnin, ℥ vj.
A teaspoonful in water thrice daily.

℞. Syrup of hypophosphites, ℥ vj.
A dessertspoonful thrice daily.

The injection of bacterial vaccines although at one time recommended, has not proved of so much value in the treatment of abscess as it has in superficial infections such as furuncles. In fact it is probably worthless, and at most is uncertain and unsatisfactory. If employed at all it should be used only as a supplement to surgical and general medicinal measures. See Serum Therapy and Vaccine Therapy.

See Brain (Inflammation), Hectic Fever, Liver (Abscess), Psoas Abscess, Spine (Caries), Sepsis etc.

Diffuse suppuration may occur either in the substance of tissues or organs, or on the surface of the skin or of the mucous or serous membranes. An example of the former is cellular erysipelas. Examples of the latter are seen in gonorrhea, bronchitis, and peritonitis. These affections are all discussed under their separate headings.

SUPRARENAL DISEASE (Addison's Disease; Adrenal Disease).—A well-marked, constitutional disease, exhibiting itself locally as a chronic inflammation of the suprarenal capsules, but in its essence consisting of a peculiar anemic condition, always tending toward death; and which is characterized by intense development of pigment in the cells of the rete malpighii and in the epithelium of the mucous membrane of the mouth.

The etiology is obscure. Tubercle, scrofula, and syphilis have each been given as the cause.

Pathologic Anatomy.—A low form of inflammation, terminating in degeneration of the suprarenal capsule. The blood is deficient in fibrin and red corpuscles, with a slight increase of the white corpuscles. Fatty degeneration of the heart and vessels has been observed in some cases. The most striking change during life—the abnormal pigmentation—is due to the deposition of granular pigment in the cells of the rete malpighii, in the papillary portion of the cutis, and even in the connective-tissue corpuscles. No change occurs in the proper structure of the skin. Similar pigment deposits occur in the mucous membrane of the mouth, especially along the edges of the teeth. The disease of the suprarenal capsules excites an irritation of the vasomotor system—the trophic system—that leads to the pigmentation.

Symptoms.—The onset of the disease is insidious, with a feeling of extreme languor, muscular fatigue, asthenia, indigestion, anorexia, dyspnea, cardiac palpitation, vertigo, melancholia, and excessive drowsiness. The surface is first pale, then changes to a hue like that seen in melancholia, changing to icteroid, finally resembling the color of a mulatto, and then to a lusterless bronze. These changes also occur on the mucous membrane of the lips, tongue, gums, and mouth.

Prognosis.—The disease is incurable. The duration is 1 or 2 years.

Treatment is symptomatic, and is of little use. Arsenic and cod-liver oil give the best results. Iron and other tonics are useful, especially a combination of the chlorid of iron, glycerin, and chloroform. Phosphorus has seemed to exert a beneficial influence. Adrenal extract has been employed in a few cases, with some benefit while used.

℞. Tincture of iron chlorid, Spirit of chloroform, } each, ℥ j
Glycerin, ℥ vj.
A dessertspoonful in water thrice daily.

SUPRARENAL EXTRACT (Adrenal Extract).—The selected dried and powdered suprarenal capsules of oxen and sheep. One part of this powder represents 5 parts of the fresh organ. Systemically, its effects are principally on the circulatory and nervous systems. It is a remarkable astringent, and is much used in operations upon the eye, ear, nose, and throat in the treatment of local congestions, inflammations and hemorrhages, especially of the eye, ear, nose and throat. When applied to any mucous surface, it produces more or less profound ischemia, depending on the strength of the solution and the manner and time of application. Locally applied, it is never followed by any constitutional manifestations. The bloodless condition of the mucosa is unmistakably due to the local action of the extract on the vasoconstrictors of the capillaries, constricting them and inducing bleaching of the surface. No injurious effects to the tissue follow the continuous application, nor is there any danger of contracting a habit, as the action of the adrenal extract is purely local on mucous surfaces, no absorption taking place sufficient to produce any evidence of constitutional effects. The pupil, accommodation, and intraocular tension are in no way affected. It has absolutely no action on the skin, nor does it possess any anesthetic properties wherever applied. Its action is wholly but strongly astringent; hence its efficacy in preventing hemorrhage during an operative procedure on mucous membranes. The depletion is complete. Maurange first recommended it for the prevention of hemorrhage in eye operations. Its local effects are enhanced by a preceding application of cocain or antipyrin solution. When applied locally for either therapeutic or operative purposes, it should always be preceded by a 5 percent solution of cocain, so as to secure the combined anesthetic and enhanced effects of the cocain and extract. The adrenal capsule has of itself no anesthetic properties, being purely astringent, and then only when applied to the mucous surfaces. The astringent action begins in from 30 to 40 seconds, and lasts from 1/2 of an hour to 3 hours, after which interval the mucous membrane returns to its normal condition. The solution of the capsule is not at all irritating, but rather imparts a cooling sensation to the conjunctiva.

A preparation made by placing 5 grains of desiccated suprarenals in 1 dram of cold, saturated boric acid solution and allowing the mixture to stand 10 minutes before filtering, applied locally, relieves congested mucous membrane, and prevents hemorrhage, thus enhancing and prolonging cocain anesthesia. Its full effect is noticed in a few seconds, and lasts from 1 to 2 hours. The extract is not antiseptic nor anesthetic, and no tolerance is established by its use. Fresh solutions should be prepared for each operation. Powdered desiccated suprarenal capsules of the sheep, 1 grain representing 8 grains of the fresh substance, in ounce bottles, are for sale.

Internally, suprarenal extract has been given with great benefit in shock and hay-fever. It has been used in Addison's disease, pernicious anemia, diabetes insipidus, diabetes mellitus, cyclic albuminuria, and heart disease, in doses of from 3 to 5 grains, 2 or 3 times daily. This extract has given good results in nasal, pulmonary and gastric hemorrhage, acute and chronic bronchitis, bronchial asthma, congestion and edema of the lungs, edema of the glottis and diabetes insipidus. It will be found useful in chronic muscular affections, especially those involving loss of tone or degenerative changes, and will probably be found valuable in all conditions in which the vasomotor tone is impaired. Being a powerful but temporary stimulant of the heart it may be used cautiously in cardiac weakness, in failure of the heart from any cause and in valvular diseases of that organ.

By local application the angiostenotic properties of suprenal extract have been successfully utilized in the treatment of local congestions, inflammations and hemorrhages, especially those of the eye, ear, nose and throat. It is an excellent hemostatic for hemorrhage following operations on the nose, and is used as an application to inflamed tissues prior to their being anesthetized by cocain, also to the mucous membrane of the turbinated bodies in ulceration or hypertrophy thereof.

Suprarenaden is a preparation made from the suprarenal capsules, used in Addison's disease, menopause, neurasthenia, and diabetes insipidus. Dose, 15 to 23 grains daily. See Adrenalin.

SUSPENDED ANIMATION.—See Asphyxia; Syncope.

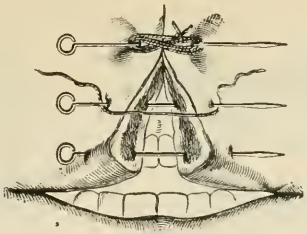
SUSPENSION.—A mode of treatment of certain diseases, especially tabes dorsalis, in which the patient is so placed that the whole weight of the body hangs upon the neck, the head being supported at the chin and the occiput. The stretching of the spinal cord sometimes removes the morbid process in a manner at present not well understood. See Spine (Diseases).

SUTURE.—A stitch used in closing the edges of a wound. Suture material may be of silk, silkworm-gut, catgut, or other animal material, and of metal. See Ligature.

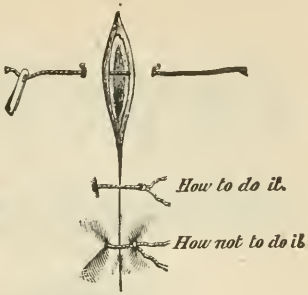
The Interrupted Suture.—The needle, carrying a single ligature, is passed through the skin on one side of the wound from without inward, and is then inserted from within outward at the corresponding point on the opposite side of the wound. The ends of the ligature are drawn together and tied tightly in a double knot. The ligature is then cut and another suture introduced at an interval of 1/2 of an inch, and so on.

Lembert's interrupted suture is recommended in wounds of the intestines. The stitches should be 3/8 of an inch from the margin of the wound, the middle suture being first introduced; the distance between the sutures should not exceed 1/4 inch. When the requisite sutures have been applied, the

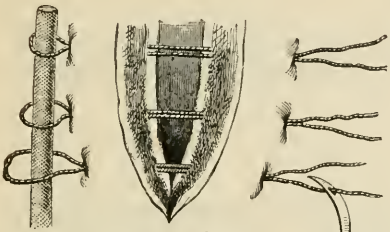
Continuous Suture.



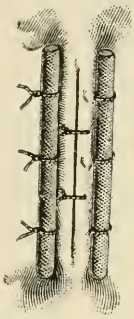
Harelip Suture.



Interrupted Suture.



Quilled Suture.



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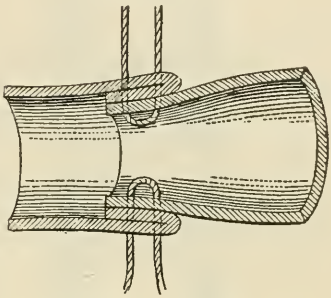
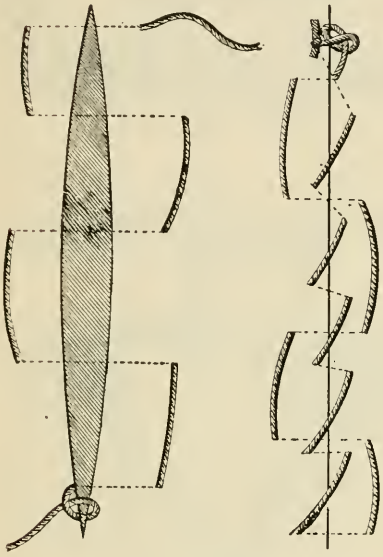
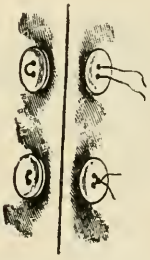


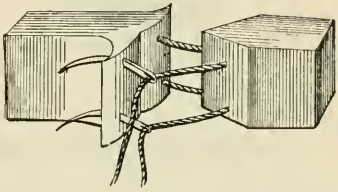
Jobert's Suture.



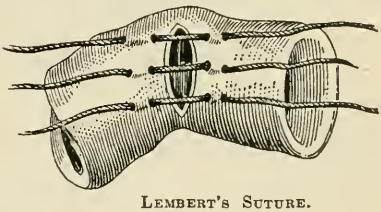
A Quilted Sutures. B



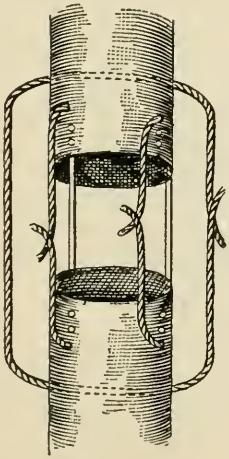
Button Suture.



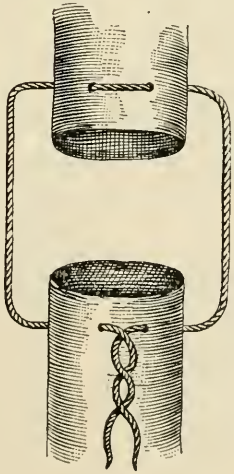
Tongue and Groove Suture.



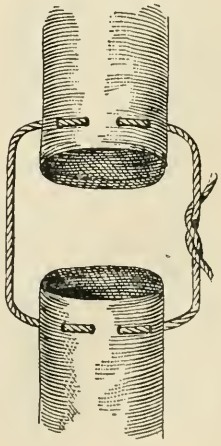
Lembert's Suture.



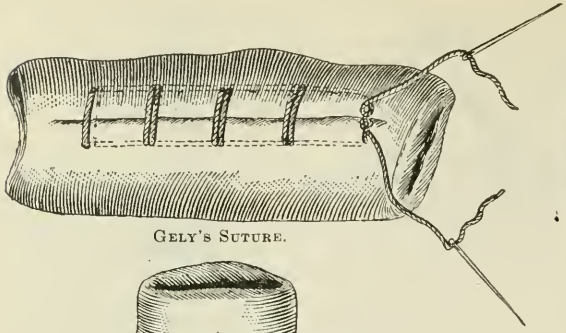
Suture of Le Dentu.



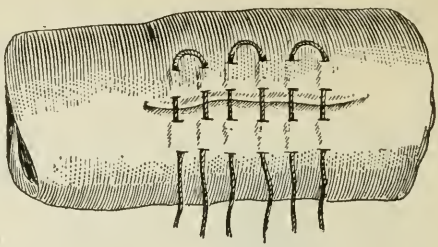
Tendon Suture of Le Fort.



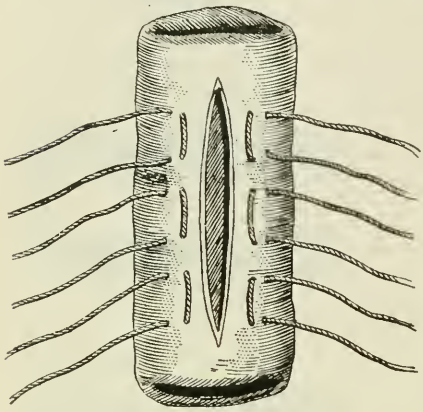
Tendon Suture.—(*Wölfler, after Lejars.*)



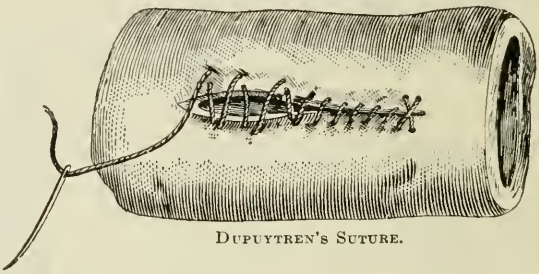
Gely's Suture.



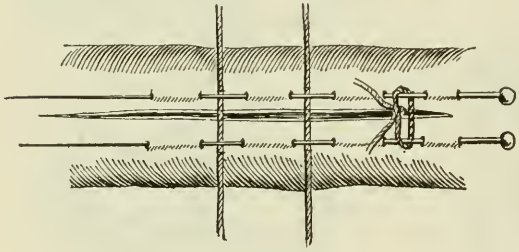
Halsted's Plain Quilt Suture.



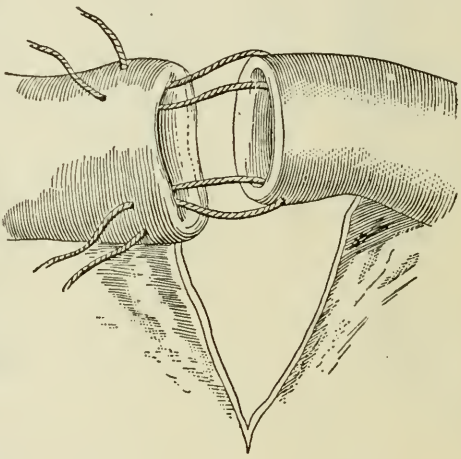
Emmet's Method.



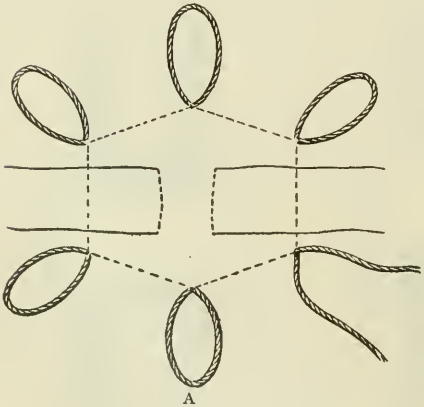
Dupuytren's Suture.



Bouisson's Suture.

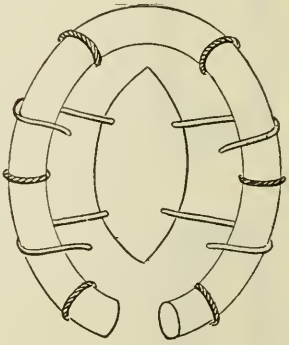


Jobert's Invagination Suture.



A

Sutures for Immediate Gastrostomy.



B

Sutures for Immediate Gastrostomy.

ends are to be tied, and cut off close to the knot. The bowel is then returned to the abdominal cavity and a glass drainage-tube inserted.

The Twisted or Harelip Suture.—Having placed the edges of the wound accurately in contact, a sufficient number of needles are passed through the edges of the wound. When the necessary number of needles have been introduced and the parts have been accurately adjusted, the middle of the long ligature is twisted around the uppermost needle in the form of a figure ∞. Then the two ends of the ligature are brought down and twisted around the other needles successively, when they are secured by a knot. After insertion the points of the needles must be cut off with pliers. The upper pin must be removed at the end of the second day, and the lower pin at the end of the third day.

The Glover's Continuous Suture.—This suture is employed in wounds of the intestines and abdomen. It is applicable to cases of injury of great extent when there is tendency to the escape of fecal matter in the intervals between stitches. It is merely the ordinary stitch employed for sewing materials together; it is made by simply passing the needles diagonally from one side of the wound to the other.

The figures on the next two pages illustrate the principal sutures.

SWALLOWING, DIFFICULT.—See Dysphagia.

SWEAT-GLANDS, DISEASES.

Hyperhidrosis (Excessive Sweating)

A functional disorder of the sweat-glands characterized by an excessive secretion of sweat. The affection may be general or local.

Symptoms.—The hands, when affected, are cold and clammy. In severe cases the sweat drops from the palms, incapacitating the patient from all manual work. The feet, when affected, become tender, so that walking produces pain. The soles are reddened and the epidermis is macerated.

Etiology.—General hyperhidrosis results from faulty innervation. It may, however, be physiologic, as during violent muscular exertion. The local forms are probably due to some disturbance of the vasomotor apparatus.

Treatment.—In general hyperhidrosis constitutional remedies are to be employed—belladonna or atropin, ergot, nux vomica, mineral acids, quinin, etc. Crocker speaks highly of sulphur, given in 1-dram doses twice daily, for both general and local sweating. For the local forms the remedies are, for the greater part, to be applied to the affected regions. Upon the palms this condition is much more refractory to treatment than upon the soles. The following prescription will be found of great value in the treatment of sweating feet:

℞. Salicylic acid, gr. xx
Boric acid, ʒ j
Lanolin, Petrolatum, each, ʒ ss.

To be rubbed in well at bedtime.

The feet should not be washed more than once a week. It is well also to place boric acid in the stockings. Hebra's plan was to wrap up the feet in diachylon ointment, and continue the treatment for a fortnight. Crocker recommends the use of belladonna ointment. All of these remedies will be found more efficient in sweating feet than in sweating hands. To check sweating of the axillæ apply, for a few hours, a sponge soaked in very hot water. Faradization and galvanization are sometimes of value in hyperhidrosis.

Bromidrosis (Osmidrosis)

A functional disorder of the sweat-glands, characterized by sweat secretion of an offensive odor. The condition may be symptomatic, as in uremia, rheumatism, etc. There is usually an excessive sweating, although the amount may be normal. The odor is often so unpleasant as to unfit the sufferer for society. The etiology is obscure. It usually occurs upon the feet of young persons. The sweat is not offensive when secreted, but soon becomes so from the action of microorganisms. The treatment is practically that of hyperhidrosis.

Anhidrosis

A disorder of the sweat-glands characterized by diminution or suppression of sweat.

It may be symptomatic, as in diabetes, fevers, etc. It may also be due to faulty innervation. There may be but slight diminution of sweat secretion or total absence. In congenital cases no treatment is of avail. In acquired cases one may employ massage, electricity, vapor and alkaline baths, etc.

Chromidrosis

A disorder of the sweat-glands characterized by colored sweat. There are two forms—idiopathic and accidental (color due to certain substances taken into the system). The color in the idiopathic form is usually black or sepia. The orbital region is usually affected.

Accidental Forms.—Green sweat is found frequently in copper workers. Red sweat, which occurs often in the axillæ, is due to the action of the bacterium prodigiosum, and is often associated with leptothrix.

The treatment is based upon broad general principles.

Uridrosis

A condition characterized by the excretion through the sweat-glands of constituents of the urine in considerable quantity. The sweat normally contains small quantities of urea. In suppression of the urine, as in Bright's disease, cholera, etc., urinary products are eliminated through the sweat-glands. There is a urinous odor to the skin, and sometimes a deposition of salts on the skin.

Hematidrosis (Bloody Sweat)

A condition characterized by hemorrhage from the sweat-pores.

The affection is very rare. It occurs in young hysteric women. It has been observed on the face, ears, umbilicus, hands and feet.

Sudamen (Miliaria Crystallina)

An eruption characterized by the formation of numerous superficial, pinhead-sized, transparent vesicles, occurring during the course of febrile diseases. The vesicles are non-inflammatory. They have been aptly described as resembling "dewdrops." They are most abundant upon the trunk and neck, and disappear in the course of a few days. The vesicles are due to a collection of sweat in the upper layers of the epidermis, as a result of obstruction of the sweat-ducts. The affection undergoes spontaneous involution.

Miliaria (Prickly Heat)

A mild inflammatory affection, caused by obstruction of the sweat-ducts, characterized by the occurrence of small papules and vesicles at their mouths.

Symptoms.—The affection comes on suddenly, after profuse perspiration. The lesions are discrete, never tending to coalesce. Itching is usually present. The trunk is the seat of predilection. In children it is likely to be complicated by furunculosis.

Pathology.—Obstruction of sweat-ducts, with surrounding inflammation.

Treatment.—Prophylactic. Children should be lightly clad in thin woolens and kept out of the heat. Constipation should be avoided. Sedative lotions and dusting-powders constitute the local treatment. The following is a useful combination:

℞.	Phenol,	♏ xxx
	Boric acid,	ʒ j
	Zinc oxid,	ʒ jss
	Glycerin,	ʒ ij
	Alcohol,	ʒ ij
	Water, add enough to make,	ʒ vj.

Sop on the skin as indicated.

Or a dusting-powder may be used:

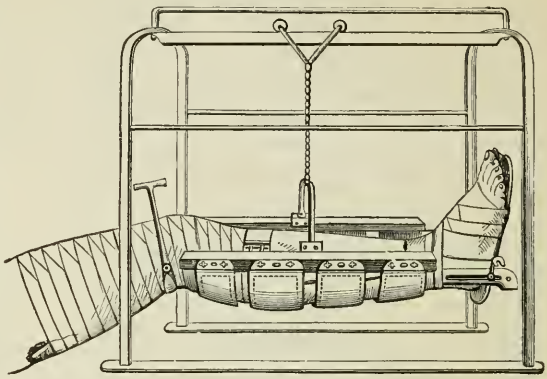
℞.	Magnesium carbonate, Boric acid, Powdered starch,	each, ʒ ij.

An excellent method is to sop on a saturated solution of boric acid, and follow this with a dusting-powder. When the entire body is involved, bran, starch, or alkaline baths may be employed with good results.

SWEATING SICKNESS.—See Miliary Fever.

SWEET OIL.—See Olive Oil.

SWING.—An apparatus consisting of a cradle that moves on wheels along a horizontal bar on an iron framework; it is used in the treatment of fractures of the lower extremities.



Salter's Swing.

SWOONING.—See Syncope.

SYCOSIS.—Chronic inflammatory disease of the hair follicles, usually of the bearded region, characterized by papules, pustules, and tubercles perforated by hairs.

Symptoms.—The disease commences by the formation of discrete pinhead-sized to pea-sized papules or pustules at the sites of hair follicles. The pustules are flat or acuminated, and contain a yellowish fluid; they show no disposition to rupture, but dry into crusts. The surrounding skin is reddened, sometimes swollen and infiltrated, and is the seat of a variable amount of itching, burning, and pain. The pustules are discrete, but may be closely aggregated. A hair perforates the center of each lesion. In the beginning the hair is firmly attached; but as suppuration becomes free, it is more easily extracted. At times tubercles are present. The eruption comes out in crops, the disease lasting for months, or even for years. The affection is confined to hairy regions, particularly the beard and mustache.

Etiology.—The disease obviously occurs only in adult males. It is due to invasion of the follicles by microorganisms, chiefly the staphylococci aureus, citreus, and albus. Nasal discharge may produce a sycosis of the upper lip.

Pathology.—The pathologic process consists of a folliculitis and perifolliculitis, due to pyogenic cocci. The inflammation is at first perifollicular, the follicle only becoming secondarily invaded by serum and pus.

Diagnosis.—Sycosis vulgaris may be confounded with tinea sycosis and pustular eczema. The differential diagnosis is appended:

Sycosis.	Tinea Sycosis.
1. A typical case shows small discrete papules or pustules pierced by hairs.	1. A typical case shows large, lumpy, or nodular tumefactions.

Sycosis.	Tinea Sycosis.
2. Hairs firmly attached until free suppuration occurs. Roots often swollen with pus.	2. Hairs broken and easily extracted. Roots usually dry.
3. Course slow. Little change from week to week.	3. Course rapid. Marked changes from week to week.
4. Mustache frequently affected.	4. Mustache practically never affected.
5. Absence of fungus in hairs.	5. Trichophyton fungus in hairs.

Sycosis.	Eczema Pustulosum.
1. Lesions strictly follicular, pierced by hairs.	1. Lesions likely to be interfollicular as well.
2. Eruption limited to bearded region.	2. Tends to spread upon nonhairy regions.
3. Absence of oozing.	3. Oozing marked.
4. Itching slight.	4. Itching more severe.

Prognosis.—Very few cases are incurable. The disease, however, is often refractory to treatment, and lasts months or years. Recurrences are common.

Treatment.—Internal remedies, such as iron, arsenic, cod-liver oil, etc., are at times indicated by the general condition of the patient.

External treatment, however, is far more important. An essential step in the local treatment is the systematic shaving or clipping of the hairs. The beard should be closely clipped with scissors, or, better still, shaved every 2 or 3 days. When suppuration is free, daily depilation should be practised.

When the inflammatory signs are marked, soothing lotions—such as lotio nigra or saturated solution of boric acid, or ointment of cold cream, oxid of zinc ointment, etc.—may be employed. Most cases, however, require more stimulating applications.

As in most follicular inflammations, sulphur is of great value here. It is best employed in salve form, although lotions may also be used:

℞. Precipitated sulphur, gr. xxx to ʒ j
Petrolatum, ʒ j.

A mercurial ointment often acts efficiently:

℞. Ammoniated mercury, gr. xv to xxx
Petrolatum, ʒ j.

The following formula is highly spoken of:

℞. Ichthyol, ʒ j to ij
Petrolatum, ʒ j.

A lotion of bichlorid of mercury, 1/4 to 1 grain to the ounce, sopped on frequently, is often followed by good results.

Ichthyol is of value especially when introduced by cataphoresis, a 10 percent solution at the cathode. Pyoktanin introduced in the same way is also advocated. Sodium sulphite in solution with glycerin and water applied locally is recommended. Copper sulphate as a lotion combined with zinc sulphate is highly praised. The X-rays have proved efficacious.

SYMPATHETIC OPHTHALMIA.—An inflammation of the ciliary body, iris, or choroid, or a combined inflammation of any or all of these in one eye, due to injury in the other eye.

Cause.—The usual cause is an injury to the ciliary body, or incarceration of the ciliary body and iris in a scleral wound. A foreign body in one eye, causing cyclitis, is often followed by sympathetic inflammation in its fellow. The manner in which sympathetic inflammation is produced is not clearly understood. Mackenzie supposed that sympathetic inflammation passed from the retina of the injured eye through the chiasm, to the retina of the other eye. Deutschmann suggested that germs travel along the optic sheath through the chiasm into the sheath of the opposite nerve, and thence into the eye. Bacteriologic infection of the sympathetically affected eye can rarely be proved. A more recent theory is that the path of irritation is from the first eye through the ciliary nerve to the ciliary ganglion; through the sympathetic root of the latter to the carotid plexus of the same side; then through the circle of Willis to the carotid plexus of the other side; and then in a centrifugal direction to the ciliary ganglion and the ciliary nerves of the second side. The time of outbreak of the secondary attack varies from 4 to 8 weeks after the original lesion, but cases have been reported from 2 weeks to 40 years afterward.

Symptoms and Diagnosis.—The premonitory symptoms are those of **sympathetic irritation**—asthenopia, photophobia, lacrimation, reduced accommodation, cloudy vision, and a mild pericorneal injection. The aqueous may be moderately opaque and the disc slightly reddened. As the stage of true **sympathetic inflammation** ensues, signs of inflammation corresponding to exacerbations of inflammation in the exciting eye are noticed. The ciliary region becomes extremely tender; cyclitis, iritis, or some form of keratitis becomes visible. The pain and cloudiness increase, and the visual acuity steadily diminishes. Synechiæ may form, and the intraocular tension becomes at first increased, and afterward diminished, as atrophy begins. It is the rule, after varying improvement and relapse, to find an adherent iris, cataractous lens, or atrophied globe from deficiency in vitreous, causing retinal prolapses and incurable blindness, despite all treatment. However, it is possible to retain some indistinct vision in favorable cases; but the process is always prone to relapse, and the inevitable result follows.

Treatment is preventive, and must interrupt the nervous connection between the eye first involved and the one showing signs of sympathetic inflammation. It has been suggested that this be accomplished by cutting the ciliary nerves. Several different methods have been proposed, one of which is to cut completely through the optic nerve, expose the posterior pole of the eyeball, and cut the ciliary nerves entering at this location. Evisceration has also been proposed. The only certain method of prevention and cure is **enucleation of the eye first affected.** This is so important a

subject that the concise rules laid down by Fick are given here as a guide:

1. If the first eye is blind, painful, and sensitive to pressure, enucleation is to be advised; it is to be urged if the patient lives a distance from a surgeon, and thus may be in danger of overlooking the beginning of sympathetic inflammation. If the patient will not consent to the operation, he should be told to seek aid at the first sign of visual disturbance or of inflammation in the other eye.

2. If the first eye has a foreign body in it, and is painful and sensitive to pressure, enucleation should be urged, even if the eye sees; it is to be supposed, of course, that the foreign body cannot be removed independently.

3. If the sympathetic inflammation, or even irritation, appears in the second eye, the first must be enucleated at once. If the first eye is not blind, but still retains a certain visual acuity, and is to some extent quiet, both patient and surgeon will hesitate at such radical proceedings. There is, however, no general rule for such a case. The visual acuity of the first eye must be carefully compared with the degree of irritation in the second; the more there remains to rescue in the second eye, the greater price can be paid by the first.

If the sympathetic inflammation is fully developed, enucleation proves of little value, and the pain must be lessened by cocain, atropin, warm compresses, and bandages, and the patient must be confined to bed. Mercurial inunctions and subconjunctival sublimate injections have been advised; iodids and mercurials may be given orally; but despite all treatment, the eye is generally lost.

SYMPHYSEOTOMY.—The subcutaneous separation of the symphysis pubis for the purpose of enlarging the pelvic diameters. The maximum degree of separation of the pubic bones is 7 cm. if injury to the sacroiliac joints is to be avoided. By this amount of separation there is gained in the true conjugate diameter 1.5 cm.; in the oblique diameter, 3.5 cm.; and in the transverse diameter, 3 cm. By this means safe delivery is secured, which under ordinary circumstances would be impossible.

Indications.—The operation is indicated in certain degrees of contracted pelvis. Unless the child is below the average size, it should not be attempted if the true conjugate measures less than 7 cm. Ordinarily, it would not be necessary with a conjugate above 8 cm. A rigid, nondilatable cervix would contraindicate the operation, as would also a narrow, contracted vagina. Marked varicose condition of the veins about the symphysis and vulva might give rise to dangerous hemorrhage.

Technic.—The steps of the operation are as follows:

1. The patient is thoroughly prepared for the operation, anesthetized, and placed in the lithotomy position.

2. A metallic catheter is passed into the urethra and pressed downward and to the right, so that injury to this structure may be avoided.

3. An incision, about 2 inches in length, is made in the median line just above the symphysis.

4. The incision is carried down through the fascia and the attachments of the recti muscles, separated sufficiently to permit the introduction of the index-finger along the posterior surface of the symphysis.

5. Using the left index-finger as a guide, the Galbiati knife is hooked under the symphysis, inclined a little to the left, and by a sawing or rocking movement the joint is divided from below upward and from within outward. If the joint does not separate, the knife should be reintroduced and the subpubic ligament divided.

6. To prevent too great a separation of the joint, the trochanters should be supported by assistants. Hemorrhage is usually profuse, but can be controlled by plugging the wound with gauze.

7. The catheter is now removed, and the child is delivered with forceps if engagement has occurred; by version, if it has not.

8. The wound is now united with a few interrupted sutures of silkworm-gut, and a firm pelvic binder is applied.

The patient remains in bed for 4 or 5 weeks. To secure union of the joint, she should remain upon her back with the limbs closely approximated. This position is best secured by a specially arranged trough-shaped bed, or hammock, or by the use of sand-bags extending from the axilla to the ankle.

Prognosis.—The maternal mortality of symphyseotomy at the present day is about 10 percent. On account of the close approximation of the limbs it is difficult to keep the parts perfectly free from the discharges. This, and the fact that the wound is so close to the genitalia, favor the development of sepsis after the operation. There may be some difficulty in walking, but this soon disappears. The rapid extraction of the child also favors injury to the soft parts. The infantile mortality is about 20 percent.

SYNCOPE.—A swooning or fainting. A partial or complete temporary suspension of the functions of respiration and circulation.

Causes.—Syncope may be due to a condition which interferes with the action of the heart, either intrinsically, through the nervous system, through the blood, or through more than one of these channels.

When intrinsic, cardiac complications, especially fatty degeneration, may be causative. Compression of the heart from diseased conditions or by tight articles of dress, excessive natural or artificial heat, or certain drugs or poisons may be provocative of syncope. The most common nervous cause is uncontrolled emotion, such as fear, joy, or grief. The reflexes are also sources of provocation, from the effects of irritant or intestinal poisons, worms, scybala, etc. Of the causes connected with the blood, that of hemorrhage is the most common, while chronic anemia and chlorosis are often accompanied by it.

Fainting also occurs from hunger and starvation, railway shocks, grief, painful lesions, and cerebral concussion. Fainting from overheated air is partly due to the direct effect of heat upon the circulation, partly to interference with respiration, and partly to the effect on the heart of carbonic acid and other excrementory products.

The duration of the several stages of shock varies from a few seconds to hours.

Prognosis.—The most common termination is recovery, but death may occur.

Fatal syncope has occurred at the height of an attack of diphtheria and in chronic valvular heart-disease, while there is a tendency to syncope in myocardial disease. Death by syncope may follow hemorrhage or may be due to thrombosis or embolism of the pulmonary artery or to pneumothorax. Sudden and fatal syncope from serofibrinous effusion in acute pleurisy may be induced by such slight exertion as getting out of bed.

Diagnosis.—Syncope must be differentiated from apoplexy, from concussion of the brain, from shock, and from poisoning of many kinds, including poisoning by gases and by alcoholic liquors. The character of the pulse will distinguish between those conditions which have their origin in the brain and those from poisoning (unless due to poisoning by heart depressants). Hysteric faints, not cardiac, are readily diagnosed by the pulse, which is of good volume and force in these cases. Shock usually produces a degree of syncope. See SHOCK, COMA.

Treatment.—Two indications are to be met: (1) The removal of the cause of the faintness, and (2) the restoration of the action of the heart. The patient should be placed flat on the back, and all neck or chest constriction, from clothing or otherwise, removed. The atmosphere should be as pure as can be obtained by throwing open windows, doors, etc., or by removal to the open air. Any causative hemorrhage must be checked, and any other cause must be removed. Cardiac stimulants are to be employed. Alcohol, as brandy, whisky, or strong wine, may be given, and ammonia or smelling salts should be inhaled. Cold water may be dashed over the face. Amyl nitrite is very efficacious in anemic subjects. Atropin hypodermically, 1/100 to 1/60 of a grain, is a valuable remedy. The oil of cinnamon is a powerful stimulant. Tincture of nux vomica in 5-minim doses is of benefit in extreme cases of cardiac syncope approaching heart failure. The compound tincture of lavender is stimulating and effective. Galvanization to the pneumogastric nerve, if practicable, is recommended, but still better is the electric brush swept over the abdomen and chest. ARTIFICIAL RESPIRATION (*q. v.*) is not to be neglected. Most cases will revive spontaneously.

SYNDACTYLISM.—See WEBBED FINGERS.

SYNOVITIS.—See JOINTS (Diseases), JOINTS (Injuries).

SYPHILIS. Synonyms.—Lues venerea; morbus gallicus; pox; "bad disorder." Fr., *Vérole.* Ital., *Sifilide.* Ger., *Lustseuche; Krankheiten der Französen.* Span., *Sifilis.* Swed., *Radezyge.*

Definition.—Syphilis is a general infectious disorder, transmitted from one individual to another both by contact and inheritance, chronic in course, and displaying a more or less determinate sequence involving one or several of the organs of the body. It is classed with the infective granulomata, and it is due to the toxic effect of the invasion of the bodily tissues by a morbific germ.

Etiology.—The spirochæta pallida or treponema pallidum of Schaudinn is in all probability the cause. This work of Schaudinn has been confirmed by Metchnikoff and other observers. Schaudinn considers that the spirochæta pallida (treponema pallidum) belongs to the protozoa rather than to the bacteria and therefore must not be classed with the spirilla. It is found in the primary and secondary lesions of acquired syphilis and in the organs of a

The Spirochæta refringens is the larger and more darkly stained organism, while the lightly stained and more delicate parasite is the Spirochæta pallida (*Treponema pallidum*). From a chancre stained with Wright's blood stain.—(*Hirsch—by Rosenberger.*)

congenitally syphilitic child, and has been demonstrated in the blood stream. For its inoculation a raw surface or abrasion is required. The infection is usually transmitted through the secretions of the primary or secondary lesions, but sometimes through the blood of the syphilitic patient. It is probable that the tertiary lesions are also capable of conferring the disease. Normal secretions unless contaminated with secretions of the lesions are not infectious. The disease may be transmitted, however, by the spermatozoa or ova of syphilitic patients.

Though the majority of cases of acquired syphilis result from sexual intercourse, the infection may be conveyed by drinking utensils, infected hands, lips, or by handling infected patients. The syphilitic child may infect the wet-nurse. Rarely the disease has been a quired by vaccination.

The Spirochæta Pallida.—This organism does not readily take up anilin dyes. A reliable stain for it is the Giemsa stain, freshly prepared: 12 c.c. of eosin solution (25 c.c. of 1 percent eosin solution in 500 c.c. of water); 3 c.c. of a 1 to 1000 aqueous solution of azur I; 3 c.c. of a 0.8 to 1000 aqueous solution azur II. One drop of this solution added to 1 c.c. of water is used as the stain, the specimen being kept in the stain for 18 hours.

The Wassermann Reaction.—The *serum diagnosis of syphilis* depends upon certain principles. If the washed red corpuscles of the sheep (antigen) are added to heated serum of a rabbit, previously immunized with washed red corpuscles of the sheep (amboceptor), and fresh guinea-pig

serum (complement) thus forming the "hemolytic series," hemolysis occurs. Bordet and Gengou showed that when emulsions of bacteria are mixed with inactivated serum and complement, hemolysis does not take place by reason of the anchorage of complement to the bacteria which prevents union of the red cell and complement through the ambocepter. This phenomenon has been applied by Wassermann to the diagnosis of syphilis. As in the immunization of the rabbit, so in syphilis, amboceptors are formed. When the blood serum of the monkey, made inactive or immune by previous syphilitic infection, was added to human syphilitic serum, no hemolysis occurred, showing that the monkey serum must have contained antibodies.

Method.—To the syphilitic antigen (extract of syphilitic organs) are added (1) the complement (fresh guinea-pig serum). (2) the suspected serum heated, (3) the amboceptor (heat-inactivated rabbit's serum), (4) the washed red corpuscles of the sheep, and the mixture is subjected to the action of incubator temperature. No hemolysis occurs by reason of the complement having been absorbed in the hemolytic series, the antigen and the serum tested being homologous. Such reaction is called positive.

The Noguchi Modification.—Recently Noguchi has modified this reaction by using human instead of sheep corpuscles in the hemolytic series. He has also introduced test papers saturated with antigen, complement and amboceptor. His method is as follows: An antigen paper is applied to a definite quantity of the suspected human serum and fresh guinea-pig serum is added. After being subjected to incubator temperature, it receives the addition of the hemolytic amboceptor paper and a definite quantity of washed human blood corpuscles. See Luetin Reaction.

Chancre (Initial Lesion, or Sclerosis).—A chancre is a modification of the sound or pathologically altered skin or mucous membrane occurring after syphilitic infection, and displayed after an incubation period, characterized by a circumscribed sclerosis and accompanied by an enlargement and induration of neighboring glands. The sole constant characteristics are: (1) An incubation period preceding its appearance—averaging between 10 and 30 days, ordinarily betwen 21 and 26 days, called the period of first incubation; (2) a sclerosis of the base of the lesion; (3) primary adenopathy, an enlargement and induration of the glands in nearest anatomic relation to the chancre. Every such initial lesion means a syphilis, mild or severe, actually present. Chancres may be represented at one time or another by every recognized lesion of the cutaneous surface, including the superficial erosion, the oftenest ignored and yet the commonest of chancre symptoms; the papule, the common result of inoculation of the skin as distinguished from that of the mucous surface; an ulcer, the result of local irritation, which may be shallow or deep. Mixed chancre exhibits at the outset all the features of the chancroid, but later becomes specifically indurated at the base, and is followed by a general syphilis. Another mixed variety is the chancre of syphilitic origin later infected with microorganisms. Persons infected with syphilis have usually but one attack in a lifetime, and most, if not all, of the so-called chancres of the syphilitic are without question gummatous. The initial lesion may occur upon any portion of the body surface, the genital region being most often involved merely because of the frequency of transmission during the sexual act. Extragenital chancres are not a rare occurrence. The lesions are seldom multiple; most often they are single, differing from the soft chancre, which spreads from one point to another on account of the autoinoculability of its discharge.

The induration of the initial lesion is one of its constant features. This may precede or follow the evolution of the chancre, or it may first be observed at the moment of detection of the sore itself; but sooner or later it wholly disappears. From the number or appearance of the lesions no prognosis can be made as to the severity or mildness of the ensuing disease. Chancres may or may not persist until the evolution of the systemic disease. They seldom leave scars, on account on their indisposition to undergo ulceration.

Diagnosis.—*The chancroid* is usually a pustular lesion, is never indurated, is usually multiple; the adenopathy is usually represented by a single bubo; and the secretion is indefinitely auto-inoculable.

Herpes progenitalis lasts but a few days, is essentially vesicular, and the cause may often be determined without great difficulty in systemic derangement.

Balanitis is always short-lived, and yields readily to treatment; produces itching and burning; there is no induration or glandular complication and no ulceration.

Venereal warts are never indurated, rarely ulcerate, survive for long periods of time, and show no adenopathy.

Epithelioma occurs commonly after middle life, is of long duration, inactive, and noninflammatory.

Molluscum epitheliale is never ulcerated, indurated, inflammatory, or the seat of evidence of any acute process; and cheesy masses can be expressed from the orifice of the sebaceous gland involved.

Lichen planus presents lesions always papular, never indurated or ulcerated, or accompanied by glandular enlargement; and it is usually multiple.

Treatment.—Strict observance of cleanliness, in order to avoid any irritation of the sore, must be observed. Cleansing with warm water and hot borated solutions, followed by bland dusting-powder and the avoidance of salves and unguents, are the principal points to be observed. Mercury should be administered by the mouth when the diagnosis is satisfactorily established, but not before. The adenopathy ordinarily requires no treatment, unless painful, when frequent ablution with hot water is the best and most grateful method of treatment, followed, when needed, by a weak mercurial salve well rubbed into the overlying skin.

Division of constitutional syphilis into primary, secondary, and tertiary stages is now abandoned

or largely modified, there being ordinarily no such definite demarcation in its manifestations. The majority of syphilitic histories may be traced within the four following divisions:

1. Benignant syphilis with mild and transitory symptoms. In these cases a slight efflorescence upon the abdominal surface, a few days of malaise, and the disease is at an end, irrespective of any treatment whatever. This is rare.

2. Benignant syphilis with relapsing or persistent superficial symptoms. This occurs in a large number of all cases occurring in the white race. Typical chancres are followed by superficial lesions without the production of any permanent results of the process. Patients of this large class, as a rule, entirely fail to exhibit symptoms of the type described as "tertiary."

3. Malignant syphilis with relapsing or persistent profound symptoms. The malignancy of these cases is declared in the deterioration of the tone of the system, in the production of cachexia, in the production of gummata, which resolve under appropriate treatment; or, when degeneration occurs, the repair is either good, or the damage resulting is so slight as not to interfere with bodily health. In this class the best results of treatment are exhibited.

4. Malignant syphilis with relapsing or profound lesions that are ultimately destructive. Here the disintegrating and ulcerating gumma destroys whatever tissue is attacked, and at times pushes its destructive forces to a fatal result. Syphilis, however, often mutilates, but rarely kills. In the majority of malignant cases the rapidity of progress of the malady is conspicuous.

The determining influences that result in these divergences are of the highest importance. First, a soil rendered favorable by other diseases or by malnutrition; second, neglect of early and proper treatment. The implantation of the germ of syphilis upon a system contaminated with tuberculosis, struma, and such cognate disorders as rickets is much rarer than is generally supposed.

The Evolution of Syphilis Subsequent to the Chancre.—The signs of a gradual intoxication are progressively apparent. The skin assumes a peculiar hue; there are often rheumatic pains, headache, backache, lassitude, neuralgia, and in some cases jaundice. The number of the red blood-corpuscles decreases and the leukocytes increase. Thermal variation may be absent or may be either slight or pronounced. Fever is more often observed in the cachectic and weak than in the strong. The lymphatic system exhibits characteristic changes; the glands become enlarged, soft, and voluminous, as distinguished from the densely indurated buboes accompanying the chancre. At a given moment this may be the sole appreciable symptom. They are usually painless and have no tendency to degenerate. Resolution is by the ordinary absorptive process. Syphilitic cachexia may occur either early or late, may be produced solely by the disease, and may be relieved greatly by properly directed medication, and may also be induced or aggravated by the injudicious employment of mercury.

Syphilis of the Skin.—A study of the syphiloderms is a study of the changes impressed by the infective process upon the simple manifestations of all skin-diseases. The early cutaneous symptoms are usually symmetric, but as the disease progresses, they exhibit a greater tendency to assymmetry. Although the terms "copper-colored" and "raw-ham tint" have been employed to designate the special hues of the syphilitic exanthem, there is displayed no color which may not at times be recognized in nonsyphilitic subjects; but the color with the other picture presented is usually highly suggestive. Multiformity is a characteristic of syphilis shared by but few other maladies. The arrangement of the syphiloderms in groups having the outline of a circle, either complete or in segments, is also highly distinctive. Itching and pain are ordinarily absent, but in some lesions, particularly in condylomata, the itching may be severe. Situation modifies the espression of the local manifestations. Pustules are often seen upon the scalp and on the face; papules, over the neck and brow; secreting lesions, around the mucus-outlets of the body. Papules are usually ham-colored, and have a tendency to scale at the apex. Tubercles are generally grouped, and tend to ulcerate and to crust. The crusts are usually bulky. Scales are commonly thin, and of a dirty whitish hue. Ulcers have a soft base, undermined edges, and a sloughing floor with purulent or hemorrhagic secretion. Pustular lesions are usually, if not always, due to secondary infection with pyogenic microbes. Scars, when recent, are generally pigmented; but when old, are of a dead white shade, with flaky, wrinkling surface.

Classification of the Syphiloderms.—

1. Macular
   - (*a*) Pigmentary.
   - (*b*) Erythematous.
   - (*c*) Purpuric.
2. Papular
   - dry
     - (*a*) Miliary.
     - (*b*) Lenticular.
   - moist
     - (*a*) Mucous patches.
     - (*b*) Condylomata.
3. Pustular
   - (*a*) Miliary.
   - (*b*) Lenticular.
4. Tubercular.
5. Gummatous.

1. **Macular Syphiloderms.**—The pigmentary variety occurs as a distinct network of macules, the pigment being gradually diminished, commencing in the center of each deposit, until at last it is wholly removed. This condition is most common in the earlier stages of the malady, and frequently in the uncleanly and negligent. The normal quantity of coloring-matter may remain after involution, or a true vitiliginous atrophy of the pigment may follow. The erythematous syphiloderm is the most common, the most benign, the earliest, and the most classic of the skin symptoms of the disease. It may be limited to the regions covered by the clothing, and it is for the most part unaccompanied by any subjective sensation. It usually appears between the sixth and seventh week, and is of a dull shade of yellowish-red, fading

under pressure. As a rule, the eruption fades under treatment in a week or 10 days. The circinate arrangement may be conspicuous. Purpuric lesions are most commonly seen in the inherited form of the disease, though they are not rare in adults. It must be remembered that iodid of potassium is capable of producing purpura of the skin. When due directly to the disease, and not to the drug, it is a somewhat grave symptom.

2. **Papules.**—Papules are among the most common of the syphiloderms. They vary largely, according to the site of each lesion. Upon the exposed surface of the skin they are usually dry and squamous; upon apposed surfaces they enlarge, flatten, and secrete; upon mucous surfaces they form a mucous patch. Dry papules may be miliary, or from pinhead-sized to bean-sized or larger. When resolution occurs, the papule flattens to the level of the skin, leaving a pigmented macule, which is apt to be exceedingly rebellious to treatment and slow to disappear. When developing upon the palms and the soles, papules have a characteristic aspect and career, and will not readily be confounded with other disorders. The papule in this situation produces a circumscribed thickening of the skin, which scales in the epidermal portions, and in extreme cases induces an ulceration in the region of each papular thickening. Papules sometimes linger for years as almost the sole symptom of the disease. The moist papule upon the mucous membrane becomes the **mucous patch**, which is pathologically identical with the moist papule of the skin. Moist papules occur on the skin in regions where the conditions are similar to those of mucous membranes with respect to heat, moisture, and the apposition of surfaces. On the mucous membranes they are moist, secrete a thin mucus, are offensive, and their secretion is highly contagious. Occasionally they develop into large vegetating masses; at other times they ulcerate. Condylomata are hyperplastic, moist papules, and are either flat or pointed. The flat condyloma is seen only in syphilitic subjects, and is a distinct symptom of the disease. Condylomata are found most frequently about the anus, and are usually the seat of a tormenting pruritus. The pointed wart is seen not only in syphilis, but in other venereal diseases as well. Condylomata are often compared in appearance to a cockscomb.

3. **Pustular Syphiloderm.**—Under this title are included all fluid-containing lesions of the skin—vesicles, pustules, and bullæ. When they appear, some accident has intervened to divert the career of the papule into singular channels—such as medicaments, pus microbes, neglect, filth, or parasites. They are extremely rare in properly treated patients. The lesions may be miliary, pinhead-sized to bean-sized, or confluent. They have frequently been mistaken for the lesions of smallpox, which they greatly resemble. The cicatrices left from the smaller lesions are rarely conspicuous; but from the larger and confluent sores the scars may be indelible. In the confluent variety there is distinct circular grouping of the pustules, and an ulcerating ring forms. There may be but few such lesions forming a single group. When repair ensues, the crusts fall, the ulcers granulate, and cicatrization concludes the history.

From *varicella* and *variola* this manifestation of the disease may be distinguished by the fever, by the activity of the lesion, by the umbilication and multiplicity of the sores; from *acne*, by the region invaded, the latter being usually limited to the face and upper trunk.

4. **Tubercular Syphiloderm.**—The tubercle is with difficulty distinguished from a gumma; clinically and pathologically there is little difference between the two lesions. Tubercles, ordinarily more superficial, are more apt to resolve, develop at an earlier period, are more numerous, and are more commonly grouped. Tubercles ordinarily occur after a lapse of from 2 to 10 years. They are firm nodules, copper-tinted, ordinarily arranged in portions of circles. They may be dry or atrophic, resolving beneath an unbroken epidermis, leaving a pigmented macule that fades and leaves an indented scar. They may be ulcerative, the upper portion of the small tumor being destroyed, involving either the small circumscribed area or producing broad, palm-sized, and larger destruction of tissue.

5. **Gummatous Syphiloderm.**—Gummata of the skin are at first uncolored elevations; later they become livid, as the integument becomes thinned to a point where bursting of the contents occurs through its envelope. They are usually late lesions, occurring from 2 to 5 years after the chancre, but may develop within a few months. They are most common on the leg; also common on the shoulders and back. The bones of the part invaded frequently suffer, causing extensive mutilation, especially about the face. Not the least conspicuous among the distinctive features of these severe ravages of syphilis is the extraordinary extent to which, when properly treated, repair ensues—a distinction of the highest value in respect to diagnosis.

Serpiginous and vegetating syphiloderms are conditions due to peculiar forms assumed by lesions previously mentioned, and are not special cutaneous expressions of the disease.

Syphilitic Affections of the Hair.—Syphilitic alopecia may be due to the action of the disease either upon the nutrition of the hair or directly upon the scalp. The most common form, however, produces no structural change in the integument. The loss of hair may be partial or general, affecting at times only the hair of the scalp; at other times, that of the entire body. As a rule, bare patches in areas from fingernail-size to palm-size occur upon the scalp. The lack of symmetry is noticeable; the hairs of one eyebrow for example disappearing while the other eyebrow remains intact. When the integument undergoes structural changes, the hair follicle itself is frequently destroyed, preventing a return of the hair; whereas in the simpler form already mentioned, the loss is not without remedy.

Syphilitic Affections of the Nail.—Syphilitic onychia and paronychia are not infrequent, and may coexist. There may be superficial exfoliations, fissures, or ulcers; the nail fold, the nail

groove, or the matrix may be the seat of deep and ill-defined infiltration. The course is commonly indolent; at times, exceedingly painful. The odor is highly offensive and the secretions are contagious. The nail may be lost entirely or partially, and the new-formed nail may be correspondingly misshapen. This complication is often a portent of a grave syphilis, and is likely to occur in middle-aged patients with weakened constitutions. When the change is confined to the nail itself, there may be either atrophy, and a characteristic worm-eaten appearance, or hypertrophy with perceptible thickening.

Syphilis of the Mouth and the Tongue.—These lesions correspond strictly to those already studied as of occurrence in the skin, modified simply by peculiarities of site and by such habits as using tobacco, holding pipes, cigars, and toothpicks in the mouth, and by the drinking of hot or highly spiced liquids and the use of salted foods. Carious teeth pressing upon the tongue and cheeks are also frequently productive of such lesions. The macular syphiloderm produces an area of vivid or dusky redness, which may result in erosion or ulceration, but which disappears under proper treatment. The papular syphiloderm is here represented by the **mucous patch** of varying size, slightly raised above the general level. These patches are usually painful, and are succeeded by superficial erosion and ulceration, particularly at the angles of adjacent surfaces, such as the outer angles of the lips, where both the mucous and cutaneous surfaces may be involved. Gummata occur in the tongue, usually single, breaking down rapidly into ragged ulcers. Usually, these lesions are present in persons who are large users of tobacco, especially in chewers. In severe cases the results may be equaled only by the extensive ravages of cancer in the same region, but the repair wrought by skillful treatment is extraordinarily happy in results.

Syphilis of the Nasal Passages.—In this tract chancres are rare. The lesions present are mucous patches and gummata. The destruction is often extensive, the hard and soft palates being perforated or destroyed or passages being obliterated by cicatricial occlusion. The disease may thus extend to the meninges of the brain. Mucous patches and gummata also occur in the pharynx, producing grave destructive results when the bone is invaded. In the larynx typically developed mucous patches are rarely seen, but erosions and superficial ulcers may be discovered over the epiglottis, the vocal cords, and other parts on laryngoscopic examination. Later, gummatous changes may produce more serious accidents. The resulting ulcers leave cicatrices which may prove harmless or may draw together the walls of the larynx or fasten the epiglottis to the tongue or to the pharyngeal wall. The chief symptoms recognized without laryngoscopic examination are the hoarse voice, cough, dyspnea, and symptoms due to imperfect aeration of the blood, varying from the mildest to the severest distress. In the great majority of cases the prognosis is favorable, restoration of the voice being secured even after well-nigh complete aphonia for months or years. In the trachea and bronchi syphilitic lesions resemble those upon the structures immediately above. The more deeply syphilitic lesions spread toward the lungs, however, the greater is the gravity.

Syphilis of the Bones.—Most of the changes in bone are due to gummatous deposits, either in the periosteum, between it and the osseous tissue, within the bone substance, or in the medulla. The lesions are commonly multiple, forming tumors varying greatly in size, which are exceedingly painful, especially at night. In fact, the nocturnal exacerbations are considered diagnostic, and are due to the warmth engendered by the bedclothing, which increases the tension between the tense periosteum and the unyielding mass of the osseous tissue. The course may be either complete involution or degeneration by softening, the tumor breaking at the center, leaving an ulcer with exposed bone at the base.

Syphilis of the Joints.—Synovitis and arthritis may involve one or more joints. The articulations are tender, painful, and hot, motion is limited, and there are generally pyrexial symptoms. Termination may be by resolution, by ankylosis, or by destruction of the joints. The knee and the sternoclavicular and scapuloclavicular joints are chiefly involved.

The tendons and tendinous sheaths may be involved in gummatous processes; the aponeuroses may also be involved. In the muscles gummatous infiltration may involve the muscle bundles, producing pain, sometimes permanent contracture, or atrophy; the latter condition may also result from involvement of the nerves supplying the muscle. Syphilitic pericarditis is rare. Gummata have been found postmortem in the septa and substance of the heart. Fibrous myocarditis of syphilis is due to invasion of the coronary arteries. Aneurysm of the heart has been recognized as directly due to syphilis, and also to the indirect results of its cachexia. The blood-vessels may be affected by a fatty metamorphosis, resulting in the formation of aneurysmal pouches; or the endothelium of the vessels may be thickened, producing an endarteritis obliterans. Gummatous periarteritis has also been observed in both the circumscribed and diffuse forms.

Considerable difficulty in discriminating between gumma and tubercle of the lungs has obscured the characteristic features of syphilitic disease. The latter, however, is found in the posterior and lower lobes of the lung oftener than in its apex; and on section the lung closely resembles the condition seen in simple pneumonia, its substance being firm and grayish or reddish. The absence of leukocytes is conspicuous. The absence of tubercle bacilli is, of course, of the greatest value in establishing a diagnosis.

Syphilis of the intestinal canal is rarely encountered save in the anorectal pouch, where gummatous deposits are found. Gummata are sometimes found in the liver of the subjects of syphilis, near the capsule or deeply set. The effect is frequently like that occurring in cirrhosis. It is rare that symptoms pointing unmistakably to hepatic

involvement are displayed during life. Syphilis of the spleen and pancreas is exceedingly rare. When these organs are involved, gummatous deposits of varying size are found.

In the anal region chancres are often mistaken for piles. The early lesions are usually flat papules, in consequence of heat and moisture becoming condylomata and mucous patches, which are rapidly developed. Syphilitic ulcers of this region are circular in outline, and have undermined walls and pultaceous floors, contrasting with the sharply cut, irregularly outlined walls and deep floors of tuberculous invasion.

Syphilitic stricture of the rectum, whether resulting from a proctitis leading to the specific complication, or from gummatous changes in the lower segment of the rectum, is more common in women than in men, and constitutes one of the most formidable of the complications of the disease. The lumen of the gut is interfered with in various grades, from those due to bands, bridles, or constricting rings around the organ to the severe grades in which the rectum is converted into a tortuous channel, interrupted by knobs and bridles and almost completely occluded. Relief is difficult in the absence of surgical interference, which may require division of the strictured portions of the gut by the aid of the electrocautery (often eventually valueless), by the production of an artificial anus in the groin, or by complete excision of the entire neoplasm. By the use of bougies relief may be secured for a time, internal treatment proper to the malady being at the same time instituted.

Gummata of the rectum may be single, multiple, or diffuse, occurring frequently in an annular form, producing the large majority of all rectal strictures.

Syphilis of the Genitourinary Organs.—Gummata developing in the corpora cavernosa are represented by nodules or, very rarely, by annular bands. Deep deposits in the urethra, as well as in the prostate gland and seminal vesicles, are quite rare. The epididymis and cord are occasionally invaded. The globus major and, more rarely, the globus minor become indurated, inelastic, and at times somewhat tender. Syphilitic orchitis is a frequent complication of late syphilis, the change occurring frequently without the knowledge of the patient. The gummatous infiltration may be circumscribed or diffuse, or there may be dense induration, suggesting the firmness of a marble. The size of the glands may be unaltered, or they may be either enlarged or shriveled. In other cases degeneration and bursting of the gumma result. Gummatous lesions of the vulva are not uncommon, while the vagina is rarely invaded. The cervix and os uteri may be the seat of either primary or consecutive lesions, which must be carefully differentiated from epitheliomata, polypi, and chancroids. The bladder is rarely involved. An acute nephritis due to syphilis may occur within a few months after infection, but recovery usually follows vigorous treatment. In late lesions lardaceous degeneration is characteristic. When both organs are involved, the prognosis is grave; but good recovery ensues frequently when but one organ is affected.

Syphilis of the Nervous System.—Changes in the nervous system due to syphilis may result from the effects of the disease upon the osseous system, upon the meningeal coverings of the nerves, upon the nerve-cells and fibers, or upon the vessels furnishing nutriment to the nerves. A fatal issue in syphilis can more often be ascribed to the nervous than to any other system. Gummatous deposit in the cortical portion of the brain is perhaps the most common involvement. An obliterating endarteritis may cause thrombosis and subsequent occlusion, or small aneurysms with subsequent rupture and cerebral hemorrhage. The symptoms are headache, with nocturnal exacerbation, possibly aggravated by pressure over certain points. The capriciousness and multiformity of the surface symptoms, however, are striking. Monoplegic or hemiplegic attacks indicate affection of the larger ganglia. Lesions of the crus, of the pons, and of the medulla are indicated by symptoms similar to those produced by other lesions of the same areas. Syphilis of the cord may produce bilateral spastic paralysis of the lower extremities, exaggeration of tendon-reflexes, contractures of muscles, rectum and bladder symptoms, and, in some cases, severe pains in the lower limbs. Syphilis is, without question, a precedent fact in a large majority of all cases of tabes and paralytic dementia.

Syphilis of the Eye.—Any of the ocular appendages—the eyelids, the lacrimal gland, the canaliculi, the sac, and the nasal duct—may be involved in any one of the early or late manifestations of syphilis. Syphilitic iritis is the most common of all luetic affections of the eye. The subjective symptoms are photophobia, lacrimation, deep-seated pain, and imperfect vision. There are noticed change of color, irregularity of the pupillary opening, sluggishness of the iris, and deep ciliary injection. The prognosis is good. Syphilitic choroiditis is next in frequency. The symptoms are clouding of the vitreous humor by specks on the membranes, diminution of ocular tension, pain, and amaurosis. Pure retinitis without choroiditis is rare. The fundus is misty, the papilla is obscured, and the disc is encircled by a grayish retina. Exudation and hemorrhages may occur. The optic nerve may be affected either within or without the cranial cavity. Bilateral choked disc indicates an intracranial lesion. When but one eye is involved, the disturbance may be wholly within the orbit. Atrophy of the optic nerve may result. Syphilis of the ocular muscles is due not to a specific myositis, but to intracranial lesion. Implication of the bony walls of the orbit, causing pressure upon the nerve, may produce exophthalmos and violent neuralgia. Abscesses may form and burst, leaving fistulous tracts to carious bone.

Syphilis of the Ear.—The external ear may be the seat of any of the cutaneous lesions of systemic syphilis. The membrana tympani is rarely attacked. Most syphilitic affections of the middle ear result directly from disorders of the nasal pharynx and eustachian tube.

Hereditary Syphilis.—Syphilis may be transmitted from progenitor to offspring as a strictly inherited disease. **Colles' law** points conclusively

to the fact that syphilis of the child means syphilis of the mother, whether or not the mother betrays other symptoms of the disease. It cannot always be determined whether such women have been infected with syphilis directly, from their husbands, or indirectly, from the syphilitic contents of the uterus. If, however, the mother is without syphilis, the child commonly escapes. The period of pregnancy beyond which the mother cannot transmit her disease to her unborn child is not fixed. After the sixth month, the child probably escapes. The question whether inherited syphilis can be transmitted to the third generation can, for the immense majority of all cases, be answered in the negative. The question respecting acquisition of syphilis later in life by the subject of inherited disease is to be answered in the same manner. A few cases have undoubtedly occurred in which the victim was not certainly protected from a second attack. See LUETIN REACTION.

Syphilis of the Placenta.—In some cases of undoubted syphilis of the offspring the placenta has been found wholly free from morbid symptoms, while in other cases the villi are represented by gummatous masses, and the vessels of the cord have been more or less obliterated. It is a matter of importance to note that the liquor amnii of the woman bearing a syphilitic fetus is capable of communicating the disease to the accoucheur.

Symptoms of Hereditary Syphilis.—A series of pregnancies resulting in abortions, first at an earlier and later at a more advanced stage of gestation; these succeeded by one or more miscarriages, and the latter by the birth of a mature child surviving but a few hours, furnishes a typical history of syphilis of the mother. Eventually, a child may be born apparently healthy at birth, but before the fourth month may develop symptoms of inherited disease. The mortality in these cases is between 60 and 90 percent. About seven-eighths of diseased infants exhibit symptoms of the inherited malady before the termination of the third month. Children showing symptoms of the disease at or about the age of puberty have, in all probability, really betrayed evidences of syphilis in infancy that were overlooked.

The cutaneous lesions in a fetus aborted as the result of syphilis are maceration of the skin and bullæ filled with ill-conditioned serum. A viable child may be born with a specific exanthem more or less generally evolved. An infant under the average weight, weazened, yellow-tinted, snuffling, with an aged appearance, with blisters on the fingers and toes, a circlet of papules about the mouth or anus, with a feeble cry and obvious weakness, enables the practitioner to make a diagnosis at a glance. In these infants the syphiloderm may be macular, papular, or tuberculous. The nails, hair, glands, bones, and genital organs may be affected. The saber-blade deformity of the tibia is characteristic. The teeth, as described by Hutchinson, are characteristically notched, particularly the central upper incisors. (See TEETH IN DIAGNOSIS). The pharynx, larynx, trachea, and bronchi may be the seat of changes that may destroy the perichondrium or cartilages. The liver may be the seat of miliary or of larger sized and diffused gummata. The spleen is frequently enlarged. The kidneys may present evidences of lardaceous degeneration. The nervous system may suffer in any portion, resulting in mental states varying from feeble-mindedness to complete idiocy. With the exception of retinitis and optic neuritis, the eye and ear are subject to most of the disorders of the acquired disease.

Treatment of Syphilis.—Attention to the general health far outweighs in importance the question of drugs. An ample supply of nutritious and digestible food; alcoholic beverages in wise discretion, according to the judgment of the practitioner; daily sponging with salt water—cold, if the patient is vigorous—with rubbing with coarse towels afterward, are important aids to a favorable issue. The use of tobacco invites mucous patches in the mouth, as does any other irritation, such as the use of chewing-gum, constantly holding toothpicks in the mouth, and the presence of carious teeth. Diversion of the mind, outdoor living, care of weak eyes, of hernia, or of hemorrhoids, all have distinct value. Delay in instituting systemic treatment until the fullest recognition of the disease has been established in no way jeopardizes the future of the patient or his amenability to the later management of his malady. In fact, an early and frank efflorescence is an augury for good in an otherwise healthy subject. The length of time during which treatment should be kept up varies according to the health before infection, the management during treatment, the virulence of the infection, and the surroundings of the patient. Most patients practically recover after from 2 1/2 to 3 years.

Mercury holds the most important place among drugs esteemed efficient both for the relief of the symptoms and for the radical cure of the disease. Its preparations, in the order of their value, are the protiodid, the bichlorid, the biniodid, the tannate, blue pill, calomel, and the gray powder. It is well to begin with an average dose of the metallic salt, to be increased according to indications. The patient should gain in weight, and should digest his food with appetite and profit. The protiodid may be given in doses of from 1/10 to 1/3 grain after each meal, combined with Vallet's mass or the citrate of iron and quinin. Whenever such a course seems desirable, any one of the other preparations of the metal may be substituted for the protiodid; for instance, the bichlorid 1/60 to 1/12 grain; the biniodid, 1/50 to 1/16 of a grain; the tannate, 1/2 to 1 grain; bluepill, 1/4 to 1 grain; calomel, 1/10 to 1/4 grain; and the gray powder, from 1 to 5 grains. It is believed that, when all progresses satisfactorily, the patient who secures complete immunity from symptoms of his disease in the first half year does better when no remedy is administered save mercury. Other things being equal, he who has secured complete relief from syphilis without using the iodid of potassium has usually had either a mild or an exceedingly tractable form of the disease.

Iron is administered with decided advantage to the great majority of all patients affected with

syphilis, and should be used whenever not contraindicated. The iron and quinin citrate, from 3 to 8 grains before meals, or the muriated tincture of iron in combination with corrosive sublimate (of the latter, 1/60 to 1/30 grain after meals), may be used.

Inunction of mercury has the excellent recommendation of sparing the stomach, and is also of advantage in grave cases or in cases of emergency; also when there are persistent lesions refusing to yield to internal medication. The ointment, in 50 percent strength, combined with lanolin or vaselin, should be rubbed in until it has practically disappeared. Often it is desirable to give a course of 20 inunctions, after which the rubbing may be suspended while other treatment is pursued, the inunctions being renewed until the entire number advised is completed. New areas of inunction should be selected on successive days in order to avoid dermatitis. Such a dermatitis is, however, rarely serious. When it really seems to demand treatment, a simple dusting-powder or Lassar's paste usually suffices.

The mercurial vapor bath is both efficient and speedy, and in an emergency is capable of producing very rapid effects. Calomel or cinnabar, or the two in combination, may be selected. It is best given before bedtime, and should last for about half an hour. If debility is induced by the steaming, tonics, and even a generous glass of wine with the dinner, should be administered.

Hypodermic injections are employed more frequently than formerly. Rapidity of effect, the sparing of the digestive tract, simplicity, and cleanliness are contrasted with its danger, its liability to produce abscesses at the site of injection, cardiac and pulmonary symptoms after injection within a vein, considerable pain, exhaustion, and possible sudden death. If, nevertheless, the hypodermic treatment is selected, strict surgical cleanliness and asepsis are extremely important. Corrosive sublimate is usually employed, dissolved in a few minims of water suspended in olive oil or emulsified, and in the strength of from 1/12 to 1/10 grain. The method has not as yet shown results that warrant its adoption as a routine treatment, its disadvantages rendering its general adoption improbable. The well-known toxic effects of mercury—including salivation, dyspepsia, anemia, and symptoms simulating those of muscular rheumatism—must be carefully watched, for many symptoms popularly accredited to mercury are really due to the syphilis, and are wrongly imputed to the metal.

Intramuscular injections have come into prominence in the last few years, the gluteal region being the preferable site. Of the soluble salts, the benzoate and the binodid of mercury are most frequently used; of the insoluble the salicylate, calomel and gray oil.

Intravenous injections of soluble salts have proved valuable in the hands of some clinicians. See Intravenous Injection.

Arsenic has recently been advocated, alone or alternately with mercury. Of the three forms which have recently come into favor atoxyl, soamin, and arsacetin (*q. v.*), the first has been found to produce optic atrophy. The second, soamin, too has been reported to be dangerous. Arsacetin, the most stable and least toxic is probably the preferable drug. See Arylarsonates.

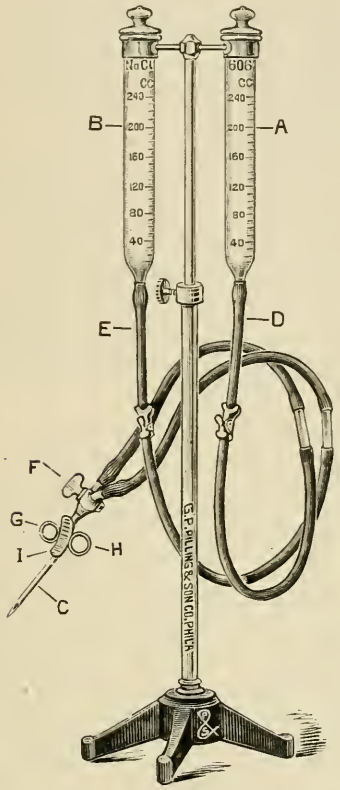
Salvarsan ("606").—The latest addition to specific therapy is Ehrlich's synthetic arsenic compound, arsenobenzol (dioxydiamidoarsenobenzol dihydrochlorid) called "606," as it was the 606th preparation tried. A single injection of a proper dose is reported to be as destructive to the spirochæta pallida as quinin is to the plasmodium malariæ. Within a day or two one injection of the drug will kill all the spirochetes in superficial lesions such as mucous patches or primary lesions.

The dose of "606" at present is from 0.45 to 0.6 gram injected subcutaneously below the scapula. "606" is an unstable yellow powder put up in vacuum tubes to prevent its rapid oxidization in the air. In order to make the injection painless—the acid solution resulting from the addition of water producing much pain—the drug is injected in the form of an alkaline salt (Alt) or, preferably, of a neutral base (Wechselmann's method). The neutral base is obtained by dissolving the dose to be given in 1 to 2 c.c. of sodium hydrate solution and then adding acetic acid, drop by drop. To the fine yellow precipitate—the base—that forms is added 1 to 2 c.c. sterile distilled water and then 1/10 normal sodium hydrate or 1 percent acetic acid, as required, until the reaction is exactly neutral to litmus. Ehrlich warns against the use of the drug in advanced disease of the heart or blood-vessels or in ocular disease involving the optic nerve. Attempts are being made to reduce to a minimum the toxicity of the drug. The latest improvement—Ehrlich's "hyperideal" is claimed to be but one-third as toxic as the original. While there is not complete unanimity on the byeffects of the drug, all the clinicians who have been testing it agree that it is not toxic to the human adult in doses of five to eight grains, and that it is a remarkable specific for syphilis.

Intravenous injection is now being used; it is claimed that this method is painless, more powerful in its effects upon the *Spirochæta pallida*, allows of more accurate dosage, and is not followed by so many bad after-effects.

Boehm's method of giving salvarsan intravenously is described by Hirsch as follows: "Two graduated glass containers of 250 c.c. capacity are used. Into one is poured 150 to 200 c.c. of sterile salvarsan solution. The other is filled with a like volume of sterile saline solution (made with sterile distilled water and chemically pure sodium chlorid). The saline solution is allowed to flow out of the needle so as to expel all air from the tube. The stop-cock is now reversed, allowing the salvarsan solution to flow out of the needle, thereby expeling all air from its tubing. The stop-cock is now reversed to its former position, until the saline solution is running in a slow even stream from the needle. The desired site of puncture is selected on the arm or at the elbow, and the needle is gently pushed or thrust through the skin into the vein. Meanwhile the saline solution is continu-

ously running from it. The needle is held at about an angle of 10 to 15 degrees to the skin surface, depending on the prominence and caliber of the vein. Care must be exercised not to push the needle through both walls of the vein. This can be avoided by not introducing too long a surface of the needle into the tissues.



The patient's arm having been carefully cleansed, a ligature in the form of an ordinary soft rubber catheter or tubing is tied around the middle of the arm, above the selected site of puncture, and the patient is requested to tighten the fist so as to make the superficial veins more prominent. Some prefer to expose the vein in all cases.

As soon as the needle has entered the vein, the rubber ligature is released by an assistant, the stop-cock of the needle is reversed, and the salvarsan solution flows through the needle into the vein. Hence there is no danger of any salvarsan solution getting into the subcutaneous tissues. The intravenous injection must be given slowly, not less than ten minutes being spent in the process; and the solution must be quite warm when poured into the container so as to allow for its cooling when flowing into the apparatus; when it enters the vein, the solution should be about the temperature of the blood. An ideal intravenous injection is painless."

Iodin and its compounds stand next after mercury in value. The following are conditions in which it is wise to employ them: First, in attempts to resolve gummatous lesions; second, when the patient is intolerant of mercury, or when he cannot be made to gain in weight and appetite during youth; third, when the patient is being subjected to the action of mercury by external use; fourth, as an alternate medication to mercury. Iodin is the one remedy earliest and most often resorted to by the ignorant, and it is the one which is last used, and then most effectively, by the expert. The dosage depends almost wholly on the emergency presented. Ordinarily, it may be administered in 5-, 10-, or 20-grain doses; but as high as 600 grains, and even more, of the iodid of potassium have been given in 24 hours with favorable results. It should be stopped or reduced upon the occurrence of any symptoms of iodism, constipation, or bladder trouble, or as soon as the immediate effect in view is secured. As a rule, the toxic effects of the drug speedily disappear when the exhibition of the remedy is suspended.

"Mixed Treatment."—This term designates a method by which mercury and a salt of iodin are administered at the same time in a single dose. A 6-ounce mixture containing from 1 to 3 grains of the biniodid and from 1/2 to 2 ounces of the potassium iodid may be advantageously given in teaspoonful doses after meals. One of the bitter tinctures may be added to produce a tonic effect. The corrosive sublimate may be substituted in equal amount for the biniodid.

The treatment of syphilitic lesions as they are presented in the several organs of the body:

Syphilis of the skin yields to systematic treatment, but at times local treatment is of value. The erythematous and papular syphiloderms may be sponged with warm boric solution and anointed with an unguent having vaselin or cold cream for a basis, with from 5 to 20 grains of calomel or white precipitate to the ounce; or the following may be used:

℞.	Mercuric chlorid,	gr. iv
	Alcohol, Tincture of benzoin, Tincture of tolu, Glycerin, each,	ʒ j
	Rose-water, enough to make	℥ iv.

For the papular and scaling lesions nothing is better than mercurial ointment in full or reduced strength. Condylomata should be washed with deodorizing solutions of chlorinated soda or boric acid, after which they are to be dusted with equal parts of calomel and starch or with boric acid. Pustular lesions, especially over the face, require careful attention. Washing with hot boric solution, followed by touching with a solution of corrosive sublimate, 1 or 2 grains to the ounce of benzoin, should be followed by dusting with calomel, europhen, or boric acid.

Early syphilitic alopecia should be treated by shampooing with tincture of green soap 3 or 4 times a week, followed by an unguent of white precipitate or calomel, 5 grains to the ounce of vaselin, or 1 dram of precipitated sulphur and 1 grain of cinnabar to the ounce.

Mucous patches should be touched daily with a silver nitrate solution, or with the solid stick. This should be done by the physician. For individual use, a lotion or gargle may be employed, such as 1 dram of potassium chlorate and 1/2 ounce each of honey and tincture of myrrh to 6 ounces of distilled water, diluted as required. When the palate is involved, medication should be prompt, both internal and local, and should be pushed to the largest tolerated doses.

In cases of **ozena** a vapor from the following solution should be snuffed through the nostrils:

℞.	Phenol,	ʒ j
	Tincture of iodin,	ʒ iv
	Ammonia water,	ʒ ij
	Cologne water,	ʒ iv.

Pharyngeal lesions may be treated with medicated sprays, caustics, the galvanocautery, or the knife.

The nails, when involved, should be bathed in warm borated water, followed by a weak mercurial salve or dusting-powder.

Syphilis of the bones and periosteum calls, in general, for the iodid of potassium internally, with mercurial unguents or plaster over accessible nodes or tumors. Any sequestrum should be removed when completely separated.

In all cases of **visceral syphilis** there is urgent need of systematic tonics, together with antisyphilitic treatment.

Lesions of the rectum and anus call for the iodids in large doses.

Strictures should be dilated by rubber bougies; and when the result of such treatment is only temporary, surgical interference is indicated.

When the epididymis or body of the **testicle** is involved, the iodid internally and abstention from sexual intercourse usually give good results.

Lesions of the nervous system require the largest tolerated doses of the iodids, with inunctions of mercury at the same time. Tonics, a highly nutritious diet, and daily sponging with hot water are valuable.

For treatment of the **eye and ear,** the reader is referred to the special articles on diseases of these organs. See Ear (Diseases), Iritis, Retinitis, etc.

The special treatment of the **syphilitic pregnant woman** is by mercurial inunctions, together with the mixed treatment. When the syphilitic infant is at the breast, the treatment of the mother is not to be neglected. Only upon very strong evidence should direct treatment of a **syphilitic infant** be begun, since even after the birth of intensely syphilitic fetuses and a series of abortions there are brought into the world children who never exhibit signs of the disease even when both parents have been infected. The child should always be nourished by its mother, and should never be allowed to take the breast of a healthy wet-nurse. When symptoms are unmistakably present, the child may be given calomel, 1/20 to 1/2 grain 3 times a day, together with tonics; or the protoiodid in doses of 1/10 to 1/4 grain; or corrosive sublimate, $\frac{1}{100}$ to $\frac{1}{50}$ grain. Iodid of potassium may be given cautiously, from 1/4 to 5 grains. Mercurial inunctions may be used in the earliest period of life. The ointment should be combined with 2 or more parts of pure white vaselin, and increasing quantities should be used until 20 to 30 grains are rubbed in daily.

The acquired syphilis of infancy is chiefly remarkable for its display of moist and secreting lesions and for its failure to relapse in cycles when the disease is duly recognized and properly cared for. But in unrecognized or neglected acquired syphilis of infancy the results may be as mutilating and as disfiguring as in the worst phases of acquired disease of later years.

SYRINGOMYELIA.—The morbid condition caused by the presence of an adventitious cavity in the spinal cord or by dilatation of the central canal.

Pathologic Anatomy.—The cavities are formed partly by defective closure of the central spinal canal and partly by the breaking down of the residual embryonal tissue. The cavity of a syringomyelia is usually in the posterior part of the cord, extending toward the posterior cornua. It may prevail throughout the entire extent of the cord, but in most cases involves only the cervical or dorsal regions or more limited areas.

The essential symptoms are loss of sensibility, chiefly to pain and to temperature; and, to a less degree, loss of simple tactile sense; also muscular atrophy, the latter progressive in development. The sensory symptoms are the earlier and the more constant. There may not only be a loss of thermal sense, but it may be reversed, in that heat is felt as cold, and vice versa. So, also, subjective sensations are felt, including heat and cold, or in their absence pain, which may be neuralgic in character. The involvement of all forms of sensibility probably takes place when the posterointernal columns are extensively involved. The muscular atrophy is the result of injury to the motor cells of the anterior cornua in the compression to which they are subjected in the dilatation. There is also muscular weakness, involving the trunk muscles, from which lateral curvature sometimes results.

The reflexes may or may not be increased, and myotatic irritability may in rare cases be lost, while tremor of the limbs has been noted in some cases. Trophic symptoms are not rare in the parts affected by sensory loss. The skin may be glossy and thin, or thick and horny, while there may be eczema, herpes, bullæ, even ulceration and gangrene. The nails may become fissured and drop off. Vasomotor disturbances are more common, including coldness, lividity, or redness with swelling and heat. There may be sweating, or its absence, brittleness of bone, and joint changes like those of tabes.

The area of the cranial nerves may be invaded when there is involvement of the medulla and pons. The phenomena include paralysis of one vocal cord and of the tongue and face, difficulty in swallowing and in breathing, and embarrassed heart action. The eyes may be disordered; the pupils unequal, and smaller on the side where greatest severity of symptoms exists, but the other special senses escape, and the sphincters are unaffected.

Diagnosis.—This is based upon the sensory symptoms, and of these, thermoanesthesia and analgesia, rather than tactile sensibility, together with muscular atrophy succeeding after some interval. Cervical pachymeningitis runs a more rapid course; the anesthesia includes all varieties of sensation, and corresponds more nearly in its distribution to that of the muscular atrophy; pain is more conspicuous, and the reaction of degeneration is commonly present in the wasting muscles. The symptoms of syringomyelia are sometimes simulated by the anesthesia and wasting of anesthetic leprosy; but in the latter disease the trophic changes are more marked, the phalanges often drop off, while the sensory symptoms include all varieties of sensation.

Progressive muscular atrophy differs in the absence of altered sensation. A spinal tumor in the same situation as a syringomyelia furnishes almost identical symptoms, and may have an identical origin if it starts from the neuroglia; but the symptoms are more rapid in their development (Tyson).

Prognosis.—This is ultimately fatal, although the course is slow, extending over a period of from 15 to 20 years. Toward the end the course is more rapid, death resulting from exhaustion or from interference with the functions of the medulla.

Treatment.—This consists of measures to combat such symptoms as cystitis, bed-sores, etc., and general tonic and alterative measures.

SYRINGOMYELOCELE.—See Spina Bifida.

SYRUPS.—Concentrated solutions of sugar in water or in aqueous liquids. They sometimes contain acetic acid, and occasionally alcohol; and are termed *simple*, *medicated*, or *flavored*, according as they are simple solutions of sugar in water alone, or contain soluble medicinal substances or flavoring ingredients. The sugar used should be very dry, and its official description corresponds with the granulated sugar of commerce. The permanence of these preparations depends chiefly on their possessing the proper relative proportions of sugar and water. They are prepared either by solution with heat, by agitation without heat, by adding a medicated liquid to simple syrup, by digestion or maceration, or by cold percolation. They are best preserved by being poured while hot into pint bottles, which should be corked securely while full, and the tops dipped into melted sealing-wax. Fermented syrups are useless for dispensing purposes. There are 29 official syrups.

T

TABACUM.—See Tobacco.

TABES DORSALIS.—See Locomotor Ataxia.

TABES MESENTERICA (Tuberculosis of the Peritoneum).—See Peritonitis; Scrofula; Tuberculosis.

TACHYCARDIA.—Abnormal paroxysmal or persistent rapidity of cardiac action. The pulse may attain a speed of 200 a minute. It is a comparatively rare affection, due to paralysis of the inhibitory nerve of the heart or to stimulation of the cardiac accelerator nerves. See Heart-disease (Functional). See Heart Examination, Pulse.

TAKA-DIASTASE.—See Diastase.

TALIPES (Club-foot).—Talipes is the technical name for club-foot, whether congential or acquired. Congenital talipes presents varieties not so numerous and less complicated than the acquired form, which develops after the second year of life. The features of congenital talipes are so pronounced that one can differentiate this from the acquired form. Acquired talipes is easily recognized, and is marked by a loss of power in certain groups of muscles, although it must be admitted that a moderate grade of talipes, resulting from slight paralysis in early life, may assume the characteristics of a congenital form in later life. Such cases, however, are exceptional. The different varieties, then, are: (1) Talipes equinus; (2) talipes varus; (3) talipes calcaneus; (4) talipes valgus; (5) talipes cavus; (6) talipes planus.

Talipes Equinus. Talipes Calcaneus. Talipes Cavus- or Arcuatus. Talipes Varus. Talipes Equino-varus. Talipes Calcaneo varus.

1. **Talipes equinus** may be described as extension of the foot, with spasm or shortening of the tendo Achillis, and usually with a loss of power in the anterior tibial group. The patient stands on the tips of the toes, on the distal ends of the metatarsals with the toes hyperextended, on the ball of the foot with the heel slightly raised or on the heel and ball of the foot, but is unable to dorsiflex the foot beyond a right angle It will thus be seen that there are four grades of equinus. Equinus is more frequently combined with varus, but it may be associated with valgus and cavus. Congenitally, it is more frequently associated with varus, and, as an acquired deformity, with valgus. It is also associated with cavus. The terms, then, would be talipes equinovarus, talipes equinovalgus, talipes equinocavus.

2. **Talipes varus** is an inversion of the foot, associated with rotation at the midtarsal joint. The degree of the deformity is determined by the amount of manual correction possible and there are recognized: first, easily corrected and maintained; second, corrected and maintained with difficulty; and third, incorrigible by the hands. Anatomically, the tissues on the inner side of the ankle and foot are shortened, and certain tendons, such as the anterior tibial and the flexor brevis pollicis, are displaced toward the inner and posterior aspect of the limb, while the structures on the outer side are lengthened and the tendons likewise are more or less displaced. Bones, ligaments, muscles, and fascia all participate in these changes. Varus is associated with equinus, usually as a congenital deformity; less frequently as an acquired deformity. Occasionally it occurs with cavus; very seldom with calcaneus.

3. **Talipes calcaneus** is, as a rule, an acquired deformity; exceptionally, it is congenital. The deformity is characterized by elongation of the tendo Achillis and of the muscles associated therewith, by shortening of the anterior tibial group of muscles, and by slight flexion of the toes. The os calcis becomes very prominent, and the patient literally walks on the heel. This bone lies vertically in place of horizontally, in the severer forms and is continuous with the vertical axis of the leg. Calcaneus is associated with valgus, frequently with varus, and not infrequently with cavus.

Talipes Valgus. Talipes Calcaneo-valgus. Talipes Equino-valgus.

4. **Valgus** is usually acquired, rarely congenital, and is a deformity of the foot in which eversion is a prominent feature. The outer border of the foot is raised, the foot is everted, the patient stands on the inner border of the foot, and, as in the other varieties of talipes, presents the different degrees. In an extreme form the patient would bear the weight on the internal malleolus. Valgus is the opposite of varus, and is combined with equinus and calcaneus: never with cavus.

5. **Cavus** is an exaggeration of the normal transverse arch of the foot, and is the result of bony subluxation at the midtarsal joint and of contraction of the plantar fascia. The typical cavus of third degree is seen in the foot of a Chinese lady.

6. **Planus** is the opposite of cavus and is a relaxation of the ligamentous, fascial and tendinous structures in the arch and sole of the foot. The arch sags and there is a flat-foot. It may be relaxed or rigid and is due to many different causes, among which are obesity, occupation, ill-fitting shoes, right-angled equinus, and weakened tissues in the foot.

Etiology of Talipes.—The appearance of talipes equinovarus, dependent upon slight paralysis many years previously and not influenced by treatment, is so much like the congenital deformity that the points of distinction are well-nigh obliterated; hence the popularity of the theory that a congenital club-foot results from an intrauterine paralysis. The theory advanced many years ago by Essericht, of Copenhagen, is that the feet of the fetus occupy various positions during the course of intrauterine life, in order that the joint surfaces, the muscles, and especially the ligaments may be developed in accordance with the future usefulness of the feet; that when anything centric or excentric prevents the feet from assuming these positions at the proper time, or holds them in any given position beyond the limit of time during which they should normally occupy such a position, talipes results. The variety of congenital talipes will depend upon the date of its production; the severity will be in direct ratio to the mechanic obstruction at work.

The etiology of acquired talipes is less difficult, the more common form being the result of anterior poliomyelitis, although it must not be inferred that talipes is the necessary result of the paralysis; it is, rather, an accidental result.

Of themselves, few cord-diseases produce talipes; but the resulting muscular contractions induce the deformity. The bilateral equinus in cases of compression myelitis is well known; yet the deformity rarely receives treatment. In cerebral hemorrhage in infancy the gastrocnemius is often the seat of a contraction that, by its long persistence, ends in contracture of the tendo Achillis.

Ostitis of the ankle occasionally includes an equinus, a varus, or an equinovarus. Rachitis may be mentioned, as one of the causes, but in reality, when deformity occurs, it is believed to be due to weak ankle or "spurious valgus." Cicatrices from lacerated wounds of the ankle may be mentioned as another cause.

Spastic paralysis has for one of its manifestations an equinovarus or an equinus, usually first noticed when the child begins to walk. There also exists a marked inward rotation of the limbs, and the deformity is readily recognized, being bilateral, symmetric, and easy of correction by manual force.

Many of the milder forms of talipes can be attributed to sprains of the ankle. However slight the deformity, the pain and annoyance caused by use are often greater than when the deformity is more marked, and to this mild grade of the deformity Schaffer has given the name of "nondeforming club-foot." Rheumatism may be mentioned as an occasional cause of talipes valgus; indeed, it is not an uncommon cause of what is known as spasmodic pes planus.

The symptoms and signs of talipes and of its varieties may be gathered from the foregoing, and little need be said beyond the description already given. There are really very few symptoms that belong to talipes. The signs are those of deformity, and are noted either as the patient stands or walks. Occasionally, in very young children, when the deformity is congenital, standing and walking are not necessary to bring out the signs.

Diagnosis.—The recognition of the various forms of talipes is easy, and particularly is this so of the deformity in the second and third degrees. It is only in the first degree that confusion may sometimes arise. Many infants in arms present certain evanescent deformities of the feet that are regarded as club-foot. A child, for instance, when it begins to stand, bears the weight on the toes and balls of the feet a good deal; the heels are raised, and deformity apparently exists. In especially stout children, in whom the gastrocnemius is flaccid, and in whom the tendo Achillis is easily stretched, a calcaneus can be produced, and often is produced. When the tendo Achillis is distinctly short, or when the anterior tibials are short and there is a history of paralysis, a talipes equinus or a talipes calcaneus may easily be diagnosed. Deformity must also be differentiated from weak ankles—a very common condition in rachitic subjects or in children who are very stout.

Prognosis.—Talipes is a deformity that can easily be corrected at almost any stage; in a young child the prognosis is exceedingly difficult. It may be said that under efficient treatment, long continued, the prognosis is good: that is, a useful foot—one free from deformity—with functions fully restored.

Treatment.—The treatment of talipes is both mechanic and operative. The two must not be regarded as separate and distinct, but as supplementing each other. The most efficient treatment is a combination of the two.

Mechanic.—The particulars underlying mechanic treatment are, first, an appliance that will hold the heel and the front of the foot in position; and, second, a lever that will correct. This lever must extend up the calf or to the thigh, sometimes to the pelvis.

The principal types of club-foot shoe are:

1. **The Knight club-foot shoe,** which is a modification of the old Scarpa shoe. This consists of a

foot-plate the shape of the sole of the foot, made of metal—steel preferably—covered by leather; a heel-cup of steel, consisting of uprights passing from a point just below one malleolus to the other; and leather, thin saddle skirting, shaped to a model of a heel, riveted to these steel uprights. An instep strap is also required, and this may be continuous with the heel-cup. The upright consists of a spring of steel passing from the outer side of the heel-cup and terminating at a calf band that is secured in place by a leather band. Half of the band is of steel. Where the spring is attached at the ankle there is a stop-joint, which holds the foot at a right angle with the leg and allows dorsiflexion, but no extension. In many instances there are double uprights in place of single ones. In adjusting this club-foot shoe the foot-plate is first secured to the plate by means of the instep strap and a bandage around the toe; then the spring is pulled back so that the calf band will grasp the calf. In making use of it, one must change frequently—at least twice a day—manipulate the foot at the same time, and guard against excoriations.

2. **The Taylor club-foot shoe** is practically the same as the Knight shoe in principle, except that the spring is on the inner side of the leg, and in place of a small calf band there is a lacing attached to a plate that passes along the inner side of the leg.

3. **The Schaffer club-foot shoe** is intended for traction on the tendo Achillis and on the plantar fascia.

The operative procedures are: Division of tendons and fascia; subcutaneous division of ligaments, either subcutaneously or by open method; open section, after Phelps; removal of the head and neck of the astragalus; osteotomy through the neck of the astragalus; cuneiform osteotomy through the os calcis, practised by Bradford; removal of the astragalus, known as astragalectomy; and supramalleolar osteotomy. All these are cutting operations, but the one most frequently resorted to is correction by manual force, frequently supplemented by the Thomas wrench—practically a tarsoclasis.

The order of operation should be as follows: (1) Division of the tendo Achillis and plantar fascia, supplemented by manual force for overcorrection; (2) division of the tendons, supplemented by subcutaneous division of the deltoid ligament, and, in addition, manual force and the Thomas wrench; (3) the open division of all obstructing soft tissue on inner side of foot (Phelps); (4) removal of head and neck of astragalus; (5) cuneiform osteotomy (Davies-Colley); (6) supramalleolar osteotomy.

The details of these various operations are simple, and few instruments are required.

Tenotomy, fasciotomy, syndesmotomy, and myotomy are performed with a small tenotome not any longer than a fascia knife. The subcutaneous tenotomy is better than the open method, because the operation is simplified, and need never be followed by sepsis. There is no special instruction needed for the site of operation. The most prominent portion of tendon, fascia, ligament, and muscle invite, so to speak, the insertion of the tenotome either directly down upon it or underneath it.

For the **open method of Phelps** the usual preparations for an aseptic operation are necessary. The foot and leg are rendered as nearly bloodless as possible by an Esmarch bandage, and then an incision is made through the skin, beginning at a point about 1 inch anterior to the internal malleolus and extending across the inner margin of the sole rather obliquely for a distance of about 1 1/2 inches. While eversion is made with one hand the section is continued to greater depths, until all tissues that offer resistance are divided. With foot thus in overcorrection rubber tissue is stretched over the gaping wound, and a sterile dressing applied over this and around the foot and ankle. The plaster-of-Paris may be applied before or after removal of the Esmarch bandage. The hemorrhage is seldom an annoying feature, and the blood becomes organized, filling in the gap with new tissue.

The operations of **astragalotomy** and **astragalectomy** are made through an incision over the head of the astragalus, prolonged sufficiently to admit of removal of the head and neck after section with osteotome, or of the entire bone after section of the ligaments holding it in place. The wound is sewed up with or without drainage, as the operator may prefer.

The cuneiform osteotomy of Davies-Colley is made through an incision over the cuboid and fifth metatarsal on the dorsal aspect. The wedge includes usually the cuboid and a portion of the distal end of the os calcis or the proximal end of the metatarsal. The smaller portion of the wedge encroaches on the middle and external cuneiform bones and the astragalus.

The section of the tibia and fibula above the malleoli is made subcutaneously by an osteotome, and the point selected is about 2 inches above the malleoli. Manual force supplements the section, and the foot is put up in eversion.

All of these operative procedures are of little avail if the deformity is not overcorrected at once, and if the good position secured is not maintained by a dressing that does not yield. Plaster-of-Paris is to be preferred. One should not be content with a single plaster-of-Paris dressing, but should renew this once a fortnight, getting the foot into better position at every dressing.

After a few weeks in plaster the foot should be fitted with one of the club-foot shoes described and over this a shoe should be worn. The anatomy of the talipes foot must never be lost sight of, and the apparatus should be worn until normality is reestablished.

The mechanic treatment of flat-foot includes the construction of a boot or a shoe so that the inner border of the foot will be raised and the weight of the body thrown nearer to the normal vertical axis of the leg with the foot.

This may be accomplished in two ways: (1) By building the boot on a last with a high arch—known as a Spanish last—and inserting an insole the inner border of which shall be from 1/8 to 3/8 inch thicker than the outer border, especially at the

heel and the ball of the shoe. (2) Fill in the shank with leather along the inner side the same height as the heel, and make the inner border of the sole and this elongated heel from 1/8 to 3/8 inch thicker than the outer border (Thomas). The effect of this is to remove the natural spring of the shank of the shoe and to throw the weight of the body over toward the middle and outer side of the foot. In the more severe forms of pes planus, associated with much bony deformity and spasm, correction of the deformity by manual force, under an anesthetic, and retention in plaster-of-Paris for two weeks will render the foot amenable to a steel shank worn within the shoe. The shank that gives most relief is known as the Whitman spring. The best fit is secured over an iron model taken from a cast of the foot in the corrected position.

Cutting operations involving removal of bone are seldom called for, in view of the relief afforded by the milder operative procedures.

In many cases it is advisable, and even necessary, to correct the deformity by manual force, under an anesthetic, and then allow the foot to remain in plaster-of-Paris some weeks before applying a sole-plate. The thorough and persistent use of exercise after the correction of the deformity is essential to the ultimate cure of the case and recovery may be aided by strapping with adhesive plaster to prevent external rotation of the os calcis and assist in supporting the arch.

When flat-foot is of congenital origin, it is sometimes necessary to refresh the astragaloscaphoid articulation, and to nail the bones together in a corrected position. In general, however, the operative treatment of flat-foot is rarely necesssary.

TAMPON.—Tampons are used principally for the purpose of applying pressure—as in uterine displacements and in vaginal and uterine hemorrhages—and for depleting in pelvic and uterine inflammatory conditions. When depletion is desired, the tampon should be made of fine lamb's wool saturated with glycerin, or 10 percent solution of ichthyol in glycerin. The well-known hygroscopic action of the glycerin acts most favorably in cases of chronic congestion from laceration of the cervix, subinvolution, and pelvic inflammation. Tampons used for this purpose are removed at the end of 24 hours, after which a hot vaginal douche is given. They may be introduced at intervals of from 2 to 5 days.

As a means of effecting continued pressure, tampons are occasionally useful in backward displacements of the uterus complicated by slight adhesions. Lamb's wool should here be used, and the tampon should be placed well back of the cervix in the posterior vaginal vault. It should be renewed daily.

For the purpose of controlling vaginal and uterine hemorrhages nothing is superior to the tampon. The tampon in these cases should be of iodoform or sterile gauze. It is removed usually at the end of 48 hours.

TANNALBIN.—A light brown powder recommended as an excellent intestinal astringent in chronic and subacute intestinal catarrh. Dose for adults, 1/2 to 1 1/2 drams; for children, 5 to 15 grains. Tannalbin is a compound of tannin and albumin, and may be prepared as follows: To 10 parts of a 10 percent solution of albumin 6.5 parts of a 10 percent solution of tannin are added; the precipitate formed is collected on a strainer, washed, pressed, and dried at 30° C. The resulting mass is then triturated and forced through a fine sieve, and finally spread out in thin layers and dried for 6 hours at 120° C. This compound is only decomposed by the alkaline secretions of the intestines.

TANNIC ACID (Tannin).—Tannic acid is a glucosid obtained from many vegetable astringents. The official tannic acid of the U. S. P. and B. P. is made from galls, and is distinguished from that occurring in leaves, barks, etc., by the name of gallotannic acid, while the others take the name of the source from which they are derived, as quercitannic acid, from oak bark. Tannic acid is solid, uncrystallizable, white or slightly yellowish, inodorous, without bitterness, very soluble in water, less soluble in alcohol and ether, especially when anhydrous, insoluble in the fixed and volatile oils. It is also very soluble in glycerin, and almost insoluble in absolute ether, chloroform, benzol, and benzine. It is incompatible with alkaloids, gelatin, albumin, and solutions of tartrate of antimony and potassium, and with ferric salts, with which it forms a black precipitate (the old-fashioned ink). It does not react with the salts of the ferrous oxid. If it is rubbed with the chlorate of potassium, the mixture explodes with great violence; hence these drugs should never be ordered in powder together, and if they are prescribed in the same solution, they should be dissolved separately. From tannic acid is prepared styptic collodion (containing 20 percent of tannic acid in the diluted collodion), troches of tannic acid (containing each 1 grain of tannin), and the ointment of tannic acid (containing 10 percent). See QUERCUS.

The effect of tannic acid resembles more closely that of alum than that of any other mineral astringent. It is more irritating, however, than the agent last named. This effect can be reduced in a measure by combination with borax and a small proportion of phenol. A paste prepared by mixing tannic acid two-thirds and gallic acid one-third is thought by some practitioners to be superior as a hemostatic power to one in which only tannic acid enters. It enters in combination with gun-cotton and ether, and in this form is known as styptic collodion.

A combination of the effects of tannic acid and carbolic acid is obtained as follows; to a half pint of water add 1 dram of tannic acid and 2 grains of phenol; filter thoroughly, with care. Glycerite of tannic acid is useful in the proportions of glycerin 5 parts and tannic acid 1 part. A tannated cotton is prepared by steeping absorbent cotton in a solution of tannic acid.

Tannic acid is of special value on mucous membranes and on abraded or superficially ulcerated skin surfaces. It is noted that many of its indications are found in localities where sound integu-

ment joins a mucous- or ichor-yielding lesion, as at the nostril, anus, or vulva, and at the margins of ulcers, fissures, etc.

TANNIGEN.—An acetic ester of tannic acid. Dose, 3 to 8 grains, up to 2 drams daily. A yellowish-gray powder used in chronic diarrhea as an intestinal astringent.

TANNISMUTH.—Bismuth bitannate. It is claimed to be efficient in chronic intestinal catarrh. Dose, 5 to 10 grains.

TANNOFORM.—A compound of tannic acid and formaldehyd. It is a powerful intestinal antiseptic and astringent. Dose, 4 to 8 grains. It is used locally in 10 percent ointment or dusting-powder with 2 or 4 parts of starch.

TANNOPIN (Tannon).—A condensation product of tannin with hexamethylenamin. It has the same action as its two components, into which it is gradually decomposed in the intestines. It is recommended in intestinal catarrh, in tuberculous enteritis, and other intestinal disorders. Dose, 15 grams.

TAPE-WORMS.—See Worms (Tape).

TAPOTEMENT.—See Massage.

TAR.—See Pitch.

TARAXACUM (Dandelion).—The root of *T. officinale*. Its properties are due to a bitter extractive principle; it is tonic, diuretic, and also aperient. It is of reputed use in dyspepsia. Dose, 1 to 8 drams. **T., Ext.** Dose, 5 to 30 grains. **T., Flext.** Dose, 1 to 8 drams.

TARTAR (Argol).—A hard mineral deposited on the inside of wine-casks as a whitish or reddish crystalline crust, the impure supertartrate of potassium. **Tartar** is also the name applied to a hard incrustation on the teeth, consisting of mineral and organic matter. **T., Cream of,** purified argol or acid potassium tartrate. **T., Emetic,** the tartrate of antimony and potassium. See Antimony.

TARTARIC ACID.—$H_2C_4H_4O_6$. A dibasic, organic acid, chiefly employed in refrigerant drinks and in baking-powders; 20 grains neutralize 27 of potassium bicarbonate, 22 of sodium bicarbonate, and 15 1/2 of ammonium carbonate. Dose, 5 to 20 grains. It is widely distributed in the vegetable world, and occurs principally in the juice of the grape, from which it deposits, after fermentation, in the form of acid potassium tartrate (argol). It results on oxidizing saccharic acid and milk-sugar with HNO_3. It crystallizes in large monoclinic prisms, which dissolve readily in water and in alcohol, but not in ether. It melts at 167°–170° F. Its salts are the tartrates. See Antimony, Potassium, Tartar.

TASTE, DISORDERS.—Taste is the sense by which savors are perceived and discriminated. The glossopharyngeal nerve and the lingual branch of the fifth pair are the nerves mainly connected with this sense, of which the tongue is the chief organ. The lips, the insides of the cheeks, the palate, and the pharynx also receive impressions from sapid substances.

The chief sensations of taste are called sweet, sour, salt, bitter, and metallic. Flavor usually blends with the gustatory sense, but it is due to the sensation of smell reaching the olfactory mucous membrane through the posterior nares. If the posterior nares are closed, so that no air passes up through them, the sense of flavor is lost and only that of taste remains. It is necessary, therefore, to distinguish between the senses of smell and taste, and, as well, to determine how far sensations that are in themselves normal are responsible for alternation of the appreciation of the sense of taste: *i. e.*, how far the sense of taste is increased or diminished in its enjoyment of or disgust at some article, the sensation itself being normal.

Taste may be impaired or lost from a variety of causes: (1) from morbid conditions of the mucous membrane of the tongue and palate, as in chronic gastritis or rhinitis; (2) from lesions of the nerves concerned in the conduction of sensory impression; (3) from certain cerebral conditions.

The first variety of causes is most common, and impairs, rather than destroys, the sense of taste. The parts of the mouth capable of receiving taste impressions are the tongue, the palate, and the palatine arches. A dry tongue or a thick coating dulls the sense of taste.

The fifth nerve is the one usually concerned in disorders of taste. It is more likely that this nerve is concerned in taste impressions of the posterior portions of the tongue and soft palate than the glossopharyngeal nerve.

In caries of the middle ear loss of taste for both the back and front of the tongue usually is noted. In general hemianesthesia and in hysteria loss of taste on one or both sides of the tongue and mouth is likely. Gustatory hyperesthesia occurs in myxedema and in mental and epileptic disorders, and is sometimes of central origin.

Tests.—Various substances may be placed on the protruded tongue, the eyes being closed. The quantity of the substance should be small, and taste should be perceived before the tongue is withdrawn into the mouth. The following are used: for bitter, quinin; for sweet, honey; for sour, vinegar; for salt, common table salt; and for metal, a feeble electric current.

Treatment.—This depends upon the etiology. Mercury or podophyllin as purgatives are to be used for a cankery taste unconnected with alcoholism, or half a glassful of pure, cold water may be taken half an hour before breakfast. Gray powder, 1/3 grain given 3 or 4 times daily, will usually remove from the mouth the disagreeable taste due to dyspepsia, in chronic disease, or in early convalescence. Electricity may add to the function of taste when its loss or perversion is due to nerve-disease.

TATTOOING.—The operation of marking the skin permanently by the introduction of foreign substances, such as carbon, India ink, and vermilion. It is a common practice among sailors, the color being introduced into the true skin by pricking it with needles.

Tattooing as a therapeutic measure, to restore the natural colors in parts which are pigmented, is occasionally resorted to. For white, use baryta white; and for other colors, the earth colors (ochers —yellow, brown, red). To assist these, cinnabar

and ultramarine may be used. Mix the colors on a glass plate and impregnate the needles. Electrolysis, followed by tattooing, is useful in cases of vascular nævi.

Tattooing of the cornea is an operation to diminish the unpleasant appearance of leukoma of the cornea by tattooing the same so as to simulate the appearance of the normal pupil and iris.

To Remove Tattoo Marks.—The method recommended by Variot is as follows:

The skin is first covered with a concentrated solution of tannin, and retattooed with this in the parts to be cleared. Then an ordinary nitrate of silver crayon is rubbed over these parts, which become black by formation of tannate of silver in the superficial layer of the derma. Tannin powder is sprinkled on the surface several times a day for some days, to dry it. A dark crust forms, which loses color in 3 or 4 days, and in 2 weeks or so comes away, leaving a reddish scar, free of tattoo marks, and, in a few months, is scarcely noticeable. It is well to do the work in patches about the size of a silver dollar at a time. The person can thus go on with his usual occupation.

TAXIS.—A reduction of a prolapsed structure, as a hernia or a prolapsed uterus, by methodic manipulation without instruments. See HERNIA.

TEA (Thea).—The leaves of *Camellia theifera*, a Chinese evergreen shrub. Tea contains an alkaloid (thein) and tannic acid, boheic acid, gallic acid, gluten, coloring-matter, etc. A decoction of the leaves is a popular astringent, restorative beverage, producing an exhilarating effect upon the nervous system. Used to excess, it powerfully affects the stability of the motor and vasomotor nerves, the action of the heart, and the digestive function, producing flatulent dyspepsia, tremulousness of the limbs, pallor of the surface, irregular cardiac action and feeble impulse, hallucinations, nightmare, anorexia, headache, nausea and vomiting, obstinate neuralgia, especially of the supraorbital and occipital nerves; also constipation and a pain in the left side are not infrequent. The condition of chronic tea-poisoning is termed *theinism or theism*, and is very often seen among women of the lower class in cities, who do not indulge in alcoholic beverages, but freely accept the dominion of the "cup that cheers" and worse than inebriates. Tea contains much more tannin than coffee, and that used as a beverage by the poorer classes is little more than a decoction of tannin, and a fruitful source of dyspepsia and other forms of gastric disorder. The properties of tea are due to thein, $C_8H_{10}N_4O_2$, a substance identical with caffein and a mild cerebral stimulant.

TEETH, ACHING.—See TOOTHACHE.

TEETH, EXTRACTION.—When extracting any tooth carry the beaks of the instrument employed up under the free margin of the gums and alveolar process until you can close the forceps upon the middle third of the tooth, thus reducing in a large measure the possibility of breaking the crown off and leaving the root. The above accident frequently results when one endeavors to extract by only grasping the tooth at its neck.

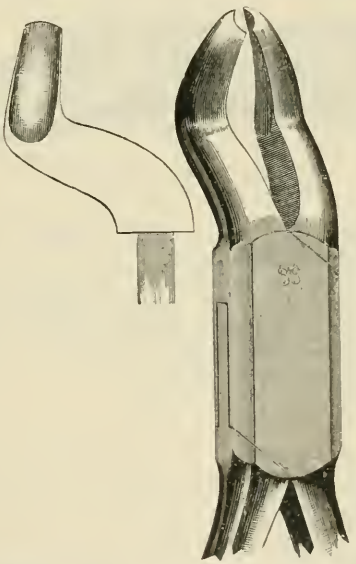
Position of Operator and Patient for the Extraction of Teeth.—Have the patient seated in a solid chair, and his head tipped slightly back, on about a level with the operator's chest, who now takes his position on the right side, and passes left arm around the patient's head and places his fingers between the lips in such a position as will best expose the teeth to be extracted and protect those not to be removed.

This position is maintained when removing all the superior and inferior teeth from right lateral to left third molar with but slight shifting of palm and fingers to best support the face or mandible, and protect the lips from injury. Some operators will find it advisable to lower the patient and have his head carried slightly forward when extracting these inferior teeth.

Take position to right and facing patient when removing all superior and inferior teeth from right cuspid to third molar. Protect lips and sustain face and body of mandible with palm and fingers of left hand.

Order of Eruption of Permanent Teeth.—See DENTITION.

Forceps to be Employed in the Extraction of the Permanent Teeth.—Upper and lower incisors,



No. 10 FOR SUPERIOR THIRD MOLARS.

cuspids (canine), bicuspids and all roots can be removed by Dr. M. H. Cryer's universal forceps No. 150 and 151, manufactured by S. S. W. Co.

For superior first and second molars, employ S. S. White's No. 88, right and left.

For superior third molars S. S. White's No. 10.

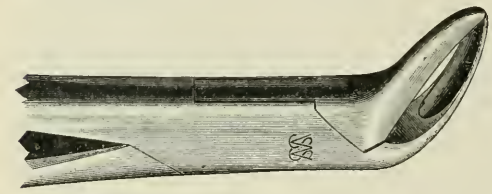
For inferior first, second, and third molars employ S. S. White's forceps No. 47.

Detailed Description of the Application of the Forces to be Employed in the Extraction of all Permanent Teeth. *Superior incisors.*—First a slight rotary motion, and then carry the tooth bodily in a labial direction with slight traction.

Superior cuspids (canines).—Carry the tooth in

a labiolingual motion with positive careful traction.

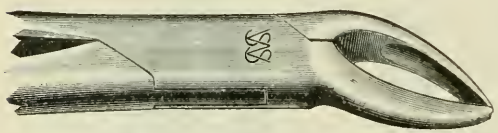
Superior first bicuspids.—Apply force cautiously in buccolingual direction, and positively no rotary motion employed for fear of fracture of the frail root ends.



No. 151 Cryer's Universal Lower Incisor, Cuspid Bicuspid, and Root Forceps.

Superior second bicuspid.—A slight buccal and rotary motion with gradual traction.

Superior first and second molars.—Positive downward and slight buccal movement until the lingual root is gradually loosened, then careful traction without rotation.

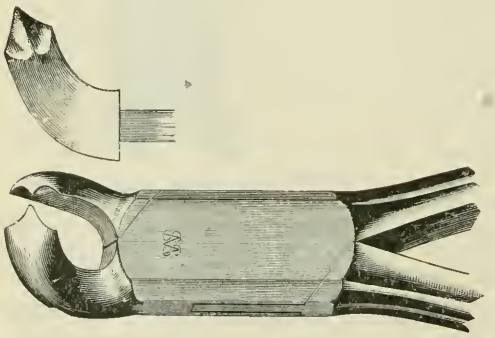


No. 150 Cryer's Universal Upper Incisor, Cuspid, Bicuspid, and Root Forceps.

Superior third molars are easily extracted by the creation of traction buccally.

Inferior incisors are removed by the application of labio-lingual motion. Great danger of root fracture with application of slightest rotary force.

Inferior cuspids.—First a labiolingual force then a gradual rotary traction.

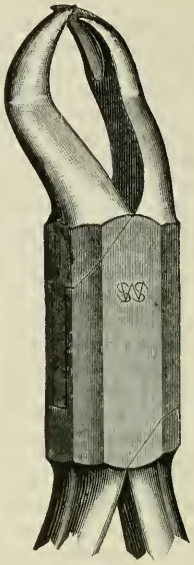


No. 47 For Inferior First, Second and Third Molars.

Inferior first and second bicuspids.—A buccolingual force, then slight rotary motion.

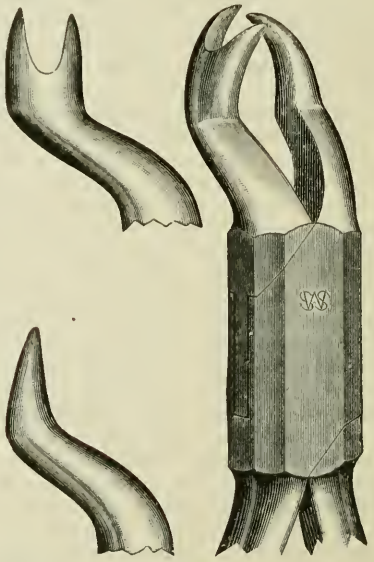
Inferior first and second molars.—A buccolingual and traction force without any rotary motion.

Inferior third molars.—The most difficult one of the molars to extract; and the direction of the force to be applied should be slightly toward the cheek with positive traction that is directed a little backward.



No. 88 R. For Superior First and Second Molars.

To properly grasp some partially erupted inferior third molars, the bony alveolar process and soft tissues on buccal and lingual sides must be cut away before the beaks of the forceps can be properly placed.



No. 88 L. For Superior First and Second Molars.

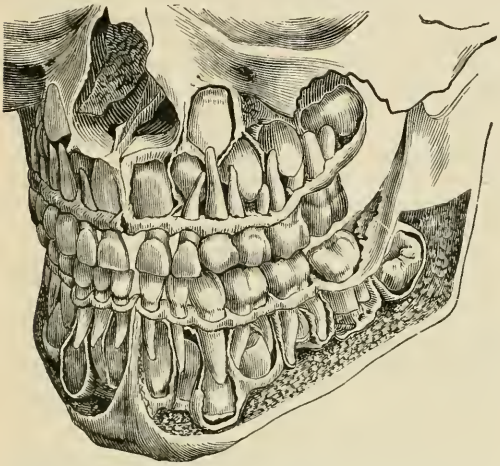
Order of Eruption of Deciduous Teeth.—See Dentition.

Deciduous teeth should be retained their full

term, for the known beneficial influence their presence has upon the normal development of the jaws and face.

When extracting the deciduous teeth, take same position as outlined as appropriate for the extraction of the permanent ones. Forceps No. 250 and 251 as designed by H. M. Cryer will be the only ones needed for the removal of all the deciduous teeth.

Great care should be exercised when extracting deciduous teeth that the beaks of the forceps are not carried to a depth that might engage the oncoming teeth.



Illustrates the Jaws of a Child between six and seven years of age, showing the relations of the two sets of teeth. (*Harris.*)

Treatment of Post-operative Hemorrhage Following the Extraction of Teeth.—To determine what socket is the seat of hemorrhage where a number of teeth have been extracted at one time, have the patient rinse out his mouth with a sterile solution, then immediately applying a previously prepared solid roll of cotton, about the size of the index finger over a number of the openings from which the teeth have been extracted, holding said pack under pressure from one to three minutes. Then remove and the deepest blood stain will be found above the socket where the excessive hemorrhage has been occurring. By this procedure you have the location and number of openings needing interference.

For controlling this hemorrhage, employ a pellet of cotton that will comfortably fill the opening to be packed. Saturate this with alcohol and then thoroughly incorporate it with powdered tannic acid (tannic acid causes the most insoluble clot to form in the presence of saliva).

Now with curved dressing forceps force the medicated cotton pellet to the bottom of the socket and hold it in position until it has become well saturated with blood, and ceases to have a tendency to leave its position.

Remove the pack in 24 to 48 hours and do not replace unless for the purpose of controlling a secondary hemorrhage.

In some pronounced cases the extracted tooth after proper sterilization has been replaced to control the hemorrhage. One precaution that should always be observed is that an operator should never dismiss a patient after the extraction of a tooth until all pulsating hemorrhage has ceased.

A Few Brief Statements in Reference to the General Question of Extraction of Teeth.—The use of an elevator for the extraction of any lower tooth should be condemned on the grounds that in their employment the mandible may be, and frequently has been, fractured.

Care must be exercised in maintaining a positive grasp upon the extracted tooth until it is well out of the mouth, to prevent its slipping from the forceps into the patient's throat.

When teeth are to be extracted from both arches, remove lower ones first, thus maintaining this field more free from blood.

Cocain above a 1 percent solution should not be employed as a local anesthetic for the extraction of teeth.

Injections should not be made into an abscess area, but may be made about it.

Chloroform is the most dangerous general anesthetic that can be administered for the extraction of teeth, and nitrous oxid should always have the preference; when prolonged anesthesia is demanded and continuous nitrous oxid anesthesia cannot be maintained, ether should be employed *and not chloroform.*

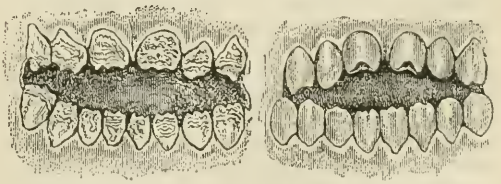
The superior and inferior second deciduous molars and cuspids (canines) should never be extracted before the child has reached the age when the permanent ones will soon be erupting, otherwise a positive irregularity of the permanent teeth will result.

No permanent or deciduous tooth should be extracted if it can be made comfortable and useful.

Teeth may be extracted during any stage of the formation of a dental alveolar abscess without danger to the patient.

Never extract a patient's tooth without first informing him that you are about to do so; otherwise you betray your patient's confidence.

TEETH IN DIAGNOSIS.—In hereditary syphilis the permanent teeth, especially the upper incisors,



Mercurial Teeth. (*Hutchinson.*) Syphilitic Teeth. (*Hutchinson.*)

are notched in a most peculiar manner. The cutting-edge, instead of being straight, with 2 or 3 small serrations, is concave from side to side; the whole tooth is dwarfed, and, especially at the sides, is somewhat beveled off from above downward, so that it has a peg-shaped

appearance. This change, which was first described by Hutchinson, is characteristic; it very rarely, if ever, occurs under any other circumstances, and it is caused by, and is proportionate to, the stomatitis of infancy. If this is severe at the time the dental papillæ are developing, they are so much reduced in size and so altered in shape that it is almost impossible to recognize them as teeth. Mercurial teeth and malformed teeth after certain infantile exanthems, in which the enamel is defective transversely and is marked by horizontal darkened grooves and pits, are totally different, but it is not uncommon to find the two associated. In exceptional cases in which the stomatitis has been late or prolonged, a similar change is visible in the lateral ones as well; but it is only the median teeth of the upper jaw that are definite and characteristic.

TEETHING.—See DENTITION.

TEMPERAMENT.—A term vaguely applied to the predominance of one group or order of constitutional functions over others in an individual. The various divisions of temperament were based on the former doctrine of the four humors of the body—blood, lymph, bile, and atrabilious or black bile, the predominance of any one resulting respectively in a sanguine, lymphatic, bilious, or melancholic temperament. Although the doctrine of the temperaments has long since lost its significance, it is generally admitted that an individual may have a predisposition to types of mental action not improperly classed as nervous, phlegmatic, lymphatic, etc.

Bilious temperament is that marked by a predominance of bile, persons of this type having sallow complexions, dark hair, sluggish circulations. They have great firmness and endurance.

Lymphatic temperament is that characterized by fair complexion, light hair, flabby muscles, slight force of character, and slightly developed passions.

Nervous temperament is that characterized by great activity and sensitiveness of the nervous system.

Sanguineous temperament is that characterized by fair or ruddy complexion, rapid pulse, a hopeful disposition, and strong passions.

TEMPERATURE.—Observations on the temperature of the body are valuable for diagnosis, because the temperature is easily altered when normal action of the nervous system is disturbed or in consequence of disease, or when toxic or infectious substances have been introduced into the body from without; because changes in the blood temperature occur to herald the onset of disease before even its presence is discernible or before even the slightest indisposition is present; because the courses of many diseases are accompanied by corresponding alterations of temperature, and because, in the numeric expression of the variations, and the complex conditions of disease, the thermometer will detect earlier and judge more correctly the conditions of the patient's body than any other means.

The temperature in health in the mouth of an adult is about 98.4° F. In the vagina and rectum it is 0.3° F. to 0.6° F. higher. In health there may be a difference of 20° F. between the temperature of exposed parts of the skin and the interior. Throughout the day the temperature varies. It is lowest between 2 and 6 A. M., gradually rising until its highest points are reached between 5 and 8 P. M. This rise is usually slower in the middle of the day, the afternoon hours showing a more rapid elevation. These facts are of fundamental importance, since they affect the judgment of health and disease. Race and sex have no influence upon the range of temperature. Age does influence the range of daily temperature. In an infant just born the temperature is slightly higher. In the first weeks of life a higher temperature is maintained. The temperature is very easily influenced in children. In old age also the temperature is higher than in adult life, and a greater mobility of temperature is observed. Pregnancy has no appreciable influence on temperature, although parturition increases the temperature slightly. As a rule, the constancy of the bodily temperature in health is such that general conditions of life, occupation, etc., show but little influence over it.

Local changes in temperature are brought about by local influences or by disease of a part. In a paralyzed limb the temperature may be lower or higher than in the other limb. In hemiplegia the paralyzed side is frequently higher in temperature. Neuralgia sometimes gives an increased temperature in the part affected, and hysteria is liable to show a variety of temperature changes.

In taking a temperature it is necessary:

1. That no local influence, such as unusual exposure or the passage of cold air or of hot or cold fluids, shall affect the temperature of the part selected.
2. That the bulb of the thermometer should be in most complete contact with surrounding parts, the column of mercury not being exposed.
3. That ample time should be allowed for the mercury throughout the tube to attain an even temperature.
4. That the thermometer should be read with the eye vertically over the point of the index.
5. That the observation be cautiously repeated if the result is unexpected, and with a reliable instrument. See THERMOMETER.

Depression of temperature is observed in hemorrhage, starvation, wasting from chronic diseases, and diseases of the brain and spinal cord. In brain-disease, with the symptoms of melancholia, lowering of the general temperature and extreme coldness of the surface occur. In the collapse of typhoid fever, in acute peritonitis, and in poisoning by various substances, temperature is lowered. In cholera the axillary temperature may be 89.6° F., while the general temperature may reach 104° F. In alcoholic intoxication general temperature may be greatly lowered, particularly when the patient has been exposed to cold and wet. In chronic diseases of the respiratory tract, in chronic heart- or kidney-disease, and in chronic nephritis the temperature is somewhat lowered.

Elevation of Temperature.—External cold after fatigue by exercise, in addition to the cooling of the

body from respiration, may be followed by a rigor, with rapid rise of temperature. No disease developing, the proper balance will soon be restored. The temperature may rise from such disturbance of the heat-regulating functions as the passage of a gall-stone or of a stone through the urethra. An injury may derange the nervous system and its heat regulation, causing the temperature to rise. Temperatures of from 110° to 111° F. have been observed after injuries to the spinal cord (cervical portion). In tetanus temperature as high as 112.5° F. has been observed. In sunstroke or heat-stroke a similar point has been reached. There is sometimes a rise of temperature just previous to death.

Hyperpyrexia has followed convalescence from acute rheumatism; and excessive rise in temperature has caused death in hysteria, although a high temperature to which the pulse and respiration do not correspond is suspicious.

In convalescence trifling external influences may cause a rise in temperature.

Significance of Abnormal Temperatures.—**Temperature is below normal** at 97° F. (36.2° C.)

Subnormal temperature is 97°–98° F. (36.2°–36.7° C.).

Normal temperature is 98.0°–99.5° F. (36.7°–37.5° C.).

Temperatures Above Normal.—*Subfebrile*, 99.5°–100.5° F. (37.5°–38.5° C.). *Moderate febrile*, 100.5°–102° F. (38.05°–38.88° C.), for the morning; 102.2°–103° F. (39°–39.44° C.), for the evening. *Febrile temperature of high degree*, 102.5° F. (39.2° C.) and more in the morning; 105°–106° F. (40.6°–41.1° C.) in the evening. *Hyperpyrexia*, 105.8°–107.5° F. (41°–42° C.).

A temperature below 93° F. (33.88° C.) or above 108° F. (42.22° C.) is almost always fatal. As a single observation this is of value, and in a general way such observations are of value for diagnosis. When other symptoms exist, the knowledge of an altered temperature will alter the aspect of the case. Fatigue, and its effect on temperature, should, of course, be eliminated in a single observation of temperature. Systematic series of observations are of greater value. In types of pyrexia this method will indicate the mode of rising, whereby some disease may be distinguished. Thus, in pneumonia the temperature rises rapidly and continuously to about 104° F. (40° C.); in typhoid fever a gradual rise in each succeeding day of about 2° F. occurs, going down again each morning about 1° F., the maximum of about 105° F. being attained on the fifth day. At the height of a disease the temperature fluctuates about 103° F. (39.5° C.), the range varying in different diseases.

Considerable remissions or intermissions may be observed in the decline of acute diseases, while in certain other chronic affections—such as syphilitic affections, tuberculous affections, in pernicious anemia or leukemia—the remissions become more marked as exhaustion of the patient increases. The intermittent type of pyrexia is shown in malarial diseases, chronic tubercular disease of the lungs, and pyemia.

Crisis in the decline of a fever occurs when the temperature falls rapidly to or below the normal in from 12 to 26 hours, even in 6 to 8 hours. Lysis is the gradual decline of elevated temperature by a daily fluctuation. The former may be accompanied by collapse or acute delirium, neither of which is of unfavorable prognosis, and from which conditions patients rally well. Irregularity in temperature in a disease which usually runs a definite course indicates some complication. External causes easily influence temperature in convalescence. See Chill, Cold, Fever, Heat-stroke.

TENDERNESS.—The condition of abnormal sensitiveness to touch; soreness. It usually implies pain in varying degrees and of different kinds, elicited by pressure or by percussion, as distinguished from subjective sensation felt spontaneously by the patient. It is a symptom of great importance, and merits close attention. It is often present when no complaint exists, while it is by no means an accompaniment of spontaneous pain. Its very absence is of consequence. Examinations made to elucidate it require gentleness and discretion, and often an especial knowledge of anatomy and physiology.

Tenderness in inflammation, especially when superficial, is of value in diagnosis. In neuralgic pain there is, on the whole, freedom from tenderness. Pressure, indeed, often relieves it. So, when associated with a particular nerve, pressure may differentiate between inflammatory trouble and a merely functional disorder. Actual neuritis gives rise to tenderness. Pressure will relieve muscular rheumatism when not of inflammatory type. Malignant growths are usually accompanied by pain and tenderness, while those of benign character are free from such symptoms. Destructive changes may be heralded by tenderness, as in diseases of the joints, in pressure from aneurysm or other tumor when there is, at the same time, spontaneous pain. Limited and obvious pain may indicate the presence of a foreign body. Localized tenderness on percussion is an important symptom in cerebral tumor. Tenderness is of value in diagnosis when there is no complaint by the patient, as in limited, obscure diseases of the abdomen, such as cancer, ulceration, or suppuration. It may also lead to undetected suppuration elsewhere. In children manifestations of pain during examinations will indicate the locality of morbid processes, and may lead to useful information. General tenderness is a striking symptom of rickets.

Acute erythema, erysipelas, peritonitis, gout, and spinal irritation are some of the affections in which tenderness is present. Other conditions are corns, bunions, chilblains, neuroma, superficial and multiple neuritis, stumps after amputation, boils, whitlows, felons, etc., and many affections of the eye and of the matrix of the nails.

Treatment.—As a rule, treatment of the disease with which tenderness is associated will relieve the tenderness itself. All pressure is to be avoided, as from clothing and bedclothes. Cradles to lift off the coverings may be used. Hot and cold applications, anodynes, and allied agents may be applied locally.

TENESMUS.—Rectal or vesical pain, with spasmodic contraction of the sphincter ani or sphincter vesicæ. The painful desire to empty the bowels or bladder without the evacuation of feces or urine.

Rectal tenesmus is a marked feature of dysentery. It may also be associated with other local diseases of the lower part of the rectum and anus, such as piles, fistula, or malignant diseases. Cystitis and pressure upon the bladder are causes of vesical tenesmus.

Treatment.—Local causes must be removed or cured, when practicable. Moist applications of heat and cold, or small enemata containing laudanum, or suppositories with morphin, extract of belladonna, or cocain hydrochlorid will often relieve the condition. See CYSTITIS, DYSENTERY, etc.

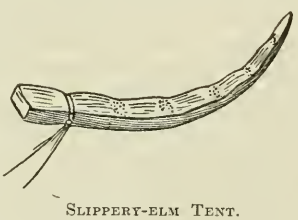
TENIA.—A genus of parasitic worms of the class cestoda (tape-worms). They form ribbon-like stocks, composed chiefly of a row of consecutive segments progressively increasing in size posteriorly (*proglottides*), and arising by strobilation from the knob-like head (*scolex*) which is provided with organs of adhesion. Over 200 species are recognized, having for their hosts very widely separated animals, with correspondingly wide geographic distribution. See WORMS (Tape-).

TENIAFUGE.—See ANTHELMINTICS.

TENNIS LEG.—This consists of rupture of the plantaris, and may occur during climbing, jumping, boxing, tennis, and similar exercises. There is a sharp pain in the calf like the sting of a whip (*coup de fouet*), tenderness, swelling, and, after a day or two, ecchymosis along the posterior surface of the leg; identical symptoms are produced by the rupture of a deep varix. The *treatment* is rest of the leg for one week, ichthyol, and a firm bandage. Later the patient may walk, but should not rise on the toes for several weeks (Stewart).

TENSION.—See EYE (Examination).

TENT.—An instrument made of compressed sponge, laminaria, slippery elm, tupelo, or other material that increases in volume by the absorption of water; it is used chiefly for dilating the cervix of the uterus. When lodged in the uterus, laminaria slowly expands the cervical canal, which in this way usually becomes accessible to the finger for diagnostic purposes. The value of the agent in the main relates to the management of some of the consequences of abortion, or the postpartum retention of the products of conception. It is largely employed by some practitioners in facilitating the application of local remedies to the endometrium. The use of the tent is always accompanied by risk, and it should not be employed without extreme caution. It must not be introduced into the uterus when there is any evidence of pelvic inflammation.



SLIPPERY-ELM TENT.

TEREBENE. $C_{10}H_{16}$.—A hydrocarbon obtained by the oxidation of oil of turpentine by means of sulphuric acid. It is soluble in alcohol and is recommended for winter cough as an expectorant, and for inhalation in bronchitis. Dose, 5 to 15 minims on sugar or suspended in water.

TEREBINTHINA.—See TURPENTINE.

TERPENE.—One of a number of hydrocarbons analogous to turpentine oil. They have the formula $C_{10}H_{16}$, or $(C_5H_8)_n$, and are contained in the volatile or ethereal oils obtained in the distillation of various plants (chiefly *Coniferæ* and *Citrus* species). The terpenes that have been thus isolated are very numerous.

TERPIN HYDRATE. $C_{10}H_{18}(OH)_2.H_2O$.—Obtained by distilling oil of turpentine with an alkali. Useful in bronchial and pulmonary diseases to loosen and facilitate the expectoration of mucus. Dose, 1 to 5 grains.

TERPINOL.—An oily substance formed by boiling terpin and terpin hydrate with aqueous mineral acids. It is a thick liquid, with a peculiar odor, boiling at 215–218° C. Its uses are similar to those of terpin. Dose, 2 to 5 grains.

TESTICLE, ABNORMALITIES. Absence.—Complete absence of the testicle is sometimes seen, and such a subject presents the ordinary appearance of a eunuch. A well-developed seminal vesicle and vas deferens have been found with no trace of testicle, and vice versa.

Supernumerary testicles have been described, but they are usually found to be fatty or fibrous tumors of the cord, old epiploceles, or encysted hydroceles.

Malposition.—The abdomen, inguinal canals, or the perineum may be the retaining place of the testicle, or it may lodge in the subcutaneous tissue of the upper thigh or be in the inner and upper part of the thigh; or it may be so rotated in the scrotum that the epididymis is in front; or it may be there completely inverted. When there is malposition in the scrotum, it must have been caused by some abnormality in the development of the cord. The consequences of retention in the abdomen are arrest of development, sometimes fatty, fibrous or malignant degeneration, or, if otherwise normal, failure to secrete a fertilizing fluid.

Retention in the Inguinal Canal.—Retention in the inguinal canal is often accompanied by inguinal hernia, and when inflamed at puberty, causes great pain from the distention of surrounding parts. In such cases peritonitis may cause the swelling to simulate a hernia. The testicle retained in the inguinal canal may be mistaken for a strangulated bubonocele or for a bubo. Retraction may be differentiated from retention by comparison with the state of development of the corresponding slde of the scrotum. A perineal or femoral position of the gland is not necessarily attended by any bad result.

When the gland in the inguinal canal is attended by inconvenience, it may be placed in the scrotum by operation. Extirpation may be necessary if, from shortenss of the cord, this is impossible.

Trusses are not to be recommended for infants, even when malposition is complicated by inguinal hernia, as the hernia frequently subsides, and the truss will then interfere with descent of the testicle. When it has passed through the crural ring, the malposition cannot be remedied. If in the perineum or thigh, the testicle may be placed in the infantile scrotum by operation. Malpositions in the scrotum are important only from the standpoint of operations, as for hydrocele, etc. Arrest of development sometimes occurs even after the testicle has passed into the scrotum, but with no serious consequences.

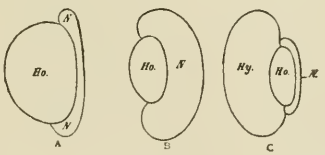
Atrophy.—Rupture or ligation of the spermatic artery, and occasionally acute orchitis (especially that variety which is associated with mumps), are the chief causes, the testicle shrinking to a small nodule. Rupture or ligation of the vas deferens, chronic epididymitis, the pressure of ill-fitting trusses, and abuse may be followed by the same effect; but the wasting is seldom so extreme. Whether it is ever a result of varicocele is doubtful, though this is so often associated with a soft and flabby condition of the gland.

Hypertrophy is said to occur as compensation in cases of unilateral retention.

TESTICLE, HERNIA.—This condition is also known as "benign fungus of the testis," and may be superficial or deep. It is recognized as a fungus protrusion from the scrotum, the size of a pea, or even of a small egg, red or yellowish-red in color. In the deep form the tunica albuginea has been perforated, and seminal tubules form the greater part of the mass. It may occur after any form of suppurative orchitis.

Treatment.—Well-adjusted pressure and applications of silver nitrate or mercuric oxid may suffice. Freeing the margins of adhesions and suturing the over-stretched skin is usually very successful. If due to specific cause, antisyphilitic treatment is indicated.

TESTICLE, INFLAMMATION (Orchitis; Epididymitis).—Acute inflammation of the testicle is generally spoken of as orchitis or as epididymitis, according as the body or the epididymis is primarily or chiefly affected.



Diagrammatic sections of (A) Orchitis, (B) Epididymitis, and (C) Hydrocele of the Tunica Vaginalis. *Ho*, Testis; *N*, Epididymis.—(*Tillmanns.*)

Etiology.—Gonorrhea is the most frequent cause; but injury of the testicle, or irritation of the prostatic urethra, as from the tying-in of a catheter, or from the impaction of a calculus or fragment of a calculus, are not uncommon causes. Orchitis sometimes occurs during an attack of mumps, and is then said to be due to metastasis. It has also been attributed to the use of strong injections for the cure of gonorrhea. In what manner inflammation of the testicle is induced by the irritation of the urethra is disputed. It is variously taught, however, that it is due to (1) inflammation spreading along the vas; (2) reflex irritation; and (3) metastasis.

Symptoms.—In a well-marked case there is intense pain in the testicle, with a dragging or aching pain in the groin and along the course of the cord. The testicle is swollen, and is exquisitely tender to the touch; the cord is slightly thickened; and the skin of the scrotum is edematous and of a dusky red color. When the inflammation is in the epididymis, the pain and swelling will be chiefly confined to the lower and back part of the testicle—the region of the epididymis—and fluid will often be detected in the tunica vaginalis. If the inflammation of the testicle occurs during an attack of gonorrhea, the discharge generally ceases or diminishes when the inflammation is at its height. The local signs are often accompanied by sharp febrile disturbance, elevated temperature, furred tongue, nausea, or even vomiting, and constipation.

Treatment.—When the attack is acute, rest in bed, with the testicle supported on a pillow, is desirable. Cooling lotions, such as lead water and laudanum and a weak alcoholic solution of ammonium chlorid are time honored applications. Hot moist compresses sometimes afford relief when cooling lotions fail. Recently hot saturated solution of Epsom salt has been highly recommended. Another much esteemed application is 25 percent guaiacol in olive oil or glycerin, painted over the affected half of the scrotum once or twice daily. Internally, a brisk purge should be given at the onset, followed by saline laxatives and small doses of antimony. If the pain is very severe, opium may be given. Urethral treatment must be stopped.

If the effusion into the tunica vaginalis is extensive, a few punctures may be made with a fine tenotomy knife, or an ordinary trocar and cannula may be introduced; and if the veins of the scrotum are distended, they may be pricked and encouraged to bleed, or leeches may be placed over the inguinal canal; but, although it is largely practised by some surgeons, and apparently with impunity, puncture of the testis itself is not advisable.

After the acute stage has subsided a properly fitting suspensory bandage should be worn. Martin's epididymitis bag is the most satisfactory American appliance.

After the skin has been lightly anointed with vaselin, the suspensory bandage is lined with cotton and so adjusted as to raise the scrotum toward the abdomen. The degree of pressure can be regulated from time to time according to the amount of swelling and tenderness of the organ.

An effort should always be made to secure resolution of the nodules which persist after the acute inflammation has entirely subsided. For this purpose the application of compound iodin ointment or oleate of mercury is useful, the latter applied very sparingly so as not to produce great irritation of the integument. Iodin internally has been thought by some to favor reso-

lution. Given in the form of syrup of hydriodic acid it will rarely, if ever, cause gastric irritation.

Traumatic orchitis may be treated in the same way. When due to metastasis, warm fomentations are better from the first; and if there is much infiltration of the scrotum, so that the condition of the circulation is doubtful, or if the patient is old and feeble, cold should not be used, for fear of gangrene.

Chronic Inflammation.—This may begin as such or may be the relic of an acute attack. When confined to the body of the testis, it is nearly always due to syphilis; gout and malaria are exceptional causes. If the epididymis only is concerned, it is probably tubercular or urethral, and in the latter case it may be either the remains of an acute attack or chronic from the first. Syphilis occasionally affects the epididymis only (in the early secondary period), and not infrequently both epididymis and testis.

Symptoms.—The testicle appears enlarged, smooth, laterally compressed, egg-shaped, hard, heavy, and painful on pressure; the testicular sensation is not lost; the vas is but slightly thickened; the skin is nonadherent, and the epididymis (except when the disease is limited to that part) is not distinguishable from the body of the organ. In chronic epididymitis an indurated, painful, and tender lump is felt in the situation of the globus minor or major.

Treatment.—Mercury or potassium iodid should be given internally, and the enlarged organ may be strapped. Mercurial inunctions are also of value.

Tubercular disease of the testicle, also known as strumous orchitis, or strumous sarcocele, is variously believed to depend upon the presence of the tubercle bacillus, or upon a chronic inflammation in a strumous subject; and to begin either as a tubercular affection in the intertubular connective tissue or as a catarrhal inflammation in the interior of the tubules.

Pathology.—Opportunities for examining the testicle in the early stages of the disease are not common, and there is uncertainty as to the origin and exact nature of the inflammation.

Symptoms.—The disease usually begins very insidiously. The epididymis, especially the head, and, later, the body of the testicle are found enlarged. The testicle is usually but slightly tender to the touch, and the testicular sensation is not lost; a hydrocele may be present or part of the tunica vaginalis may be obliterated. Subsequently, the cord, especially the vas, becomes thickened and the skin adherent; while still later the skin may give way and a fungus, composed of the infiltrated tubules, may protrude or a discharging sinus may be produced. When the testicle becomes adherent to the skin, soreness and pain will develop as the initial manifestations of the long-existing disorder. The seminal vesicles or prostate may now be felt enlarged on examining by the rectum, and bladder or urinary disorders may set in; while symptoms of tubercle in the lung, larynx, or other organs may supervene, and the patient may succumb to tubercular disease. At other times no constitutional signs manifest themselves, and the patient may completely recover.

Diagnosis.—From syphilitic orchitis it may generally be distinguished by the enlargement of the epididymis, thickening of the cord, adhesion of the skin, enlargement of the seminal vesicles and concomitant signs of tubercle elsewhere.

Treatment.—In the early stages, before the vas or seminal vesicles have become involved, some surgeons advise castration or resection of the epididymis for the purpose of preventing, if possible, general dissemination of the disease; and when both testicles are affected, even the removal of both. Others, however, rely on constitutional, hygienic and climatic treatment, and only advise the removal of the testicle should it become destroyed by the disease. If the seminal vesicles are found affected in the early stages, or if signs of tubercle are discovered in other parts, the testicle should, of course, on no account be excised.

The *constitutional treatment* is that of tuberculosis.

The *local treatment* consists in suspension of the organ, avoidance of horseback riding or other violent exercise, and recumbency during an exacerbation of the inflammation. Should the tubercle soften and suppuration occur, the abscess must be opened and the wound dressed with iodoform or other antiseptic. If intractable sinuses remain, they should be scraped with a Volkmann's spoon. If a fungus forms, it will frequently recede under rest in bed, cleanliness, and the application of a stimulating ointment or of iodoform. Should the testicle become completely disorganized, it had better be excised.

Syphilitic Inflammation.—Subacute epididymitis may occur in the early secondary stage, a painful irregular swelling making its appearance at the back of the testicle, involving the cord to a slight extent. It never possesses the severity of urethral epididymitis; the skin may be reddened, but is not edematous; and, like the other secondary symptoms with which it occurs, it subsides rapidly under mercury.

True orchitis appears later, either during the intermediate period (when both glands are involved), or with the tertiary symptoms, when one gland is often attacked long before the other. As a rule, it does not affect the epididymis or the cord, and is very chronic in its progress; but often, in neglected cases, after the first testicle has been enlarged for some time, the second suddenly becomes actually inflamed, the skin grows hot and red, the tunica vaginalis distended, the epididymis affected as much as the testis, and the pain so severe that the patient is compelled to apply for relief.

Symptoms.—The character of the swelling depends upon the distribution of the syphilitic exudation and upon the changes it undergoes. In some cases, especially the earlier ones, there is uniform enlargement of the whole gland, so that it remains ovoid, smooth, and even, and merely becomes heavy and intensely hard; in others the surface is nodular and uneven in con-

sistence, dense indurated patches alternating with others that are soft and elastic. The exudation, in other words, may be uniformly distributed throughout the whole of the fibrous tissue of the gland, or it may be aggregated either into one central gumma or into numerous scattered gummata of various sizes; and, according to the success of the treatment, it may be completely absorbed, merely leaving a slight depression, or may become organized into cicatricial bands, or may break down and undergo caseation and liquefaction. Occasionally, this ends in suppuration and hernia testis; more frequently, partial absorption takes place, and a hard, irregular mass is left, sometimes in the middle, sometimes at one side of the testis, composed of a caseous or even calcareous center, surrounded by an immense thickness of cicatricial tissue—a so-called chronic abscess.

The size to which a testicle may attain under these conditions is enormous; usually, when large, it is painless and is devoid of testicular sensation. Heat, redness, thickening of the cord, edema of the skin, and effusion into the tunica vaginalis are signs of acute inflammation, and are only present when the testicle is first attacked or when a fresh gumma suddenly develops. Cases of this kind have lasted for 10 years, with occasional subacute attacks compelling the patient to apply for relief, until at length the testicles were enormously enlarged, irregular in shape, hard, painless, and absolutely devoid of sensation.

The diagnosis of syphilitic orchitis is rarely difficult; the only form that resembles it is that occurring in gout. The chief features are the essentially chronic character of the affection (varied from time to time by more acute attacks); the smooth, hard, heavy character of the swelling; the disappearance of the epididymis, which in many instances is so flattened out that it cannot be felt (occasionally, it is enlarged); the absence of pain (during the greater part of the time) and of testicular sensation; and the fact that both testes are involved, though usually not to an equal degree. .

Treatment.—In epididymitis and recent orchitis mercury may be given freely, with a view to causing speedy absorption; later, especially if the disease has relapsed, more benefit is derived from small doses of bichlorid of mercury, continued with occasional interruptions. Iodid of potassium always causes a rapid diminution in size, but absorption of the syphilitic exudation is rarely complete; it progresses up to a certain point, continues as the dose is increased, and then comes to a standstill, leaving a dense mass, over which nothing appears to have any influence. The acute symptoms, however, are quickly relieved by it. Occasionally, other remedies are of service: mercury, for example, rubbed into the skin on the inner side of the thigh (it cannot be applied to the scrotum), strapping, or the removal of hydrocele fluid. If suppuration occurs, the abscess must be opened; and at length, if the testis becomes useless and is a constant source of pain and suffering, castration may be advisable.

TESTICLE, PAIN.—Pain and retraction of the testicle are of frequent occurrence in disease of the kidneys and in affections involving branches of the lumbar plexus; further, after obliteration of the vas, sexual intercourse, or even sexual excitement, may be attended by severe pain and swelling of the gland; in addition to this, however, in certain persons the testicles are liable to attacks of intense neuralgia, coming on at regular intervals or excited by the most trivial irritant. Usually, one only is affected, but both may be; the gland may be apparently well nourished, or it may be small and flabby; it may be exceedingly irritable, resenting the slightest touch, or there may be nothing noteworthy about it. In many cases there is a history of injury, but it seldom stands cross-examination. Gout, malaria, anemia, and other constitutional ailments are sometimes present. Neuralgia of the testicle may occur in the most continent; and though in many there is a history of abuse, it is difficult to connect one condition directly with the other. Sexual hypochondriasis may be associated with it, and often the family history is decidedly neurotic.

Treatment is very unsatisfactory. Any local or constitutional cause that can be detected must, of course, receive thorough consideration; a suspensory must be worn; lead or some other cooling lotion should be applied; and the thoughts and ideas directed into other channels. Cupping over the loins, massage of the back, and the free (local) use of anodynes may be tried as well. If there is a large varicocele, operation may give relief, but castration is useless.

TESTICLE, REMOVAL.—See CASTRATION.

TESTICLE, TUMORS. Hematocele.—See HEMATOCELE.

Hydrocele.—See HYDROCELE.

Dermoid and hydatid cysts are occasionally met with. The former may be recognized by their congenital origin, though often they do not attain much prominence until late in life, and their uneven consistence; but no certain diagnosis can be made without puncture.

Cystic adenoma is more common. Like parotid glandular tumor, it is peculiar to the organ from which it springs, and only admits of a somewhat vague comparison with other growths. It consists of cysts of all sizes, lined with cubic or flattened epithelium, filled with a clear brownish or greenish fluid, and developed from the seminiferous tubules, the epithelium of which has either lost or has never acquired its distinctive characters. A variable amount of fibrous tissue exists between them, sometimes undergoing myxomatous degeneration, and occasionally mixed with cartilage. Intracystic growths may occur as well. Tumors of this kind may occur at any age, but they are rarely noticed before puberty. Growth is slow and painless, the patient suffering no inconvenience other than that due to the weight. The vas is never affected, and secondary deposits do not occur, the cases in which this is said to have taken place having really been sarcomata, with an accidental development of cysts.

Fibroma and enchondroma of the testis are met

with in young adult life, but they are both very rare. The chief clinical feature is the slow growth of a hard and heavy painless mass. The surface is usually smooth, but it may be nodular, suggesting the presence of cysts. Growths of this kind do not extend along the cord, invade other organs, or recur; but removal is always advisable. There is no means of distinguishing one from the other but by a section.

Carcinoma of the testis is nearly always encephaloid, though a few cases of scirrhus have been described. It is stated to be most common between 20 and 40 years of age. The beginning is usually very insidious; the testis is enlarged, smooth, ovoid, and at first fairly firm; the cord is not thickened, nor are its components matted together, but it is fuller than the other, and the veins over the scrotum are distended. There is little or no pain or tenderness, and testicular sensation is soon lost. In a very few weeks there is a rapid increase in size; the tumor is softer, the surface uneven, the cord distinctly thickened, the shape becomes globular and the epididymis flattened out at the back. If left, it becomes so soft that it almost seems to contain fluid; the skin becomes adherent, the veins are more distended, the thickening extends higher up the cord, and, perhaps, if the patient is thin, an ill-defined sense of resistance can be made out by deep pressure at the back of the abdomen. The skin of the scrotum soon gives way, allowing a bleeding mass to protrude, the glands of the groin enlarge, secondary deposits make their appearance in other organs, and the patient sinks rapidly from exhaustion.

Sarcoma of the testicle presents greater variety of appearance and character. It may be round-celled or spindle-celled, and the latter especially may become more or less converted into cartilage (without, however, losing one atom of its malignant sarcomatous character); sometimes there are only nodules here and there, sometimes branching outgrowths—due, perhaps, to the spreading of the disease inside the lymphatics—and occasionally so much that the original sarcomatous growth is hard to find. In addition both of these forms may be associated with cysts, due either to softening and hemorrhages or to distention of the seminiferous tubules, with proliferation of the epithelium lining them, and occasionally intracystic growths, so that they may present a close resemblance to some of the forms of cystic adenoma. Sarcoma may occur at any age, even before birth, though it is most common under 10 years and between 30 and 40. The round-celled variety, unless the patient is a child, or unless both testicles are attacked at once, cannot be distinguished from encephaloid carcinoma; the progress is as rapid, and the glands of the lumbar and other regions are involved as soon; if possible, it is even more fatal. The other variety is much less uniform in rate of growth and consistence; it may, for example, be formed almost wholly of cartilage or of fibrous tissue; cysts are less common, and it does not appear to fungate so readily; but the ultimate results—the infiltration of the glands with growth of the same histologic character as the primary one, and the secondary deposits in the lungs and other organs—are equally certain.

Teratomata.—These are congenital tumors containing embryonal tissue elements from the three blastodermic layers. Dermoid cysts also belong to this class. Many of these tumors are exceedingly malignant, especially those which contain tissue resembling chorioepithelium.

Treatment.—Sarcoma, carcinoma, and the teratomata should be removed as soon as the diagnosis is made. The usual operation of castration is inadequate for the removal of malignant tumors of the testicle. Although it is impossible to reach the lymphatics which drain the testicle at their termination, they should nevertheless be divided as high up as possible.

Following the method of Cumston and Rolfe an incision is made parallel to, and about three quarters of an inch above, Poupart's ligament, the inguinal canal laid open, the cord freed and lifted out. The iliac fossa is then entered by an opening made through the posterior wall of the canal. The vas is followed downward into the pelvis as far as possible, cut, and the stump touched with pure carbolic acid. The spermatic vessels are then traced upward as far as possible, ligated in two places and divided between the ligatures. The cord is separated from its coverings from above downward to a point below the external ring. The testicle may be pushed up and removed with the cord unless it is very large, when a longitudinal incision down the scrotum is required for its removal. The prognosis is very unfavorable, but in all probability this is due in some measure to delay; there is evidence to show that if castration is performed in time, recurrence may not take place for many years. Even if the skin is involved and the cord thickened, the operation is advisable in order to save the patient from the formation of fungus, if only there is reasonable prospect of securing immediate union of the wound.

Diagnosis of Tumors of the Testes. *Age.*—A tumor that appears in infancy is probably hydrocele; sarcoma and syphilitic and tubercular orchitis occur, but are very rare in comparison.

Etiology.—A definite history of accident deserves consideration, though it may merely have drawn attention to an already existing, but unsuspected, enlargement. Sarcoma as well as hematocele may follow injury.

Rapidity of Growth.—Hematocele is an affair of minutes, or, at most, of hours; malignant disease, of a few weeks. Acute orchitis presents no difficulty in diagnosis; chronic inflammation, on the other hand, if only one side is involved, if there is no evidence of constitutional complaint, and if there are but little heat or pain and no redness, can often be diagnosed only by the results of treatment. Syphilitic orchitis, for example, may, so far as a single examination is concerned, be indistinguishable from incipient malignant disease.

Duration.—If the tumor has lasted more than 6 months without the doubt in diagnosis clearing up, it is not malignant.

Consistence, whether solid or fluid. Hydrocele

and hematocele are the only fluid tumors at all common, but there are many sources of fallacy. A hydrocele may conceal an enlargement of the testes (hydrosarcocele). Old hydroceles and hematocle may have walls of such thickneess as to appear solid, and rapidly growing malignant tumors may be as soft and elastic as if they contained fluid.

Translucency.—This distinguishes at once thin-walled hydroceles.

Number.—Hydrocele and sarcoma may occur on both sides, but when both testes are affected, the tumor is nearly always of inflammatory origin.

Shape.—If the tumor retains the shape of the testis, it is probably either chronic inflammation or incipient, malignant disease. Sarcoma and carcinoma (when more advanced), hematocele and encysted hydrocele, are all spheric; other tumors are very irregular.

Pain and Sensitiveness.—Hematocele may be very painful at first; the others—except acute inflammation—are rarely attended by pain. In chronic orchitis, malignant disease, and hematocele testicular sensation soon disappears.

The Condition of the Cord.—In chronic orchitis, hydrocele, and hematocele, the cord is not affected. In acute inflammation and incipient malignant disease it feels full because of the increased amount of blood. In acute epididymitis and advanced sarcoma and carcinoma it is thickened and all its component structures are welded together. The vas itself is enlarged in tubercular epididymitis. The skin is not adherent unless there is acute inflammation or advanced malignant disease (Moullin).

The following table, from Keyes and Stewart, shows the main points in the diagnosis of chronic diseases of the testicle:

	Simple Chronic Epididymitis.	Tuberculosis.	Syphilis.	Tumor.
History	Gonorrhea, stricture, or hypertrophy of prostate.	Tuberculosis, family or personal.	Syphilis inherited or acquired.	Perhaps trauma.
Frequency	Uncommon	Frequent	Frequent	Rare.
Size	Small between attacks.	Does not reach any great size.	Does not reach any great size.	May reach any size.
Tenderness	Yes	Yes	No	No.
Shape	Between attacks testis normal, epididymis nodular.	Epididymis nodular. Testis not involved unless acute or ancient.	Testis evenly enlarged, slightly nodular, "clam shell" epididymis.	Testis greatly enlarged, no characteristic involvement of epididymis.
Cord	May be slightly thickened.	Enlarged and nodular.	Free	Free.
Seminal vesicles	Usually distended	Tuberculous	Uninfluenced	Uninfluenced.
Prostate	Posterior urethra inflamed.	Congested or tuberculous.	Uninfluenced	Uninfluenced.
Urine	Cloudy	Cloudy, may contain bacilli.	Clear	Clear.
Hydrocele	Unusual	Often	Nearly always	Unusual.
Onset	Usually acute	Usually chronic	Chronic	Chronic.
Age	Adult life	Not often after 30	Middle life	Any age.
Origin	Epididymis	Epididymis	Testicle	Testicle.
Course	Recurring acute attacks.	Chronic	Very chronic	Usually rapid.
Suppuration	Unusual	Common	Rare	None, but fungus common in later stages.
Atrophy of testis	Rare, potency unimpaired.	Rare, potency somewhat impaired.	Common, potency somewhat impaired.	Never, potency unimpaired.
Opposite testicle	Often involved simultaneously.	Usually involved subsequently.	Free	Free.

TESTICULAR EXTRACT (Orchitic Extract.)—This substance has been recommended as a general tonic for the aged, for subjects of impotence, or for a debilitated nervous system. It has been used in general adynamia, anemia, atonic gastro-intestinal affections, scurvy, malaria, epilepsy, cancer, nymphomania, perverted sexual habits, impotence, neurasthenia, hysteria, melancholia, diabetes, tuberculosis, hemiplegia, paralysis agitans, and locomotor ataxia.

It is prepared in the following manner: The testicles of bulls, enveloped in their membranes, are washed in a 10 percent solution of sublimate, and again with sterilized water, are each divided into 5 or 6 parts, placed in aseptic glycerin (a pint to the pound of testicle), and allowed to macerate therein for 24 hours. An equal quantity of a 5 percent solution of common salt in boiled water is then added, and the mixture is filtered and sterilized by being subjected to a pressure of 30 atmospheres of carbonic acid gas. The dose is from 10 to 20 minims hypodermically, once daily or every other day, with strict aseptic precautions as to the syringe used and the site of injection; the latter should be washed with a 1:1000 sublimate solution or with a 2 percent solution of carbolic acid. The extract seems to have little or no effect when given by the mouth, but is efficient when administered by the rectum.

TESTIMONY, MEDICAL.—See EXPERT TESTIMONY.

TESTS.—See URINE (Examination), BLOOD (Examination), SPUTUM, STOMACH-CONTENTS, BACTERIOLOGY, PATHOLOGIC TECHNIC, VISION (Tests), HEARING (Tests), etc.

TETANUS (Lock-jaw; Trismus).—An infectious disease, marked by tonic spasms of the voluntary muscles, with distinct exacerbations. The contractions may be confined to the muscles of the lower jaw (trismus) or to certain other groups of muscles, or they may involve the muscles of the whole body. Tetanu smay occur at any age. It

BACILLUS OF TETANUS, SHOWING SPORES.—(*Fränkel and Pfeiffer.*)

is often epidemic among children. Males suffer oftener than females by about 4 to 1.

Etiology.—Tetanus is caused by a specific bacillus—the tetanus bacillus, first discovered by Nicolaier, and first obtained in pure culture by Kitasato. It is present in surface soil and dust. This explains the fact that wounds which have been infected by dust or earth are so often followed by tetanus.

This bacillus is long, slender, and swollen at one end in the shape of a "drumstick," in which a spore develops. The germ is generally isolated or in pairs, and is motile, but has no flagella. The bacillus of tetanus is anerobic. It is exceedingly resistant to the action of heat and to that of carbolic acid solution. It grows upon artificial culture mediums, such as gelatin, bouillon, and with gelatin containing glucose.

Men, horses, mice, rabbits, and guinea-pigs are all susceptible; birds and dogs are less so, while the frog is immune. It is said, however, that if the body temperature of the frog is increased it becomes susceptible. The bacillus of tetanus stains well with all the ordinary aqueous solutions of anilin dyes and by Gram's method.

Symptoms.—At first the patient finds stiffness in the movement of the jaw; he experiences uneasiness in swallowing, and soon perceives that he has difficulty in separating his teeth for the admission of food. He begins, now, to feel pain behind the sternum, and this pain extends from the pit of the stomach toward the vertebral column. The muscles of the back and those of the back of the neck begin to be affected by spasms; then those of the abdomen, afterward those of the limbs, and lastely those of the face. The muscles become more and more rigid as the case proceeds. In the extreme period of the disorder all the muscles of voluntary motion are affected; among others, those of the face; the forehead and nose are drawn up; the eyes are distorted, fixed, and motionless; the cheeks are retracted, and the features undergo an extraordinary change. The spasms become universal, and a violent convulsion puts an end to the misery of the patient.

Profuse sweating usually occurs during a paroxysm. The temperature in some cases is normal throughout; in others there is marked pyrexia from the outset, the temperature reaching 105° or 106° F. before death, and being 109° or 110° F., and even higher, soon after death. When death occurs, it is usually due to exhaustion, inanition; spasm of the diaphragm, or the muscles of respiration; spasm of larynx, with asphyxia; arrest of heart action from spasm or paralysis.

Diagnosis.—The symptoms are so characteristic, with the addition of a history of a wound, that an error seems hardly probable.

Tetany.—The spasms chiefly affect the extremities, the muscles being free in the interval and trismus a late or very rare condition.

Strychnin poisoning often closely resembles tetanus, but there is no beginning trismus and there is more rapid development of the symptoms. No history.

Hydrophobia does not have trismus; but respiratory spasm occurs, excited by attempts at swallowing, with increasing mental symptoms.

Prognosis.—In the acute form the prognosis is very grave; in the chronic form it is favorable.

Treatment.—The indications are to keep up the strength of the patient until the disease ceases; to remove, as far as practicable, all conditions believed to have the power of creating the tetanic state; and to employ any sedative or special

treatment from which it may be hoped to derive advantage. Perfect quiet is absolutely essential; the room should be darkened, and the patient kept, as nearly as may be, in perfect repose; remedies should be administered as gently as possible; everything harsh or violent should be avoided. If nourishment cannot be swallowed, it should be administered through the anus; it should be as plentiful as the nature of the case will admit; the supply of brandy and wine should be abundant. Quinin and iron should be freely administered; opium and morphin have, in many cases, been serviceable; chloral hydrate, chloroform, Indian hemp, and tobacco have all been tried in turn, and sometimes with success. Hydrobromid of hyoscin has recently been highly recommended in the treatment of convulsions. Large doses of bromid of potassium and chloral are also used. Should suffocation be threatened from spasm of the glottis, inhalations of nitrite of amyl should be resorted to: the usual quantity administered is from 5 to 10 minims. From a physiologic standpoint, calabar bean is the drug that deserves the most attention, as it is antagonistic to the tetanic spasms caused by strychnin. It has, however, not proved to be a specific for tetanus. Extract of physostigma, 1/8 grain, may be given every hour until complete contraction of the pupil occurs, and this must be followed by stimulants to counteract the resulting depression.

Intraspinal injections of magnesium sulphate suggested by Meltzer have been used with success in some cases. The danger of respiratory paralysis is combated by the administration of oxygen and artificial respiration long continued if necessary.

Specific Treatment.—This consists in the use of the antitetanic serum along with the other treatment. The dose is 10 to 20 c.c. of fresh serum, every 4 to 12 hours according to the severity of the symptoms. Results have not been better because generally the treatment is begun too late. In any suspected case the serum should be administered at the earliest possible moment after the infliction of the wound. As tetanus antitoxin is harmless it should be used as a prophylactic measure, a dose of at least 5000 units being given. The subarachnoid injections of magnesium sulphate should be used in connection with the injections of tetanus antitoxin.

TETANUS ANTITOXIN.—The toxin of tetanus is a toxalbumin of extraordinary potency, and is perhaps the most virulent poison known. Whereas the fatal dose of strychnin for a man weighing 70 kilos is from 30 to 100 milligrammes (gr. ss–jss), that of the tetanus toxin is estimated at 0.23 milligramme (gr. 1/320). In laboratory experiments the disease is prevented and cured by its antitoxin with almost absolute certainty, but the conditions are in every respect different from those which obtain in cases of accidental infection, the amount of toxin present in the animal being known, and the antitoxin being administered at the same time with the toxin or very soon afterward. The disease is clinically unrecognizable until the nervous system has been sufficiently damaged to produce symptoms of nerve lesions, and the toxin is firmly united with the proteins of the central nervous tissue before symptoms develop, until which a diagnosis is impossible. The case is usually far advanced when professional assistance is first sought, and is therefore not so amenable to treatment as diseases which manifest their symptoms by progressive stages.

The study of tetanus statistics shows that its mortality prior to the use of antitoxin was from 70 to 90 percent, in the acute form 80 to 90 percent, and in the chronic type about 40 percent. The available statistics of cases treated by antitoxin give the general mortality under this treatment as between 40 and 50 percent, the reduction being chiefly manifested in the subacute and chronic cases, acute tetanus showing a mortality of 70 to 80 percent.

On account of the natural difficulties in treating this disease by antitoxin at the late period when the symptoms are manifested, and from the fact that the serum is powerfully immunizing and harmless, the tendency is to adopt a prophylactic method in all cases, giving a full immunizing dose as soon as possible after the infliction of a wound received under circumstances which indicate a possible tetanus infection. For this purpose not less than 1500 antitoxic units should be administered. Along with this treatment the usual preventive measure should be employed, including excision of the part or the actual cautery if the wound is recent. The actual cautery, or the application of a strong solution of corrosive sublimate with tartaric acid, or the injection of phenol solutions, are the most effectual methods of combating the tetanus germs in the wound. For curative purposes the serum should be injected as soon as possible, the quantity being determined according to its stated strength, the gravity of the symptoms, the patient's age and the time since infection. The serum must be fresh to be effective, and as a curative agent should be given so as to reach the nerve centers as quickly as possible, therefore 5000 units are given intraspinally, or 10,000 units intravenously, and repeated as indicated.

TETANUS, INFANTILE.—Tetanus occurring in infants, as in adults, is an acute infectious disease due to a certain bacillus (Nicolaier's bacillus) which has its habitat in the soil. The germ of tetanus usually gains access to the body of the infant through the umbilical wound. Tetanus is rare except when dirt and filth prevail, but these alone are not sufficient to produce the disease.

Symptoms.—These usually begin on the fifth or sixth day or at the time of the separation of the cord. The first symptom may not appear before the tenth or twelfth day, but seldom later, and the first thing noticed is a difficulty in nursing, due to the rigidity of the jaws. The muscles of the jaws and face are hard and firm. Soon a slight stiffening of the body occurs, the child remaining rigid for a short time, but relaxing during the intervals. These paroxysms soon increase in extent and frequency; the whole body becomes rigid and stiff; the arms are extended, the thumbs turned in, and the hands clenched. The thighs

and legs are extended and no motion is possible at the hip or knee. The jaws may become firmly closed, and food cannot be taken. The pulse is rapid and weak, the temperature is more or less elevated (101° to 104° F.). The duration of fatal cases is very short (24 to 48 hours); but when recovery takes place, which is rare, the disease continues from 1 to 3 weeks, and the child usually suffers from malnutrition for some time longer.

Treatment.—The preventive treatment consists in obstetric cleanliness and in especial care, in districts where tetanus is epidemic, that the cord is kept in a perfectly aseptic condition. Tetanus antitoxin should be given as soon as the slightest suspicion of the disease exists. The child should be kept in a very quiet, darkened room. During severe paroxysms inhalations of chloroform should be given until the patient is quiet. When the mouth cannot be opened, it may be necessary to introduce a wedge, so that nourishment can be taken.

When unable to swallow, food should be introduced through a stomach-tube, which, when it cannot be passed through the mouth, may be inserted through the nose. Chloral hydrate should be given, and often large doses will be necessary. Beginning with 1 grain every hour, this may be increased, if the effects are not marked. The chloral should be well diluted in water, and may be given by the mouth or rectum. Extract of physostigma in 1/10-grain doses should be given hypodermically 3 times a day, or more frequently if necessary.

TETANY.—Tetany is a form of tonic muscular spasm, affecting most commonly the muscles of the extremities, especially those of the hands and feet. It may occur at any age, but is most frequent during infancy.

Etiology.—Tetany rarely occurs as a primary disease, but when occurring in infants, it is, in a majority of cases, associated with rickets, although in some cases it occurs with marasmus, chronic diseases of the intestinal tract, or some of the acute infectious diseases. The principal exciting cause is some irritation of the gastro-intestinal tract, as acute diarrhea, worms, prolapse of the rectum, or intussusception. In some cases teething may be the exciting cause. It has been known to recur among school-girls as an epidemic, in this respect resembling chorea.

Symptoms.—The attacks consist of cramps of the muscles of the extremities. There is no loss of consciousness and, as a rule, no spasm of the facial muscles, but the face wears an expression of pain when the cramps come on, and the infant screams when it is touched. The legs and arms are flexed and rigid, and the hands and fingers are tightly flexed. The feet may assume various positions of flexion, such as that of talipes equinus or equinovarus. The duration of the disease varies from a few minutes to hours or days. There is no loss of consciousness and no fever with the spasms. Laryngismus stridulus is quite often associated with tetany, as are also general convulsions. Tetany of itself is seldom fatal, but the prognosis of any case must depend upon the original disease that tetany may complicate.

Diagnosis.—The diagnostic features of the disease are bilateral spasms without loss of consciousness, the spasm in infants being usually limited to the hands and feet.

Tetanus is to be distinguished from tetany by the fact that the former is a very rare disease, except in the new-born, etc., and that the attack begins with trismus, which does not occur in tetany. From **meningitis** tetany is distinguished by the fever and cerebral symptoms.

Treatment.—When tetany is due directly to some digestive disturbance, as is usually the case, this should receive attention. A dose of castor oil (1 to 4 teaspoonfuls) should be given to clear out the intestinal tract, or, for the same purpose, calomel, 1/6 grain every 2 hours.

If worms are suspected, the following should be given:

℞. Calomel, gr. j
Sodium bicarbonate,
Milk-sugar, } each, gr. vj.
Powdered santonin,
Make 12 powders, giving 1 every 2 hours, until 3 are taken, and repeat every other day.

For the attack a hot bath is very effective, and sodium or potassium bromid, in 5- to 15-grain doses, should be given until the child is quiet, but continuing the bromid in small doses as long as any nervous symptoms remain.

Following the attack, the child's general nutrition should receive careful attention.

TETRONAL. — Diethylsulphondiethylmethane. A disulphone of the ethyl and methyl groups, harmless in ordinary doses, and having marked hypnotic properties. Dose, 10 to 30 grains.

TETTER.—See ECZEMA.

THALLIN.—A synthetic chemic product and a derivative of coal-tar. It is a powerful antipyretic, but its effects are not so lasting as those of antipyrin. It is likely to produce collapse. Dose of thallin or its sulphate, about 5 grains.

THEA. THEIN.—See CAFFEIN, TEA.

THEOBROMA.—A genus of plants of tropical America. *T. cacao* is the cacao plant, or chocolate tree. See CACAO-BUTTER. **T., Ceratum** ("red-lip salve"), cacao-butter, white wax, of each, 35; oil of almond, 30; oil of rose, to flavor, and carmin, to color, a sufficient quantity of each. **T., Oleum,** butter of cacao. The fixed oil of the seed of the chocolate tree, *T. cacao.* It consists mainly of stearin, with a little olein, and is demulcent, not becoming rancid. It is used in making suppositories.

THEOBROMIN.—$C_7H_8N_4O_2$. An alkaloid occurring in the seeds of *Theobroma cacao* (1.5 percent), obtained from the pressed cacao mass by mixing with slaked lime and exhausting with 8 percent boiling alcohol. It is a white, crystalline powder, slightly soluble in water, alcohol, and ether. Theobromin is a homolog of caffein, differing in containing one CH_2 group less; it unites readily with alkalies, forming soluble salts. See DIURETIN. Because of its insolubility, theo-

bromin is unsuitable for use, but is employed in the form of a double salt. In physiologic action it resembles caffein, being, however, free from any irritating action on the nerve-centers. See CAFFEIN.

Theobromin Salicylate.—$C_7H_8N_4O_2.CO_2.C_6H_4OH$. This occurs in small, white needles having an acid reaction and an agreeable bitter taste, and being slightly soluble in water. It is recommended as a substitute for diuretin in the same doses. The advantages claimed over the latter are that it is perfectly stable, and is not altered by air, moisture, or carbonic acid. See DIURETIN.

Theobromin Sodium Formate (Thephorin).—A powerful diuretic said to be free from irritant effects on the stomach. Dose, 7 1/2 grains.

Theobromin Sodium Iodid (Iodotheobromin).—A white powder, soluble in water, decomposed by hot water. Used to increase arterial pressure; also as a diuretic. Dose, 8 grains.

THEOCIN.—The trade name for synthetic theophyllin (dimethylxanthin), an organic base isomeric with theobromin. It is a white crystalline powder. Like theobromin it differs from caffein in having but little effect on the central nervous system.

Theocin has not so great a stimulant action on the heart as caffeine, but is a much more powerful diuretic than either caffein or theobromin. The diuretic effect, however, is not prolonged and its administration is, therefore, advantageously followed by one of the theobromin derivatives having a weaker, but more persistent, action. It occasionally produces gastric disturbances, and renal irritation has also been reported. In doses of 3 to 5 grains in warm tea, it is recommended in cardiac affections, nephritis, dropsy, etc.

The double salt, *acet-theocin-sodium*, being more soluble, is said to be more readily absorbed and better tolerated than theocin.

THERMODIN.—Phenacetin-urethane. An analgesic, antipyretic and antiseptic. It is said to be effective in typhoid fever and other febrile conditions, influenza, pneumonia, tuberculosis. It is claimed to produce no unpleasant by-effects. Dose, as an antipyretic, 5 to 10 grains, as an analgesic, 15 to 20 grains.

THERMOMETER.—An instrument for measuring the intensity of heat, consisting of a reservoir of mercury (or of alcohol) expanding into a vacuous capillary tube, the intensity being measured by the length of the column of mercury.

Varieties.—**Centigrade** (or **Celsius**), one in which the freezing-point is at 0° and the boiling-point at 100°. **Fahrenheit**, one in which the interval between freezing and boiling is divided into 180 equal parts, each called a degree, the zero-point being 32 degrees or divisions below the freezing of water. The freezing point is 32°, and the boiling point 212°. **Reaumur**, one in which the freezing-point is 0°, and the boiling-point 80°.

Comparison of Thermometers.—To convert the registration of one thermometer into that of another, the following formulas are useful:

Let F = number of degrees Fahrenheit.
Let C = number of degrees Centigrade.
Let R = number of degrees Reaumur.

Then:

$$C° = \frac{5}{9}(F° - 32) \qquad C° = \frac{5}{4}R°$$

$$F° = \frac{9}{5}C° + 32 \qquad F° = \frac{9}{4}R° + 32$$

$$R° = \frac{4}{5}C° \qquad R° = \frac{4}{9}(F° - 32)$$

The following is a comparative table:

FAHR.	CENT.	REAU.	FAHR.	CENT.	REAU.	FAHR.	CENT.	REAU.
212	100	80	122	50	40	32	0	0
210	98.9	79.1	120	48.9	39.1	30	−1.1	−0.9
208	97.8	78.2	118	47.8	38.2	28	−2.2	−1.8
206	96.7	77.3	116	46.7	37.3	26	−3.3	−2.7
204	95.6	76.4	114	45.6	36.4	24	−4.4	−3.6
202	94.4	75.6	112	44.4	35.6	22	−5.6	−4.4
200	93.3	74.7	110	43.3	34.7	20	−6.7	−5.3
198	92.2	73.8	108	42.2	33.8	18	−7.8	−6.2
196	91.1	72.9	106	41.1	32.9	16	−8.9	−7.1
194	90	72	104	40	32	14	−10	−8
192	88.9	71.1	102	38.9	31.1	12	−11.1	−8.9
190	87.8	70.2	100	37.8	30.2	10	−12 2	−9.8
188	86.7	69.3	98	36.7	29.3	8	−13.3	−10.7
186	85.6	68.4	96	35.6	28.4	6	−14.4	−11.6
184	84.4	67.6	94	34.4	27.6	4	−15.6	−12.4
182	83.3	66.7	92	33.3	26.7	2	−16.7	−13.3
180	82.2	65.8	90	32.2	25.8	0	−17.8	−14.2
178	81.1	64.9	88	31.1	24.9	−2	−18.9	−15.1
176	80	64	86	30	24	−4	−20	−16
174	78.9	63.1	84	28.9	23.1	−6	−21.1	−16.9
172	77.8	62.2	82	27.8	22.2	−8	−22.2	−17.8
170	76.7	61.3	80	26.7	21.3	−10	−23.3	−18.7
168	75.6	60.4	78	25.6	20.4	−12	−24.4	−19.0
166	74.4	59.6	76	24.4	19.6	−14	−25.6	−20.4
164	73.3	58.7	74	23.3	18.7	−16	−26.7	−21.3
162	72.2	57.8	72	22.2	17.8	−18	−27.8	−22.2
160	71.1	56.9	70	21.1	16.9	−20	−28.9	−23.1
158	70	56	68	20	15	−22	−30	−24
156	68.9	55.1	66	18.9	15.1	−24	−31.1	−24.9
154	67.8	54.2	64	17.8	14.2	−26	−32.2	−25.8
152	66.7	53.3	62	16.7	13.3	−28	−33.3	−26.7
150	65.6	52.4	60	15.6	12.4	−30	−34.4	−27.6
148	64.4	51.6	58	14.4	11.6	−32	−35.6	−28.4
146	63.3	50.7	56	13.3	10.7	−34	−36.7	−29.3
144	62.2	49.8	54	12.2	9.8	−36	−37.8	−30.2
142	61.1	48.9	52	11.1	8.9	−38	−38.9	−31.1
140	60	48	50	10	8	−40	−40	−32
138	58.9	47.1	48	8.9	7.1	−42	−41.1	−32.9
136	57.8	46.2	46	7.8	6.2	−44	−42.2	−33.8
134	56.7	45.3	44	6.7	5.3	−46	−43.3	−34.7
132	55.6	44.4	42	5.6	4.4	−48	−44.4	−35.6
130	54.4	43.6	40	4.4	3.6	−50	−45.6	−36.4
128	53.3	42.7	38	3.3	2.7	−52	−46.7	−37.3
126	52.2	41.8	36	2.2	1.8	−54	−47.8	−38.2
124	51.1	40.9	34	1.1	0.9	−56	−48.9	−39.1

The clinical thermometer is a small, maximum, self-registering, mercurial thermometer, used in obtaining the temperature of the body. In its usual form the range of scale is about 15° F., and graduation is carried to one-fifth of a degree. The bulb is of extremely small diameter and fine bore, in which the mercury is rendered visible by a lens-fronted stem. The best clinical thermometers register in 30 seconds, but to secure sufficient accuracy it is generally desirable to allow 5 minutes to elapse before removing the thermometer from the mouth or axilla. Especially in obscure cases is this desirable.

The axilla is the locality most suitable for ther-

mometric observation. The mouth, the rectum, or even the vagina may be utilized. When inserted in the mouth, the thermometer should be placed under the tongue, and the lips should be tightly closed. Great care is to be exercised that the instrument does not slip too far into the rectum when rectal temperature is taken. The thermometer should be introduced 2 inches deep, or above the internal sphincter, the patient lying on the side, the thermometer being kept *in situ* by one hand, letting the other rest on the hip of the patient to arrest any turning movement which might be made. To remove the instrument, it may be gently pushed forward a little to bring the bulb in contact with a fresh part of the mucous membrane, a part that has not been cooled by the thermometer. A practical caution is that the thermometer should not be introduced into a mass of feces which may fill the rectum. The inguinal fold or the fold of skin between the thumb and second metacarpus may be used for special, but not for general, clinical purposes. The clinical thermometer should be washed after usage. See TEMPERATURE.

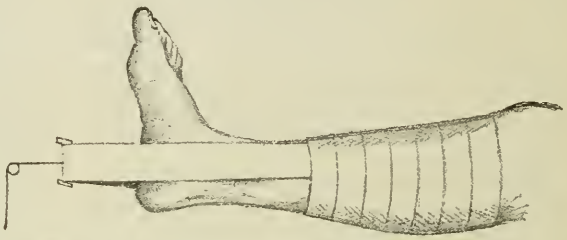
THIGENOL.—The trade name of a solution of sodium sulphite in a synthetic sulphuretted oil containing 10 percent of sulphur in organic combination. It occurs as a dark-brown, syrupy fluid, soluble in distilled water, alcohol, or glycerin. It is odorless and almost tasteless, and is used locally in eczema, seborrhea, acne rosacea, and other skin diseases. Dose, 3 to 10 grains.

THIGH, AMPUTATIONS.—In amputations through the shaft of the femur the mixed method (an anterior skin flap with a shorter posterior one by transfixion) answers so well that any other is seldom needed. Care must be taken not to slit or prick the artery as it is passing out of Hunter's canal, and in arranging the dressings it must be remembered that, owing to the rotation of the thigh, the flaps very soon assume a lateral position.

Amputation through the condyles may be performed according to either Carden's or Stokes' method. The section of the bone in the former runs through the base of the condyles, and the anterior flap passes across the limb midway between the apex of the patella and the tubercle of the tibia; in the latter the bone is divided above the condyles (supracondyloid), and the anterior flap reaches down to the tubercle, the increased length being required by the patella, the sawed surface of which is removed, so that it may face and become adherent to the cancellous tissue of the femur. They are both far superior to amputation through the thigh, owing to their enabling the pressure to be borne (in part, at least) on the face of the stump and their preserving the insertion of the adductor, and, in Stokes', the insertion of the extensor muscles. Gritti's amputation is similar to Stokes', but the bone is divided 1/2 inch lower, and the patella does not fit so well. In Carden's operation there is no posterior flap; in Stokes' the posterior flap is nearly as long as the anterior, and is cut either by dissection or transfixion, according to the bulk of the limb. See AMPUTATION.

THIGH, FRACTURES.—**Fracture at the upper end of the femur** is a frequent injury, and is of great practical importance. The neck of the femur is situated in large part within the joint capsule; hence, pure intracapsular fracture may occur. Fracture nearer the base of the neck may be entirely extracapsular, but, as a rule, the line of such a fracture is oblique to the long axis of the neck, and the fracture is partly extracapsular and partly intracapsular, or "mixed."

This fracture results generally from a fall upon the hip: (1) upon the trochanter, the fracture resulting generally being at the base of the neck (extracapsular), impaction not infrequently occurring into the trochanter; (2) upon the extended knee or leg, such fracture generally being intracapsular. Extensive rotatory movements may likewise cause fracture, through tension and traction of the iliofemoral ligament (fracture by traction). These fractures occur frequently in old persons—most frequently in old women. This is due to the fragility of the bones in advanced age, which is especially pronounced at the upper end of the femur. The bones become fragile earlier in women than in men; and, together with the sharper angle that the neck forms with the shaft in women, this fragility explains the more frequent occurrence of this fracture in women than in men.



MODE OF APPLYING STIRRUP FOR WEIGHT-EXTENSION.

Impaction of the thin portion of the neck into the head (intracapsular fracture) or of the neck into the trochanter (extracapsular fracture) is likely to result if the force producing the fracture acts in the direction of the long axis of the neck. Such impaction prevents the occurrence of several of the physical signs of fracture (abnormal mobility, crepitation); and when it occurs, no effort should be made to disengage the fragments. Clinically, such impacted fractures resemble incomplete fracture of the neck of the femur.

The symptoms of fracture of the neck of the femur are sometimes very obscure, a positive diagnosis often being impossible. Fracture is probable when a person of advanced age is unable to walk after receiving a fall, and when the injured leg is rotated outward and is more or less shortened. In forward luxation of the femur the leg is fixed *elastically* in outward rotation, while in fracture of the neck the rotation can be readily overcome, but the limb immediately drops back outward on being released. In incomplete or

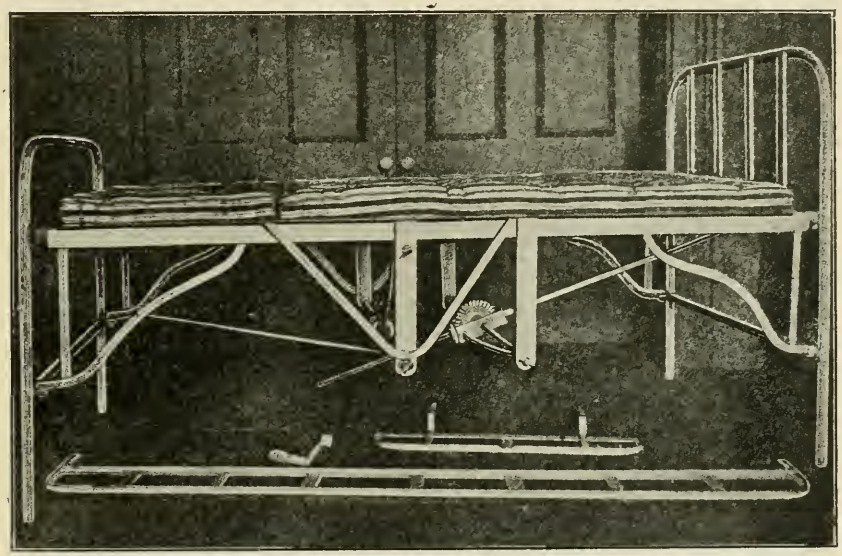
impacted fracture this outward rotation is less marked.

The higher position of the trochanter, determined by the comparative relationship to Nélaton's line, is a matter of great importance. If there is shortening of the injured side, measuring from the anterior superior spine of the ilium to the knee, and if the distance from the tip of the trochanter to the knee is the same on both sides, manifestly the seat of the shortening must be in the neck of the femur.

It may happen that no fracture is sustained at the time of the fall, only a severe contusion, which, however, markedly interferes with the nutrition of the head of the femur and of the contiguous portion of the neck; the result of this may be a complete breaking down of the bone structure, and the appearance of a fracture secondarily. This occurrence is rare, but does undoubtedly take place. Movements of the injured thigh, are usually possible in all directions, are painful, and elicit crepitation when the fragments are loose and remain in contact. In rotating the thigh the shaft of the femur turns about its long axis in extracapsular fracture, while in intracapsular it turns about a radius equal in length to the intact portion of the neck of the femur. The X-rays should be employed in all these cases and will remove all possible doubt as to the character and extent of the injury.

Treatment.—These patients are generally old, and therefore treatment is complicated by the necessity of preserving and improving general health and nutrition, and of guarding against the occurrence of an asthenic hypostatic pneumonia, which may easily prove fatal. Frequent change of position is indicated—sitting up, turning from side to side, deep breathing, and, finally, early walking with the aid of ambulatory splints. This last is most readily accomplished by means of a spica of plaster of Paris; the sole of the shoe on the sound side is raised, and then a pair of crutches permit locomotion without disturbing the injured hip. In intracapsular fracture the fragment composed of the head is so poorly nourished that bony union is exceptional, fibrous union the rule. In extracapsular fracture callus-formation is likely to be abundant, and so bony union is the rule.

In impacted fracture, or in loose fracture without tendency to displacement and outward rotation, the indicated and necessary rest is readily attained by means of sand-bags placed along the inner and outer sides of the limb. Comfort or necessity may demand the addition of a Buck's extension apparatus (adhesive-plaster straps, weight, and pulley). In the ordinary loose fracture, with displacement, reposition must first be carefully effected; then a Buck's extension apparatus applied, the foot preferably being held fast and controlled by means of a sliding foot-rest to which the foot is made fast, thus preventing the tendency to outward rotation. A weight of from 10 to 15 pounds ordinarily serves to maintain the fragments in good position. This weight and pulley method is especially admirable in that it permits mobility of the limb and the assumption of a semirecumbent attitude, without injury or pain.

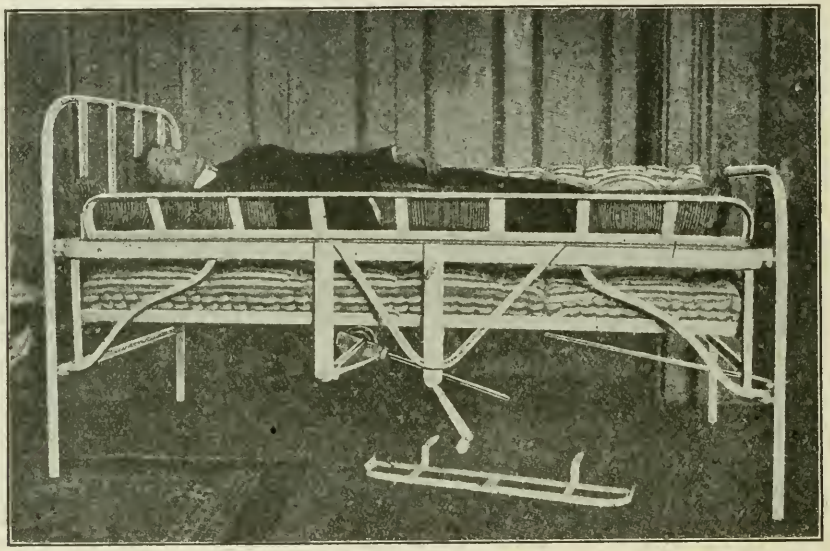


Bed Used in Fracture of the Thigh.—(*Bullitt.*)

Plaster-of-Paris and hip splints of leather are applicable only when the patient is able to leave the bed, intermittingly at least. The majority of these patients are old and feeble, so a brilliant final result is seldom to be expected; most of them do very well if they learn to walk again with a limp and a cane after the expiration of 6, 8, or more weeks.

The serious difficulty in the treatment of these cases is the maintenance of rest of the injured

hip in good position, at the same time providing for frequent shifting of the patient's position, combating the hypostatic tendency. The hip must, therefore, frequently be sacrificed to the patient's life. The accompanying illustrations show a bed designed by Bullitt for meeting this very difficulty. The bed is so arranged that the whole bed plane can be tipped from side to side, and the head can be raised to an almost upright position without any movement on the part of the patient. The utility of this contrivance in the handling of such cases is obvious, and practical use has demonstrated its great value. The working and uses of the bed are illustrated by the cuts made from photographs. The first cut shows the bed for use as an ordinary bed. The second cut shows the bed plane tilted laterally, thereby shifting the weight from the back to the side. Small, firm, hair pillows are packed in



The Bed Tilted Laterally.

between the patient and the side bar, and so the patient does not move or slip while the change in position is being effected. The third cut shows the bed-frame tilted lengthwise; this position is especially designed for the treatment of fractures of the thigh and hip in old persons. The foot of the sound side is supported by two small and firm hair pillows inserted between it and the foot-board, so permitting the foot of the injured side to swing free. Elevation can be accomplished to almost an upright position, though such a degree of elevation would probably seldom be employed.

The great trochanter is rarely separated as a result of direct force. When separation occurs, it is recognizable through the displacement, the fragment being felt behind and above the glutei muscles, with a wide diastasis between it and the femur. The muscular traction makes it difficult to hold the fragment in place by dressings. In case of failure, it only remains to fix the fragment in place directly by means of suture or nails. In any event, the thigh should be kept in abduction.

Fractures of the diaphysis of the femur in its middle third, or just above the middle, are frequent. Some are due to torsional force, but the greater number to bending by direct force (run-over accidents). In this locality displacement is generally considerable in the adult; in children the relatively thick periosteum remaining intact usually prevents marked displacement. The fracture line is generally oblique, and longitudinal traction of the powerful thigh-muscles easily effects displacement, which is sometimes extreme. Abnormal mobility is readily demonstrated; likewise crepitation. If crepitation cannot be demonstrated, especially after reposition, it is presumable that soft parts are interposed between the fragments; correct and bony union cannot be expected unless the fragments are brought into good apposition.

A typical displacement accompanies fractures above the middle of the shaft. The upper fragment is carried into flexion by the iliopsoas muscle, and into abduction by the glutei muscles; at the same time the lower fragment is drawn upward and inward by the hamstrings and the adductors. This projection of the upper fragment forward and outward is to be carefully borne in mind when effecting reposition and fixation; otherwise the deformity will be found persisting after the consolidation of the fracture.

Treatment.—In the treatment of fractures of the diaphysis permanent extension, by means of adhesive-plaster straps, weight and pulley (Buck's extension apparatus), is of the very greatest usefulness, and tends to greatly simplify treatment. The adhesive-plaster straps are to have broad surfaces, and should be capable of supporting a weight of from 20 to 25 pounds, which is necessary to overcome the upward muscular trac-

tion. Pillows and sand-bags sometimes suffice to support and further control the position of the limb; usually, however, it will be found best to support the fragments by means of short splints padded and securely bound to the thigh over the extension apparatus. The addition of a sliding footboard is sometimes necessary properly to control the rotatory tendency of the lower leg. In fracture with a short upper fragment the displacement already referred to (forward and outward) is difficult to combat. Here the double inclined plane of Agnew is of good service, together with an extension apparatus acting on the thigh from the knee upward and making traction in the direction of the displacement of the upper fragment forward and outward. Perhaps the best support of all is by means of molded leather splints in combination with Buck's extension apparatus. The splint is cut from saddle skirting leather and is made of a shape to extend from the knee well over the hip and to cover the anterior and outer aspects of the limb. The leather is immersed in hot water (hot as the hand can bear), and is then molded to the part, being held in place for a few minutes by means of a roller bandage. It is then removed and dried before the fire for a short time, when it will retain its shape. The extension apparatus is now applied, reposition is effected, and the leather splint is securely bound to the limb. It is necessary from time to time to measure the two thighs from the anterior superior spine to the patella, guarding in this way against the occurrence of any excessive shortening.

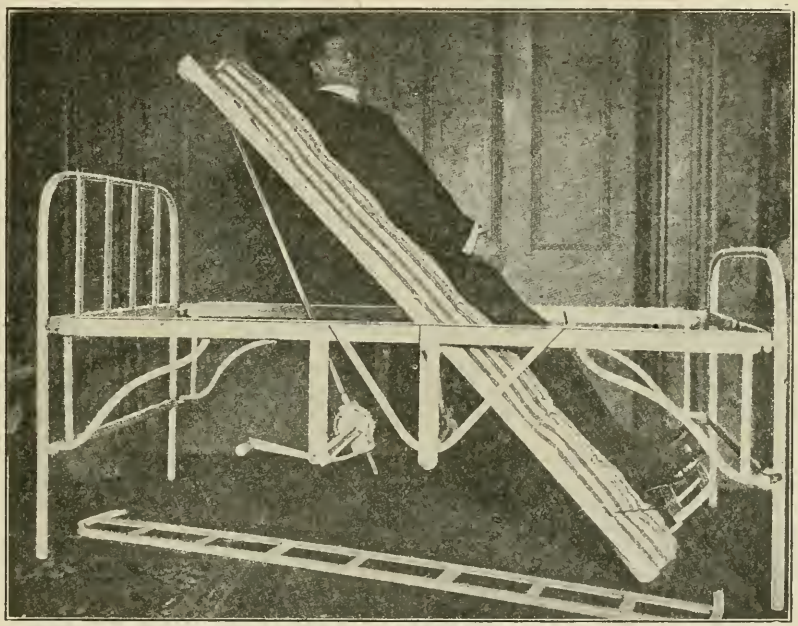
Ordinarily, at the end of 4 weeks consolidation is far enough advanced to change the dressing to one of plaster of Paris, which permits locomotion and is worn for 4 weeks more.

Bryant's Vertical Extension for Fracture of Femur in Children.

In children the method of **vertical suspension** of the whole limb (or better, of both limbs) is a most excellent one. Vertical suspension is also applicable in adults when it is found otherwise impossible to preserve the proper position of the fragments.

In new-born children almost the only possible way to fix the thigh is in the position of the fetus *in utero*, with the thigh flexed against the abdomen and held there by means of adhesive-plaster straps. This dressing permits the ready handling and cleansing of the child.

Every fracture of the thigh is likely to be attended by greater or less permanent shortening of the limb.



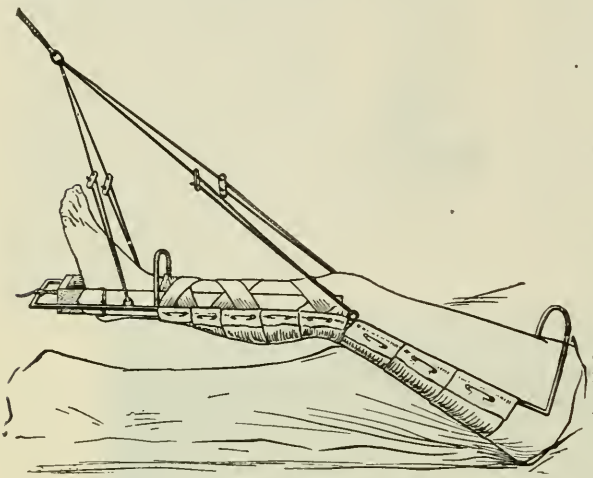
The Bed Tilted Lengthwise.

Compound fractures, which require frequent change of dressings, are very conveniently treated by means of the suspending splint of Hodgen.

Fractures at the lower end of the femur are rarer than those of the shaft and neck, and result from direct violence.

In supracondylar transverse fracture the lower fragment is drawn downward in flexion by the calf-muscles, while the traction of the thigh-muscles tends to increase the overriding of the fragments and the marked displacement. In epiphyseal separation similar displacement occurs, although slighter in degree, because the periosteal covering remains intact, in part, at least. The

knee-joint may be involved, and certainly is if the lower fragment becomes split longitudinally—T-fracture. The vessels and the sciatic nerve are in danger of injury from the sharp edges of the displaced lower fragment. Abnormal mobility and crepitation readily determine the nature of the injury. After requisition it is manifest that the mechanically correct position is one of flexion, more or less acute, whereby the tendency of the lower fragment to recurrent displacement is best overcome. This may be accomplished by a posterior angular splint or by the double inclined plane. Sometimes permanent extension is suitable, together with gentle pressure from behind against the lower fragment. After 4 or 5 weeks passive motion should be instituted, and further treatment, as for articular fracture elsewhere, should be given.



Hodgen's Suspension Splint.—(*Moullin.*)

Fracture of one condyle is necessarily intra-articular, and is recognizable by the to-and-fro movements at the knee, by crepitation and by the localized pain. Hemorrhage into the joint may be profuse, and if so, the blood should be evacuated by aspiration. An extension dressing with a posterior splint is best, or a double inclined plane may be used. Care must be taken to counteract any varus or valgus tendency that may become manifest.

THIOCOL.—The potassium salt of guaiacol sulphonic acid. It contains about 60 percent of guaiacol, and is in the form of a fine, white powder, which has a taste at first bitter, then sweetish. It is used in diarrhea, pneumonia, and all forms of tuberculosis. As advantages over other remedies may be mentioned: Entire freedom from odor, great solubility in water, ready absorption, and freedom from irritant action on the mucous membranes. It is claimed that these properties make it applicable for the most sensitive patients. Dose is from 7 to 30 grains, up to 1 1/2 drams or even 4 drams daily. Daily doses of from 150 to 225 grains may be continued for a considerable time without disadvantage, which is of the greatest importance in the creosote treatment. It causes no nausea or diarrhea.

THIOL.—Prepared by the sulphuration of certain nonsaturated hydrocarbons, and is a product very similar to ichthyol. It occurs in both dry and liquid form, the former, *Thiolum siccum*, as dark-brown lamellæ or powder, of bituminous odor and bitter, astringent taste; soluble in water and in chloroform, sparingly in alcohol, insoluble in ether and in benzin. The liquid form, *Thiolum liquidum*, is a dark-colored, syrupy fluid, miscible in all proportions with water. Dose, internally, 5 to 30 grains.

The dry form is used as a dusting powder in erysipelas, eczema, erythema, intertrigo, impetigo pemphigus, periphlebitis, subcutaneous, hemorrhages, and syphilitic ulcers. It is an efficient application in pelvic exudations and endometritis. Thiol causes neither pain, burning, nor other symptoms of irritation, nor any bleeding from eroded surfaces.

Glycerinated thiol is a remedy for chilblains, consisting of equal parts of liquid thiol and glycerin.

THIOSINAMIN.—Allyl-sulpho-carbamid. It is prepared by heating together oil of mustard 3, alcohol 3, and ammonia 6. It occurs as colorless crystals, which are very soluble in alcohol and in ether, and moderately so in water. The addition of antipyrin in one-half the quantity renders it soluble in water to the extent of 15 percent (Michel). It produces a local reaction when injected for lupus, or where sclerotic tissue is present, which it softens and permits of its absorption. It is used for the removal of scars, corneal opacities, and keloid; also for lupus, fibrous deposits in joints, stenosis of the esophagus, and for deafness due to thickening of the drum or fixation of the aural bones. Dose, 1/2 to 1 grain, thrice daily by mouth; or 10 to 20 minims of a 10 percent solution in absolute alcohol, hypodermically every third day. The ethyl-iodid of thiosinamin is said to be of service in arteriosclerosis, asthma, emphysema, scrofula and syphilis, given internally in doses of 2 grains several times a day.

THIRST.—The state manifested by a desire for drink. It is marked by dryness of the mouth and fauces, together with constriction of the pharynx and esophagus.

Although referred to the back of the throat, thirst is not a purely local feeling, since it cannot be allayed until fluid reaches the stomach and is absorbed. In febrile disorders, after hemorrhage or operation, in cholera and diarrhea, in diabetes mellitus, and in acute and chronic gastritis thirst is usually present. It forms a useful diagnostic sign between chronic gastritis and mere atonic dyspepsia.

Remedies that allay thirst and impart coolness, such as the vegetable and mineral acids, ice, water, if cold, effervescing drinks, fruit-juices, and many diaphoretics are called refrigerants. Acid drinks allay thirst by promoting the secretion of alkaline

saliva, but when excessively used, they will derange the stomach. Cracked ice, sucked, is very grateful, and allays thirst in fever. Fruit-juices, or those made into drinks, must be used in moderation: excess will do harm. Bitters, in drinks with acids, most effectually slake the thirst. A weak infusion of orange-peel acidulated with hydrochloric acid makes an efficient thirst-queller in fever patients. Tepid drinks are useful in the thirst of diabetes.

THOMSEN'S DISEASE.—See MYOTONIA CONGENITA.

THORACIC DUCT, AFFECTIONS. Diseases.—Narrowing may result from inflammation of the coats or blocking of the lumen by pressure of an aneurysm, tumor, or contracting cicatrices, or from cancerous or tubercular material. Complete obliteration need not cause death or even marked symptoms, since the veins seem to act vicariously. Aneurysm of the duct and dilatation and calcification of the walls have also taken place. A primary growth in the duct has not been recorded.

Injuries.—The thoracic duct has occasionally been torn or wounded. In such cases a discharge of a spontaneously coagulating fluid, milky during digestion, has taken place. In one instance the fluid escaped into the pleural cavity, which had to be tapped repeatedly. A diagnosis of injury to this duct is impossible save by evidence of this chylous fluid escaping or being tapped from the pleural cavity. The prognosis is of the utmost gravity, as death is the general rule, in weeks rather than months, and from marasmus. In one case the opening in the duct was said to have healed under a plug. In another case a clamp was made use of, and packing of the cavity around this with gauze resulted in recovery. See CHEST (Injuries).

THORACOPLASTY.—See PLEURISY (Treatment).

THORAX.—See CHEST.

THREAD-WORMS.—See WORMS.

THROAT.—See ESOPHAGUS, LARYNX, NECK, PHARYNX.

THRUSH.—See STOMATITIS (Parasitic).

THUMB.—See HAND AND FINGERS.

THYME.—A plant of the genus *Thymus*.

Oil of Thyme is a stimulant and antiseptic oil containing thymol; chiefly used topically in veterinary practice.

THYMOL.—$C_{10}H_{13}HO$. A phenol with active antiseptic and anesthetic properties. It exists in oil of thyme and other vegetable oils. It occurs in large, colorless plates, melting at 44° C. and boiling at 230° C. It has a thyme-like odor, and is slightly soluble in water but readily soluble in alcohol. Thymol is chiefly employed as a gargle, spray or inhalation in laryngitis and diphtheria; as an ointment in ringworm, eczema and psoriasis, and as an injection in ozena. A solution of 1 part in 1000 is the strength usually prescribed. Internally it has been used with success in diphtheria, typhoid fever and other intestinal affections, diabetes, phthisis and vesical catarrh. Its fragrant odor renders it a very agreeable antiseptic application for ulcerated conditions of the mouth and fauces, but makes it very attractive to flies, which fact together with its high price will prevent it becoming a favorite in hospital practice. A solution, used as a mouth-wash, is very efficient in removing the odor of tobacco from the breath. Thymol is almost specific against the intestinal parasite ankylostomum duodenale (*uncinaria Americana*) for which it is given in three or four doses of 10 to 30 grains, well triturated, in capsules; care being taken that no alcoholic drink is ingested afterward, in order to avoid the absorption of thymol and consequent poisoning thereby. Dose, 1/2 to 3 grains. **T. Inhalation,** thymol, 20 grains; alcohol, 3 drams; magnesium carbonate, 10 grains; water; add enough to make 3 ounces; add a teaspoonful to a pint of water at 150° F. for each inhalation. **T. Iodid,** See ARISTOL. **T. Solution,** for spraying, 1 : 1000. **T., Ung.,** contains 5 to 30 grains to 1 ounce. **Volkmann's Thymol Solution,** thymol 1, alcohol 10, glycerin 20; and water 100. It is used as a spray and antiseptic lotion; it does not produce eczema, as do phenol lotions.

THYMUS GLAND.—See STATUS LYMPHATICUS, NECK (Injuries).

THYMUS GLAND EXTRACT.—An animal extract whose mode of preparation and dose are similar to those of thyroid extract. It has been serviceable in exophthalmos with anemia and debility, in leukemia, chlorosis, idiopathic and pernicious anemia, and in the so-called "status thymicus."

THYRESOL.—The methyl ether of santalol. It is similar to sandal wood oil in its properties but is said not to produce gastric or renal irritation. It is recommended in the treatment of gonorrhea, etc. Dose, 8 grains in milk or in gelatin capsules.

THYROID EXTRACT.—See THYROID TREATMENT.

THYROID GLAND, DISEASES.—Colloid degeneration, affecting the contents of the sacs and attended with atrophy of the cellular lining, is of so common occurrence as almost to be considered normal. Nothing is known with regard to its function beyond the general fact that the activity of growth and nutrition of all parts of the body (including the brain) are intimately connected with its integrity. In women it frequently enlarges and becomes tender—at puberty, during the menstrual period, and during pregnancy. Cretinism is, in all probability, due to its imperfect development; removal during childhood causes a similar condition, and, in a large proportion of cases, removal of the whole gland is followed by myxedema, if performed on adults. The temperature falls; the oxygenating capacity of the blood diminishes; leukocytosis sets in; the coagulability is lessened; the skin and subcutaneous tissue undergo a peculiar transformation; nervous symptoms (tremors, paresis, paresthesia, etc.) make their appearance, and, at length, a cretinoid condition, with imbecility and coma, follows. When this does not take place, it is probably owing to the fact that the whole gland

has not been removed, or that accessory thyroids (which are of very common occurrence) have undergone compensative hypertrophy. Sometimes it follows with great rapidity shortly after the operation; sometimes, on the other hand, slowly and gradually. In a few instances the immediate onset, after a period of apparently perfect health, has been brought on by exposure to cold (Moullin).

Inflammation may be acute or chronic, and in resolution or in suppuration and sloughing, according to the cause and the addition or not of pyogenic irritants.

The symptoms, when the attack is acute, are very alarming, often beginning with a rigor and high fever. Owing to the way in which the gland is bound down by the cervical fascia the pain is very severe; the tissues of the neck are hard and rigid, the superficial veins distended, the trachea and esophagus compressed against the spine, and there may be cerebral symptoms caused by the obstruction to the cranial circulation. In most cases resolution sets in after 48 hours, and the acute symptoms begin to subside, but often the improvement is only partial; the diffuse enlargement disappears, but one or more local swellings remain; the skin becomes red and edematous, and at length fluctuation is apparent. Death may occur from pressure upon the trachea, from pus finding its way down into the lungs, or from pyemia or septicemia. In one or two instances the gland has sloughed.

The treatment must be energetic. At the onset aconite or antimony may be given internally in small, frequently repeated doses, until a distinct effect is produced upon the arterial tension. Ice-cold compresses should be placed upon the neck, the superficial veins pricked to relieve the circulation, and leeches applied to the supraclavicular region. Venesection (either from the arm or the external jugular) may be advisable, if the patient is young and the inflammation sthenic. If signs of suppuration make their appearance, the superficial structures must be carefully divided, layer by layer, and a director used for exploration, after Hilton's method. A drainage-tube must be inserted to prevent the opening becoming valvular.

Goiter, or **Derbyshire neck,** is an enlargement of the thyroid gland. It may be due, as is commonly the case, to simple hypertrophy of the normal tissues of the organ (*ordinary goiter*), and may then involve the whole gland or one of the lateral lobes or rarely only the isthmus. In other instances the hypertrophy may fall chiefly on the fibrous tissue, constituting the septa of the gland (*fibrous goiter*). Or along with some amount of simple hypertrophy and increase of fibrous tissue (*adenoma*) one or more of the normal alveolar spaces may become enlarged, forming single or multiple cysts (*cystic goiter*). Such cysts contain, when single, a serous fluid, or when multiple, a colloid or a dark, grumous material sometimes mixed with altered blood; while occasionally, proliferating growths project into their interior from the cyst walls. In other instances again, but more rarely, the hypertrophy is associated with a great increase in the vessels, and a forcible and expansile pulsation is given to the gland (*pulsating goiter*). But the tissues, besides hypertrophy, may undergo secondary changes. Thus, calcification may occur, and the enlarged gland become of stony hardness (*calcified goiter*) in places, or the fluid normally contained in the alveolar cavities may assume a colloid character. Lastly, the enlargement of the thyroid may be due to malignant disease (*malignant goiter*). In certain districts goiter is endemic, especially in the Rhone Valley in Switzerland, and in Derbyshire in England, and is then frequently associated with the condition known as cretinism. It also occurs sporadically; and in some cases again is accompanied by a peculiar jerking beat in the carotids, by anemia, and by a prominence of the eyeballs. See Exophthalmic Goiter.

The symptom common to any form of enlargement of the thyroid is a swelling taking more or less the characteristic shape of the thyroid gland, and *moving with the larynx in deglutition.* In this country the enlargement is generally moderate; but sometimes, and especially in Switzerland, the goiter forms a large mass hanging in front of the neck, and may press upon or even displace the trachea and esophagus. It occurs chiefly in women. In the ordinary variety it is soft, semi-fluctuating, and of uniform consistency; in the cystic one or more fluctuating places may be felt; while in the fibrous it will be firm and hard and more or less lobed or irregular, and when calcification has taken place, of stony hardness. Malignant goiter, which is very rare, may be known by rapid growth, enlarged glands, and the other signs of malignancy.

The cause of endemic goiter is not known. It has been attributed to impure water, water from limestone, and snow water, but without conclusive evidence. It is said to be most prevalent in valleys where, from their direction, the sun does not penetrate, on damp soil, and in damp parts of towns; but, according to Berry, these influences have little or nothing to do with its causation. In sporadic cases heredity, disturbance of the sexual functions, and conditions producing congestion of the head and neck are given as causes.

Treatment.—Sporadic cases of ordinary goiter should be treated by the internal and external application of iodin, and removal from the goitrous district. Thus the syrup of the iodid of iron may be given internally, and an ointment of iodin and iodid of potassium applied externally. The use of biniodid of mercury ointment, followed by exposure to a hot sun, has been attended with much success in India. An ice collar has sometimes been of service.

Cystic goiter may be treated by aspiration, drainage or enucleation. Of these the first is of little avail, except as a temporary expedient in an urgent case, or as a preliminary to other measures. The fluid must be drawn off very slowly, or hemorrhage may occur from the delicate vessels in the

walls of the sac, and fill it even more tensely than it was before.

Drainage and enucleation are more successful. A linear incision is made through the superficial structures, and the capsule of the gland freely exposed. If there is a large single cyst, it can usually be enucleated by careful dissection, clamping and dividing between two ligatures every vessel; solid adenoma may be treated in the same way. If this is impracticable, the cavity may be laid open and the contents cleaned out; but the operator must be prepared for severe hemorrhage. Plugging with iodoform gauze may be necessary if it does not stop at once. It does not appear to be necessary to fasten the edge of the cyst to the skin or the cervical fascia; according to Clutton, if the superficial structures are not disturbed or displaced, there is very little risk of inflammatory infiltration. If a number of small cysts are packed closely together, it is better to excise the part so long as it is not too large, ligating the vessels one by one as they appear, and taking especial care of the recurrent laryngeal nerve.

Operative treatment consists in ligation of the thyroid arteries; division of the isthmus; removal of the isthmus or one lobe; or partial removal of both lobes.

In beginning goiter ligation of the superior thyroid arteries has sometimes arrested the process of morbid growth. Division of the isthmus is a palliative operation for late cases in which the trachea is compressed.

It may be stated as a general rule that every rapidly growing goiter should be removed. Timely recourse to operation will save the patient much trouble. Partial excision of the thyroid is the operation of choice. It is performed as follows: As little anesthetic as possible, and that chloroform or ether by the open method, should be given since dyspnea is liable to occur during the operation. On this account some surgeons employ local anesthesia with cocain. An incision is made over the tumor along the anterior border of the sternomastoid when part only of one lobe is to be removed. If a part of both sides, then a curved incision across the front, so that the scar may be covered by a necklace. Then the sternomastoid is retracted, and the sternohyoid, sternothyroid split, or, along with the omohyoid, cut across, but as far from the line of the cutaneous wound as possible to prevent their adherence to the scar, which would then be puckered in every time the muscles contract. The tumor having been thus exposed, the fascia should be opened carefully so as not to injure the veins lying beneath it. When necessary, the veins are divided between clamp forceps, and later tied. Enucleation should now be begun with the finger, aided by a small sponge held in clamp forceps, bearing in mind that although the common carotid artery is pushed outward, the internal jugular vein usually runs over the tumor, being held more or less in position by the veins opening into it. The pulsation of the artery is therefore no guide to the position of the vein, which may run in front of, or internal to the artery.

The superior thyroid arteries should be sought at the upper and inner part of the tumor and securely tied. Of the lower part of each lateral lobe a piece should be left, at least as large as the end of the thumb. In this way one may avoid injuring the recurrent laryngeal nerve which passes upward among the main divisions of the inferior thyroid artery. When the tumor has plunged behind the sternum, delicate manipulation is needed to isolate it from the pleura and innominate veins. After applying ligatures, the capsule may be drawn together by a purse-string suture, next the divided muscles should be sutured together if possible, and the skin united except for a small drain.

Sarcoma or carcinoma arising in the thyroid gland, if it is to be removed must be diagnosed early. A tumor arising in the thyroid gland, in a patient over forty, especially in a man, and a gumma being excluded, should at once be explored, and removed early, while still within the capsule of the gland.

THYROID GLAND, INJURIES.—See Neck (Injuries).

THYROID TREATMENT.—The treatment of disease by the administration of thyroid gland or substances derived from it.

Preparations.—(1) The fresh gland of the sheep, minced. (2) The thyroid glands of the sheep, freed from fat, and cleansed, dried and powdered (the desiccated thyroid gland of the U. S. P.). (3) Dry thyroid (thyroideum siccum of the British Pharmacopeia). This is prepared be removing the fat and connective tissue from the healthy gland taken from the sheep directly after it is killed. The gland is minced, dried at from 90° to 100° F., and powdered. Fat is removed by washing with petroleum spirit, and the powder dried. (4) Glycerin extract of thyroid (liquor thyroid of the British Pharmacopeia). The fresh, healthy thyroid glands of the sheep are bruised with 34 minims of glycerin and 34 minims of a 0.5 percent solution of phenol for each gland. The mixture is allowed to stand for 24 hours, strained, and sufficient of the phenol solution added to make 100 minims. (5) Iodothyrin. This is obtained by hydrolysis of the colloid matter of the gland with diluted caustic soda, and precipitation of the colloid by acetic acid.

Dosage.—Of the raw gland, from 1/2 to 1 may be used. The dose of the U. S. P. preparation is 4 grains. Three to 10 grains of dry thyroid and from 15 to 60 minims of the glycerin extract may be given twice or thrice daily. Iodothyrin, as found in the shops, is rubbed up with sugar of milk and is administered in 5-grain doses.

Method of Administration.—The transplantation of thyroid glands (*greffe thyroidienne*) as practised by Bettencourt and Serrano has been abandoned. The ingestion of minced, raw, or slightly warmed sheep's thyroids, even when seasoned, so speedily provoke nausea and vomiting that this method is impracticable for prolonged use. The dry powdered gland can be given as such or in capsule, wafer, or tablets by the mouth. The glycerin extract is most frequently employed when given

by the mouth, or when sufficiently diluted, hypodermically. Iodothyrin may be exhibited in substance, in capsule, wafer, or tablet, by the mouth or subcutaneously. The frequency varies from 2 or 3 times daily until the physiologic effects are obtained, then once daily or less frequently as may be necessary to maintain them.

Physiologic Action.—The result of the administration of thyroid is to increase oxidation in the body, the nitrogenous substances being excreted entirely as urea, fats as carbon dioxid by the lungs and as water by the kidneys. Diuresis is a constant effect, and this is greater than can be accounted for by increased oxidation, so that it is evident that the tissues themselves are desiccated. It is probable that the circulating proteids are first destroyed, while the fixed proteids are only attacked after the store of fat is considerably diminished. It is likely, considering the small quantity of thyroid administered, that these effects are brought about through the influence of the nervous system rather than by its direct action upon the tissues themselves. Since glycosuria is often a result of thyroid medication, it is likely that this substance may effect carbohydrate metabolism, so as to diminish the power of the tissues to utilize sugar (Hutchison). Increased rapidity of the heart's action is very constant, and often there are observed irregularity, palpitation, and even weakness; the fall of blood-pressure is probably due to the last-named condition rather than to dilatation of peripheral blood-vessels. As to its effects upon the blood, contradictory results have been observed. Probably small doses exert no influence, while large doses destroy blood-corpuscles. Making use of the colloid material, it may be said that excretion is entirely by the kidneys. This excretion is gradual, and may be continued for several days after its administration is stopped. Whether this material is excreted as such or is broken down in the organism is still an open question.

Some differences are observed in the results of administration of different preparations. The most important are that iodothyrin seems to have no effect upon the heart as to its rate, rhythm, or vigor; and this is true of the intravenous injections of colloid matter. The fall of pressure on administration of the gland or improperly prepared dry extracts is undoubtedly due to contained organic extractions, and it can be definitely stated that absolutely fresh thyroid gland is not poisonous when absorbed by way of the alimentary canal. Iodin is readily detected in the urine of patients who are taking iodothyrin, while it is found with difficulty after administration of thyroid preparations. The explanation doubtless is that normal thyroid stores up iodin and prevents its excretion. Inasmuch as there is no satisfactory method of standardizing thyroid preparations, the dose must, for the present, be determined from the results rather than the physician be guided by the posology as found in the literature.

Precautions in Administration.—Under the term "**thyroidism**" have been described symptoms that may be divided into 2 groups; (1) the alimentary—nausea, colicky pains, and diarrhea; (2) the metabolic—headache, pains and heaviness in the limbs, palpitation, disturbances of cardiac rhythm, and weakness. The first group may be due to products of putrefaction, to which the thyroid is especially liable, particularly if fever, sweating, and collapse are prominent. These can be avoided if the method of d'Arsonval (sterilization in an autoclave by carbon dioxid, under a pressure of 50 atmospheres) is employed. The second group is probably the result of overaction of the substance itself, since idosyncrasy must always be taken into consideration. Symptoms may appear after the use of any preparation, and are the results of increased metabolism. The practical suggestion to be borne in mind is that small and frequent doses—instead of large ones at longer intervals—should be employed. Caution and good sense should be shown in the use of thyroid preparations, and they should always be administered by a physician. The result after thyroidectomy in the practice of surgeons, demonstrates the necessity of strict observance of this rule. As improvement is secured the interval between doses should be lengthened, until constant physiologic effects only are secured.

Therapeutic Applications.—In the treatment of **myxedema** the use of the various preparations of the thyroid gland approaches nearer to specific action than any other in therapeutics, the results of mercury and the iodids in syphilis not even excepted. Inasmuch as in this disease the something that through cessation of function of the thyroid is not supplied to the organism can be furnished by the administration of preparations of this gland, the cure of myxedema becomes an assured fact. This statement is accurate only in the understanding that continued administration is persisted in. The tangible results observed are: (1) Lessening of the physical and intellectual torpor; (2) increased urinary excretion; (3) restoration of body temperature to the normal; (4) reabsorption of the edema of face and limbs. (5) progressive disappearance of difficulty of speech, interference with swallowing and muscular movements; (6) cessation of constipation; (7) diminution of body weight; (8) cessation of trophic disturbances—as, for instance, falling of the hair. In other words, the nutrition is stimulated and the principal functions are regulated.

The treatment may be divided into 2 stages: (1) curative and (2) prophylactic. In the first, daily doses should be persisted in until all symptoms have disappeared. If a preparation free from decomposition products is employed—and none other should be used—the amount given should be that which does not affect the pulse or produce other untoward action. So soon as cure has been obtained, the remedy should be given at intervals of one week or less, in such amount that no symptoms reappear. A fall of temperature or an appearance of slight edema should warn the physician that the dose is too small, the interval too long, or both dose and interval should be changed. If the dry extract is employed, the source of the powder should be known as well as

its strength. Six to 15 grains may represent one thyroid gland, depending upon the manufacturer; tablets are unreliable, since they may not dissolve; capsules are uncertain on account of the varying solubility of the gelatin, and on no account should the powder be previously made into a mass. As a rule, the powder should be used as such, and in about double the dose by mouth as when injected subcutaneously. The glycerin extract is more useful; but of each specimen the dose must be determined clinically, since accurate standardization is, at present, impossible.

Cretinism or Infantile Myxedema.—The same rules apply and the same results are obtained—the dose being somewhat larger than reached by Young's rule and determined by experiment. Here the increase of height is notable, and the development of the intellectual processes is a fairly accurate index of the success of the treatment. In children the difficulties are fewer and the dangers less, for toxic symptoms are but rarely observed.

The treatment of postoperative myxedema (after total extirpation of the thyroid) yields brilliant results when used as a prophylactic. In comparison with the small number of patients observed, the instances of toxic symptoms have been considerable in number. These are entirely unnecessary and would never be seen were the treatment always intrusted to a careful physician. The smallest dose at the longest interval which will keep the patient free from symptoms of the disease should be chosen. Hard and fast rules cannot be formulated; each patient should be studied.

Obesity.—Next to the three conditions just enumerated, obesity affords the best example of therapeutic efficiency. Since the increased nitrogen elimination is due to the breaking down of the circulating proteids and the fixed are not attacked until the store of fat is considerably reduced, the diet should not be much restricted, and nitrogenous matter ought to be well represented. In these cases more than ordinary care must be exercised, because the heart may have undergone fatty changes. Since heredity and habits of life have much to do with obesity, the results of thyroid administration are not always satisfactory. It is claimed that iodothyrin is more efficient in anemic obese persons than in vigorous subjects.

The insanity of myxedema (acute or chronic mania, melancholia, or dementia) is amenable to treatment, because the disease itself can be cured. The insanities from other causes do not present constant results. In the chronic varieties the improvement in nutrition is likely to benefit the mental condition. In acute mania, by increasing tissue metabolism, the danger of exhaustion is heightened. The dangers as to the heart, gastric irritation, and muscular weakness must be borne in mind. Experience only can determine, outside of the exceptions noted, whether a particular patient will be likely to receive benefit.

The results in **exophthalmic goiter** have been various. From the literature as well as from personal experience no final conclusions can be reached. Since, as Gley very properly observes, the majority of the symptons in many patients can be as plausibly explained by the hypothesis of partially deficient thyroid activity as by the hypothesis of augmentation of thyroid function, those who accept the first view are justified in making use of this remedy. Beyond the fact that it may increase the tachycardia and dangerously depress the heart, there is no objection to a trial being made—although good authority holds it to be contraindicated. In goiter the question depends entirely on how far the particular variety of disease has interfered with the proper functionating of the gland. The only constant result has been that the size of the goiter is reduced by its administration.

Skin-diseases.—The rapid and marked changes that occur in the skin of a patient suffering from myxedema while under thyroid treatment suggest its use in various dermatoses. Psoriasis and eczema, particularly the chronic varieties, have received considerable attention. At present, while some successes have been recorded, there is no rule that determines the probability of success, and even the treatment may aggravate the disease. In lupus Bramwell found more encouragement. The cutaneous lesions of malignant syphilis were markedly benefited, in the experience of Menzies, by thyroid medication. Various other conditions have been, with more or less reason, treated by the administration of thyroid preparations. The physician, bearing in mind the physiologic action of these, can determine the probability of success. The influence of the thyroid upon nutrition is available in the treatment of ununited fractures. Allusion must be made to observed facts bearing upon the supplemental secretion of one gland in the deficient action of another. In **akromegaly** it is highly probable the impaired or abolished functions of the pituitary body are taken up by the thyroid gland, and that with the exhaustion of that gland symptoms of myxedema may supervene. To some extent, then, the symptoms of akromegaly may remain in abeyance during the period of exaggerated activity of the thyroid. Further, improvement in some respects has followed the use of thyroid preparations in akromegaly. Whether this supplementary action is reciprocal or not, so far as is known no recorded facts are at hand upon which to base an opinion. Within the boundaries now accurately delineated thyroid preparations have their use, based upon sound physiology and pathology; if their use is improper, the theories in regard to the disease are at fault, and not the facts now well ascertained. See ORGANOTHERAPY; SERUMTHERAPY.

TIBIA.—See LEG.

TIC.—See CONVULSIONS.

TIC DOULOUREUX (Prosopalgia). See NEURALGIA.

TICK.—See BITES AND STINGS.

TICK FEVER.—An obscure tropical disease prevalent in certain districts of Africa transmitted by several varieties of ticks or wood-lice. It is closely similar to, and upon further investigation may be proved identical with relapsing fever

(*q. v.*) due to the spirillum Obermeieri. About a week after the bite the disease is ushered in with prostration, headache, pain in the back and legs, anorexia, vomiting, diarrhea, fever ranging from 101° to 104° F. There may be splenic enlargement. There are several febrile paroxysms of several days' duration occurring about every fortnight.

TIGLIUM.—See Croton Oil.

TINCTURE (Tinctura).—In pharmacy an alcoholic solution of the medicinal principles of a drug, and, excepting the tincture of iodin, of nonvolatile bases. Tinctures are prepared by percolation, maceration, solution or dilution; the menstrua employed being chiefly alcohol, diluted alcohol, and alcohol and water in various proportions. Two ammoniated tinctures are made with aromatic spirit of ammonia, in one acetic acid is an ingredient of the menstruum, and several have glycerin. The official tinctures are now practically in two classes as to strength, 10 percent for the more powerful ones, and 20 percent for the others, with a few exceptions. They number 63, the figures placed after each giving the number of grams to the drug in each 100 c.c. of the tincture: **Tinctura** aconiti 10, **T.** aloes 10, **T.** aloes et myrrhæ 10, **T.** arnicæ 20, **T.** asafetidæ 20, **T.** aurantii amari 20, **T.** aurantii dulcis 50, **T.** belladonnæ foliorum 10, **T.** benzoini 20, **T.** benzoini composita 10, **T.** calendulæ 20, **T.** calumbæ 20, **T.** cannabis indicæ 10, **T.** cantharidis 10, **T.** capsici 10, **T.** cardamomi 10, **T.** cardamomi composita 2 1/2, **T.** cimicifugæ 20, **T.** cinchonæ 20, **T.** cinchonæ composita 10, **T.** cinnamomi 20, **T.** colchici seminis 10, **T.** digitalis 10, **T.** ferri chloridi 13 1/4, **T.** gallæ 20, **T.** gambir composita 50, **T.** gelsemii 10, **T.** gentinæ composita 10, **T.** guaiaci 20, **T.** guaiaci ammoniata 20, **T.** hydrastis 20, **T.** hyoscyami 10, **T.** iodi 7, **T.** ipecacuahnæ et opii 10, **T.** kino 5, **T.** krameriæ 20, **T.** lactucarii 50, **T.** lavandulæ composita 0.8, **T.** limonis corticis 50, **T.** lobeliæ 10, **T.** moschi 5, **T.** myrrhæ 20, **T.** nucis vomicæ 2, **T.** opii 10, **T.** opii camphorata 0.4, **T.** opii deodorati 10, **T.** physostigmatis 10, **T.** pyrethri 20, **T.** quassiæ 20, **T.** quillajæ 20, **T.** rhei 20, **T.** rhei aromatica 20, **T.** sanguinariæ 10, **T.** scillæ 10, **T.** serpentariæ 20, **T.** stramonii 10, **T.** strophanthi 10, **T.** tolutana 20, **T.** valerianæ 20, **T.** valerianæ ammoniata 20, **T.** vanillæ 10, **T.** veratri 10, **T.** zingiberis 20.

For **tinctures of fresh herbs** (*Tincturæ Herbarum Recentium*), the pharmacopeia prescribes a general formula, according to which, when not otherwise directed, they are to be prepared by macerating 50 grams of the fresh herb, bruised or crushed, in 100 c.c. of alcohol, for 14 days, then expressing the liquid and filtering.

TINEA.—See Ringworm.

TINEA VERSICOLOR (Pityriasis Versicolor, Chromophytosis).—A vegetable parasitic disease, due to the microsporon furfur, characterized by furfuraceous, yellowish, macular patches, occurring chiefly upon the trunk.

Symptoms.—The disease begins by the appearance of yellowish macules, from the size of a pin's-head to that of a pea, scattered over the affected region. These, in the course of a few weeks or months, increase in size and coalesce, with the production of large patches. The patches are irregular in shape with sharply defined edges. The color is usually fawn, although it may vary from a pale yellow to a brown; occasionally it has a distinct pinkish tint. The affected area is covered by a fine, furfuraceous, mealy scaling. When this is not apparent, it may be made evident by scratching the surface with the finger-nail.

The eruption is usually confined to the trunk, particularly the chest and interscapular region. The neck, axilla, arm, and in rare cases the face, may also become involved. Itching of a mild character is usually present.

Tinea versicolor pursues a chronic course, lasting, untreated, for months and years. The disease, with rare exceptions, is confined to adults. It is but slightly contagious.

Etiology.—The disease is due to the presence and growth in the skin of the microsporon furfur.

Pathology.—The corneous layer is permeated with a luxuriant growth of mycelium and spores. The mycelium consists of short, jointed, and angular threads, which may be clear or contain spores. The spores are rounded, highly refractive bodies, varying in size from 9/100 to 3/100 of an inch in diameter. In tinea versicolor there is a characteristic tendency of the spores to become aggregated in masses.

Diagnosis.—Tinea versicolor may easily be distinguished from chloasma, vitiligo, and the macular syphiloderm by attention to the character and distribution of the eruption. In doubtful cases the microscope will decide the question.

Prognosis.—The disease responds promptly to treatment. Relapses are not infrequent.

Treatment.—The treatment is rapidly efficient, a few weeks sufficing in most cases to establish a cure.

℞.	Precipitated sulphur,	ʒ j
	Salicylic acid,	gr. xx
	Benzoinated lard,	ʒ j.

Rub in twice a day.

Solutions of hyposulphite of sodium (1 dram to 1 ounce) and bichlorid of mercury (1 to 4 grains to 1 ounce) are easy of application and eminently useful.

It is well to continue the treatment for some time after apparent cure in order to preclude the possibility of relapse.

TINNITUS AURIUM.—The subjective ringing, roaring, or hissing sound heard in the ears in various affections of the tympanum and internal ear, and also after the administration of certain drugs in large doses, notably quinin.

It may be continuous or intermittent, of all characters, and localized in the ear or extending over the cranium. Tinnitus is a frequent symptom of disease of the external, middle, or internal ear. It is usually present when there is undue pressure on the labyrinth. Cerumen on the tympanic membrane, imperfect entrance of air into the tympanum from obstruction of the caliber of the Eustachian tube, or effusion into the tympanic cavity will cause it. It follows blows on the head,

and is a prominent symptom in all nervous affections of the auditory apparatus. An altered condition of the blood-vessels, anemia, cerebral congestion, large doses of quinin, deranged digestion, and diseases of central origin, are causes. It occurs as a prelude to epileptic attacks, syncope, or vertigo, and is not uncommon in the gouty or uric acid diathesis.

Treatment.—Any curable local condition should be treated, and the general health improved. The tinnitus in nervous affections is very intractable. The most useful tonic is strychnin, while quinin exerts a distinctly injurious effect, particularly in large doses. See EAR (Diseases).

TITUBATION.—The staggering gait and incoordination of motion accompanying certain diseases of the spine and cerebellum; also the staggering gait of the drunkard.

TOBACCO (Tabacum).—The dried leaves of *Nicotiana tabacum*, native to America. Its properties are mainly due to an alkaloid, nicotin, $C_{10}H_{14}N_2$, which, next to prussic acid, is the most rapidly fatal poison known. Tobacco is but rarely used in medicine; but it is a powerful depressant, nauseant, emetic, diaphoretic, and antispasmodic; it is also narcotic and sedative, lowering arterial tension. In toxic doses death occurs by paralysis of the respiratory centers. It is used chiefly as an antispasmodic, and is said to be effectual in tetanus. **T. Enema,** 20 grains in 8 ounces of hot water for each enema. **T., Ol.,** obtained by distillation; violently poisonous. **T., Vinum,** 1 ounce to 1 pint. Dose, 5 minims to 1 dram. **Nicotin,** the alkaloid, efficient in tetanus and strychnin poisoning. Dose, 1/20 to 1/10 minim and up to 2 minims in 2 hours. Preparations unof. See LAMBERT TREATMENT for NARCOTIC ADDICTION.

TOE, Amputation.—See FOOT (Amputation).

TOLU.—See BALSAM.

TONGUE, DISEASES.—**Tongue-tie** is due to the tongue being more or less tightly bound down to the floor of the mouth by the shortness of the frenulum. It is likely, when well marked, to interfere with sucking, and later, with distinct speech. It is easily remedied by dividing the frenulum with probe-pointed scissors, care being taken to direct the points downward and backward and merely to notch the free border, lest the ranine artery be wounded—an accident that, in infants, has been attended by severe and, in some cases, fatal hemorrhage. If the division of the frenulum is too free, the tongue may loll backward, pressing the epiglottis over the entrance of the larynx, and produce severe dyspnea or even fatal asphyxia—"swallowing the tongue," as it has been called. On drawing the tongue forward the symptoms will at once cease; but a ligature should be passed through its tip and secured to the cheek, with instructions to again draw the tongue forward with ligature should the symptoms recur.

Macroglossia, or hypertrophy of the tongue, may be congenital or acquired. In either case it is rare.

Causes.—The affection appears to be due to occlusion of the lymphatics at the base of the tongue; at any rate, the lymphatics are found enlarged and distended with lymph, and the connective tissue is increased in amount and infiltrated with lymphoid corpuscles. It appears related, therefore, to elephantiasis—a condition sometimes found coexisting in the neck and other parts of the body.

Symptoms.—The whole tongue is uniformly enlarged, and sometimes so much so that it presses forward the alveolar process of the lower jaw with the incisor teeth, and protrudes from the mouth, hanging as low as the chin. When thus exposed, the mucous membrane becomes cracked, spongy, and bluish-red, and is subject to repeated attacks of subacute glossitis.

The treatment is excision of part of the organ. The removal of a V-shaped piece has been attended by excellent results. It should be done before the teeth and jaw have been deformed by the pressure.

Acute parenchymatous glossitis, or deep inflammation of the tongue, may be due to mercury, fever, iodism, injury, carious teeth, stings of insects, abscesses beneath the jaw; sometimes there is no apparent cause.

Symptoms.—In severe cases the whole tongue is swollen, and protrudes from the mouth, interfering with speech and deglutition, and sometimes threatening suffocation. It frequently ends in abscess. It is often attended with high fever and salivation, and may be quite sudden in its onset.

Treatment.—Should a brisk purge and the milder measures applicable to acute inflammations fail, free longitudinal incisions, which need not be deep, should be made along the dorsum of the tongue, and the swelling will usually subside in a few hours.

Suppuration and abscess sometimes follow an attack of acute glossitis; but the preceding inflammation may be so slight as to be overlooked. The abscess, which then forms a firm, tense, elastic swelling in the substance of the tongue, may be mistaken for a gumma or carcinoma; but the diagnosis is readily made by an exploratory puncture. A free incision is the proper **treatment,** the cavity filling up in a few days.

Chronic superficial glossitis (*leukoplakia buccalis*), also known as psoriasis, or ichthyosis of the tongue, or smokers' patches, is a chronic inflammation of the mucous membrane, and may be induced by syphilis, excessive smoking, some forms of dyspepsia, the abuse of spirits, jagged teeth, etc. It may be found associated with psoriasis. The mercurial treatment of syphilis may be a factor in its etiology. The disease has a marked tendency to become malignant.

Treatment.—All sources of irritation, especially smoking, stimulants, and condiments, should be avoided; antisyphilitic remedies should be given when indicated; gastritis, if present, should be treated; and soothing washes of chlorate of potassium, or sodium bicarbonate (20 grains to the ounce) should be applied. Should any of the leukoplakial patches show signs of ulceration, the whole patch should be excised at once; or should signs of epithelioma already be present, the whole or half of the tongue should be removed.

Simple ulceration may depend on digestive disturbance (*dyspeptic ulcer*) or on irritation, as of a sharp or carious tooth, hot pipe-stem, etc. (*dental or irritable ulcer*). Both varieties are generally superficial, and unattended by the induration and infiltration characteristic of epithelioma. The *dyspeptic ulcer* usually occurs on the dorsum of the tongue near the tip. The ulceration is sometimes extensive and multiple, and is often accompanied by some superficial glossitis at other parts of the tongue. The *dental ulcer* is situated on the side of the tongue, and generally corresponds with a carious or sharp tooth. At first it may be a mere superficial, red abrasion, but if neglected, it becomes a distinct ulcer, irregular in shape, and surrounded by an inflammatory area. The edges are abrupt and a little raised, but not everted; the base is depressed, sloughing, and sometimes phagadenic, but not indurated unless the ulcer has existed some time, when it may become callous. It is always unattended by infiltration.

Treatment.—In the *dyspeptic ulcer* the diet and bowels must be carefully regulated, bismuth or sodium in infusion of calumba given internally, and soothing washes or borax and honey applied locally. Caustics must be avoided. In the *dental ulcer* any offending tooth must be filed, stopped, scraped, or extracted; in short, every source of irritation removed. The ulcer will then heal rapidly, but if neglected, it may become epitheliomatous. On the first appearance of infiltration, therefore, free excision is imperative.

Tubercular ulceration of the tongue is rare, and generally occurs in young adult males, the subjects of phthisis or of general tuberculosis. It usually begins as a small pimple or nodule on the dorsum of the tongue, especially near the tip. This, after a short time, breaks down into round, oval or irregular, painful ulcer. The edges are slightly raised, vertical, inverted, or undermined, sometimes slightly thickened, but never everted or greatly indurated. The base is uneven or nodular, and covered with coarse, pinkish-gray granulations, or with a gray or yellow shredded slough. Sometimes several smaller ulcers appear around the one first formed, and coalesce with it. The ulceration usually progresses in spite of treatment, the patient dying of phthisis or other tubercular affection. The absence of glandular enlargement, of induration, and of signs of syphilis, along with the presence of tubercle elsewhere, and the characters enumerated, should serve to distinguish it from syphilitic and epitheliomatous ulceration.

Treatment has hitherto been of little avail. The ulcer, however, may be soothed by Ferrier's snuff or cocain; or if the constitutional state does not forbid, it may be scraped with a Volkmann's spoon, and dusted with iodoform, cauterized with nitrate of silver, or cut out. The usual constitutional treatment for tubercle should, of course, at the same time be employed.

Syphilitic ulceration may be divided for practical purposes into the superficial and deep, the former commonly occurring in the early, the latter in the later, stages of syphilis.

Treatment.—Large doses of iodid of potassium, combined with quinin, if the constitution is at all broken, and the local application of a cleansing gargle, as chlorate of potassium, will rapidly cause them to heal. The scars left by these ulcers sometimes, though rarely, degenerate into epithelioma. Should any induration, therefore, appear in them, their free removal with the knife should at once be undertaken.

Epitheliomatous ulceration is due to the breaking down of squamous carcinoma. It is described under ulceration instead of among new growths, as, in consequence of the irritation from the teeth and the movements of the tongue, epithelioma in this situation very rapidly ulcerates, even if it does not begin as an ulcer; hence, it is from other ulcers rather than from new growths that it has to be distinguished. It is much more common in men than in women, and seldom occurs under the age of 40. Often it is due to some form of irritation such as that produced by a carious or sharp tooth, or a syphilitic ulcer, or leukoplakia. Occasionally it begins as a wart or pimple in patients in whom no cause for it can be assigned. It is most common on the side of the tongue opposite the molar or bicuspid teeth. The ulcer is irregular, with raised, sinuous, hard, and everted edges, and uneven, excavated, or warty base; while the tissues around are infiltrated and indurated. Its growth is generally rapid, and attended with neuralgic pain and copious salivation. If allowed to take its course, it spreads backward to the pillars of the fauces, downward to the floor of the mouth, and inward to the opposite half of the tongue; while the submaxillary lymphatic glands, and later the lymphatic glands in the neck, become enlarged, and the parts about the angle of the jaw infiltrated and matted together by the disease. Secondary ulcers then form from the breaking down of the glands in the neck, and the patient dies, worn out by pain and irritation, or exhausted by hemorrhage; but, like squamous carcinoma in other parts, it seldom becomes disseminated in distant organs.

Treatment.—Early and free extirpation ought, in every instance, to be undertaken, but even then a recurrence in the glands of the neck is only too frequent. When the disease has attained some magnitude, the propriety of removal becomes a question, and opinions differ as to under what circumstances it ought to be attempted. Its removal is contraindicated: (1) When it has extended so far backward that the finger cannot reach healthy tissue beyond it; (2) when it is firmly and extensively adherent to the jaw; (3) when the tongue is firmly bound down to the floor of the mouth; (4) when the glands not only below the jaw, but deep in the neck, are much implicated; and (5) when the patient is too weak or emaciated from the disease itself, or from disease of other organs, to withstand an operation. Moderate enlargement of the glands, slight adhesion to the jaw, and some infiltration of the floor

of the mouth, do not, it is thought, forbid an operation (especially if the patient is suffering from much pain, and is otherwise in good health), provided the whole of the disease with the enlarged glands can be removed. When the disease is regarded as beyond the reach of extirpation, the pain and salivation may often be relieved by removing not only decayed, but sound, teeth that may be irritating the growth, or by stretching or dividing the gustatory nerve. This, which, however, is sometimes impracticable on account of the extension of the growth, may be done by making a small incision transversely from the last molar tooth through the mucous membrane to the side of the tongue, then passing an aneurysm needle into the wound, and hooking up the nerve, which is here quite superficial. Cocain, or morphin and glycerin, may be painted on the part, while the patient's remaining span of life may be rendered bearable by increasing doses of opium or morphin (Walsham).

Tumors of the Tongue.—*Papillomatous or warty growths* are not uncommon, and may be distinguished from epithelioma, into which they are liable to degenerate as age advances, by the absence of induration about their base. They should be freely removed by the knife or scissors. *Vascular tumors* or *nævi* and *lymphangiomata* are occasionally met with, and may be destroyed by the ligature or knife. *Fibrous, fatty, myxomatous, adenomatous, sarcomatous,* and *carcinomatous tumors* other than the squamous variety, which has already been described under epitheliomatous ulceration, are too rare in the tongue to call for further remark.

Syphilis of the Tongue.—*Primary chancres,* which are very rare in this situation, require no description. *Mucous tubercles* consist, as elsewhere, of heapings up of epithelium over infiltrated and enlarged papillæ, and appear as flattened elevations of a grayish-white color. They are generally present on the palate and fauces at the same time. Mercury internally, and black wash locally, cause them rapidly to disappear. *Superficial glossitis* and the *superficial* and *deep ulcerations* have already been described. *Gumma* occurs as a hard, globular mass in the fibrous tissue of the septum, and also in the substance of the muscles. It may be single or multiple. The mucous membrane covering it is at first natural in appearance, but as the gumma softens, it gives way, and a deep syphilitic ulcer is produced. Iodid of potassium is the remedy.

See Hypoglossal. Nerve.

TONGUE, EXCISION.—Excision with the knife, on account of the profuse hemorrhage that attends it, is only applicable when the anterior portion of the tongue requires removal. The tongue should be well drawn forward, and the diseased portion cut away with one sweep of the knife, and the bleeding vessels tied.

The écraseur is much less used than formerly. The mouth having been widely opened by a gag, two ligatures are passed through the tongue, one on either side of the tip, and the mucous membrane, where it is reflected from the tongue to the jaw, is divided with scissors along with some of the fibers of the geniohyoglossus. The mucous membrane covering the dorsum of the tongue is next divided in the middle line by a bistoury, from the tip as far back as to be well beyond the disease. This allows the tongue to be readily split with the fingers into two halves. The cord of the écraseur is now passed over one-half, and well behind the disease, and, if the whole tongue is to be removed the cord of a second écraseur over the other half. The cord being tightened by screwing up the écraseur, the tongue is cut through. The lingual artery, with the gustatory nerve, is drawn out in the form of a loop by the cord of the écraseur. A ligature should be passed around the artery with an aneurysm needle, and the artery severed in front of the ligature. The anterior part of the tongue will now come away, leaving the ligature on the artery in the stump of the tongue.

Excision with the scissors (Whitehead's method) consists in drawing the tongue well forward by two ligatures through its tip, dividing the frenulum, splitting the tongue as previously described, and then separating the diseased half from its attachments, beginning from below by a series of short snips with blunt-pointed scissors, clamping or tying the lingual artery, if seen, before it is divided, or else immediately after it is cut. The lingual artery lies immediately below the muscle substance about 1/4 inch from the middle line. If the disease involves both sides of the tongue, the opposite half can next be removed in the same way. Should bleeding occur, it can always be arrested temporarily by merely passing the finger into the pharynx and pressing the tongue against the inner surface of the jaw, and then as soon as the mouth has been sponged clear of blood, the bleeding vessel can be seized and tied. Or Lockwood's clamp for compressing the lingual artery may be used during the operation if the surgeon fears severe hemorrhage, the only objection to it being that it is likely to get a little in the operator's way. Some surgeons operate with the patient's head hanging over the end of the table, so that the blood may not run down into the throat. When Hahn's cannula is used, it is often kept in for several days after the operation, for the purpose of excluding septic discharges from the air-passages and so preventing septic pneumonia. The advantages of the scissors over the écraseur are that a cleaner-cut surface is left and consequently that the surgeon can be more certain of having removed the whole of the disease; that less sloughing occurs; and that the operation is more quickly performed. When, however, the tongue is adherent to the floor of the mouth and hence cannot be drawn forward, or the mouth cannot be opened sufficiently wide, or the light is bad, or a reliable assistant is not at hand, removal with the scissors is attended with considerable difficulty, and under these circumstances removal with the écraseur will be found safer (Walsham).

Excision with the galvanocautery is strongly recommended by some surgeons, but is open to the serious objection that it is liable to be followed

by secondary hemorrhage on the separation of the sloughs.

Kocher's Operation.—A preliminary tracheotomy is performed, and an ordinary cannula inserted. Entry of blood is prevented by plugging the pharynx with a sponge soaked in carbolic acid. The incision runs along the anterior border of the sternomastoid from the ear down to nearly the middle of the muscle; from this it turns forward to the hyoid bone and along the anterior border of the diagastric to the symphysis. A flap, containing skin, platysma, and fascia, is reflected upward; the facial artery and vein are tied; the lingual artery is secured on the hyoglossus; and the submaxillary fossa is completely cleared out, beginning from behind. All the cellular tissue is removed, together with the lymphatic glands, and the submaxillary and sublingual glands are removed if they appear involved. The mylohyoid muscle is then separated, the mucous membrane divided, and the tongue drawn through the opening. If the whole thickness is removed, the opposite lingual must be tied as well.

Preliminary Treatment.—Before commencing the operation, the mouth and the nasal cavities are thoroughly washed out with a solution of bichlorid of mercury (1:2000); and after it is finished and the wound adjusted with sutures, the surface of the stump and the pharynx behind it are covered over completely with a sponge soaked with carbolic acid. The dressings are changed twice a day, advantage being taken of the opportunity to pass an esophageal tube and feed the patient; for the rest, nutrient enemata are used. The operation is undoubtedly more extensive than the others, but it is believed that this is amply compensated for by the thoroughness with which the whole of the affected tissue is removed and the way in which the risk of septic inflammation and pulmonary complications is avoided. Kocher himself has been very successful as regards immediate mortality, but the operation does not seem to have been performed by other surgeons to any great extent.

The after-treatment of these cases requires even more than ordinary care. Every endeavor must be used to prevent putrefaction, which, owing to the temperature, moisture, and alkaline reaction, is very prone to follow; the patient's strength must be husbanded and maintained in every way; and precautions taken to prevent food or the discharge from the wound entering the lungs. With this in view, Kocher fills the entire cavity, from the edge of the wound back into the mouth and pharynx, with a sponge soaked in carbolic acid solution, shutting off the nasopharyngeal cavity on the one hand and the larynx and pharynx on the other. The same object may, however, be achieved much more satisfactorily by means of a plan recommended by Barker: The whole wound is carefully cleansed, dried, and dusted with iodoform, and the two ends of the incision sutured. In the middle a piece of rubber tubing is adjusted, is long enough to reach well down into the esophagus; and all the space around carefully packed with antiseptic wool. This can be left untouched for days, the patient being easily fed by means of a funnel as often as it may be required.

TONGUE IN DIAGNOSIS.—The tongue is a general index of disease, whether its condition is a local manifestation of a constitutional disturbance or whether the process is limited. The coated tongue of certain gastric disorders, the reddened tongue of fever, the strawberry tongue of scarlatina, the brown coating and fissuring of the typhoid tongue, the hypertrophic and thickened tongue of myxedema and akromegaly, and the pigmented tongue of suprarenal disease are all characteristic. Herpes febrilis, mucous patches, aphthous stomatitis, and thrush often have their starting-point in this organ.

The elongated and pointed tongue indicates a condition of irritation and determination of blood to the stomach and bowels. The full tongue, broad and thick, is evidence of atony, want of action in the digestive tract. The dry, pinched tongue expresses a want of functional activity in the digestive organs. It is the tongue of acute disease, and is usually associated with dryness. The fissured tongue in chronic disease indicates inflammatory action of the kidneys. The fissured tongue in advanced stages of acute disease is significant of lesions of the kidneys or irritation of the nerve-centers. In many cases there is a defect in the secretion of urine.

Dryness and moisture are important evidences of the condition of the digestive organs. If the tongue is dry, the stomach and intestines are disordered. In acute disease with dryness of the tongue, when it becomes moist, improvement is indicated, and it is nearly always looked upon as a favorable symptom.

The thin, transparent coating of the tongue gives evidence of enfeebled digestion, frequently from intemperate eating and drinking. A tongue coated heavily at the base calls attention to accumulations in the stomach, and suggests the use of an emetic. The broad pallid tongue gives evidence of a want of the alkaline elements of the blood. It may be the basis of the disease, which will fade away as soon as the proper alkali is given, or it may be but a portion, the alkaline salt preparing the way and facilitating the action of other remedies. The deep red tongue, generally dry, indicates an acid.

TONICS.—Medicine or agents that promote nutrition, and give tone to the system. The most typical agents are strychnin, quinin, iron, and the vegetable bitters. Those especially acting on the stomach are arsenic, bismuth, cinchona, hydrastis, and nux vomica; on the spinal cord and general circulation, strychnin; on the heart, digitalis, squill, convallarin, and cimicifuga; on the general nervous system, phosphorus, quinin, and the valerates; on muscular tissue, tannin; on the blood, iron, manganese, cod-liver oil, and other fats.

In administering tonics care is required to see that the tonic is suitable to the case; for in apparent debility and imperfect functional activity, imperfect removal of tissue or other waste is responsible. Not tonics, but cholagogs, purgatives, etc., are then indicated. Tonics are em-

ployed in debility of the whole or part of the body; the character of the medicinal agent depends upon the part affected.

General tonic prescriptions:

℞. Quinin sulphate, gr. xx
Dried iron sulphate, gr. xl
Strychnin sulphate, gr. ss.
Divide into 20 pills. Give 1 pill 3 times a day.

℞. Tincture of iron chlorid, Dilute phosphoric acid, each, ʒ ss
Simple syrup, add enough to make ʒ iij.
A teaspoonful 3 times a day.

℞. Arsenic trioxid, gr. j
Strychnin sulphate, gr. 1/3
Quinin sulphate, ʒ j.
Divide into 20 pills. One pill after each meal.

℞. Iron sulphate, gr. xij
Magnesium sulphate, ʒ vj
Dilute sulphuric acid, ʒ j
Infusion of quassia, ʒ vj.
Tablespoonful in water 3 times a day.

℞. Solution of potassium arsenite, ♏ x
Fluidextract of nux vomica, ♏ xx
Compound tincture of gentian, Tincture of cinchona, Tincture of calumba, Wine of kola, each, ʒ iv.
A tablespoonful after each meal.

℞. Tincture of nux vomica, ʒ ij
Tincture of cinchona enough to make, ʒ iv.
A teaspoonful after each meal.

In atonic dyspepsia:

℞. Dilute nitrohydrochloric acid, ʒ vj
Solution of strychnin, ʒ jss
Tincture of orange, Tincture of calumba, each, ʒ j
Compound infusion of gentian, add enough to make ʒ x.
Tablespoonful in a wineglassful of water 3 times daily, after eating.

Or:

℞. Strychnin sulphate, gr. j
Dilute nitrohydrochloric acid, ʒ j
Compound tincture of gentian, ʒ j
Compound tincture of cardamom, ʒ ij
Solution of pepsin, add enough to make ʒ iv.
A teaspoonful after each meal.

TONSILLITIS (Amygdalitis). Varieties.—(1) acute; (2) chronic; (3) phlegmonous (quinsy, tonsillar abscess).

Etiology.—(1) It most often occurs during youth or adolescence; (2) exposure to the cold and wet; (3) heredity; (4) certain diseases, such as lithemia, rheumatic diathesis; (5) changeable climate.

Pathology.—In the first stage, superficial, of acute tonsillitis the catarrhal inflammatory process is principally confined to the mucous membrane of the tonsil, which is covered with a viscid secretion. The epithelium desquamates rapidly. The organ is enlarged from congestion of the blood-vessels. In the second stage, lacunar or follicular, the epithelium collects in the crypts, and undergoes necrosis, forming small, whitish, offensive, cheesy masses, which obstruct the secretion of the gland. In the last stage, parenchymatous, a phlegmon may form constituting circumtonsillar abscess or quinsy.

Symptoms and Clinical Course. Acute follicular Tonsillitis.—The onset is generally marked by chilliness or a general body ache. The temperature may rise suddenly—often to 104° F.—within the first 24 hours. The region of the affected part is dry, hot, and gives rise to severe pain on swallowing or on opening the mouth. The tonsils are enlarged, and may be felt externally. The surface is usually covered with a thick whitish mucus, often offensive. The tongue is heavily coated; urine high colored, scanty, and contains excess of urates. In the follicular stage the glands are red and swollen, and in the crypts are seen the small, whitish, cheesy plugs, which are the remains of degenerated epithelium. They may often be brushed away in making local applications, leaving small depressions in the glandular substance. In many cases they become detached, and are cast off with the expectoration.

Chronic Tonsillitis.—The lacunæ of the tonsil are filled with debris which impart a fetid odor to the breath. From time to time these cheesy masses are expectorated. The quality of the voice may be altered. There is a more or less constant cough. The tonsils may be slightly or markedly enlarged.

Phlegmonous Tonsillitis (Quinsy).—The affected organ is very painful and greatly distended by the purulent collection, which may be throbbing in character. The jaws are stiff, and the mouth cannot be opened. Often the pain is diffused over the whole angle of the jaw. The jaws may be edematous, and fluctuation may be obtained on palpation of the parts.

Deglutition is painful, and often entirely lost; the voice becomes hoarse, and has a nasal character; saliva is greatly increased. The fever is higher, as a rule, and the suffering more intense than in the other varieties of tonsillitis.

Diagnosis.—

Tonsillitis.	Diphtheria.	Scarlet Fever.
1. History of exposure to cold and wet; rheumatic diathesis, or history of previous attack.	1. History of contagion.	1. History of contagion.

Tonsillitis.	Diphtheria.	Scarlet Fever.
2. Onset sudden; high fever rising rapidly.	2. Onset gradual. Urine quickly showing albumin and casts.	2. Onset sudden; strawberry tongue; scarlet red rash; pulse rapid, out of proportion to temperature; convulsions frequent.
3. Severe pain in region of tonsil on opening the mouth; moderate prostration.	3. General body pain as well as pain in angle of jaws; severe cough or bronchitis may be present; prostration severe.	3. Prostration severe.
4. Absence of membrane in all forms; small cheesy lumps in the crypts of gland in follicular tonsillitis.	4. Grayish-white membrane, and on being pulled off leaves behind a bleeding surface; membrane contains Klebs-Loeffler bacilli.	4. False membrane may be present, but absence of Klebs-Loeffler bacilli.
5. No sequels; symptoms subside quickly.	5. Paralysis of nerves of pharynx or eye common.	5. Tendency to nephritis.

Prognosis is favorable, except in the phlegmonous form, which may involve the deeper tissues, and extend downward behind the carotid sheath, causing death.

Treatment of Acute Follicular Tonsillitis.—In the majority of cases it is well to begin the treatment by the administration of calomel in fractional doses, or saline purgatives. Should there be a rheumatic diathesis, sodium salicylate, or preferably aspirin, 7 grains every 3 or 4 hours, should be given. If temperature is high (102.5° F.), phenacetin, 5 grains every 4 hours, and quinin, 4 grains, may be given from the onset of the symptoms.

℞. Tincture of aconite, ♏ xl
Elixir curacoa, ʒ iij
Solution of potassium citrate, add enough to make ℥ iij.
Tablespoonful every 3 or 4 hours.

Guaiac may be given in the form of the compound tincture, 1 dram with milk every 4 hours, or may be used as a gargle. It may also be administered in the form of a lozenge:

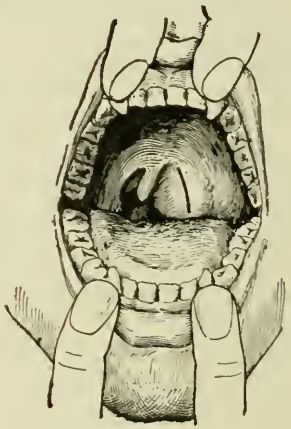
℞. Guaiac, ʒ v
Oil of lemon, ♏ x
Oil of peppermint, ♏ iv
Acacia, ʒ ss
Sugar, ʒ jss.
Confection of rose, add enough to make 30 lozenges.
Allow 1 to dissolve in the mouth every 3 or 4 hours.

Local Treatment.—Small pellets of ice may be allowed to dissolve in the mouth to relieve the inflammation. If the application of cold is disagreeable, hot compresses may be substituted. Occasionally, spraying through the anterior nares with an alkaline solution (see Pharyngitis) will prevent mouth-breathing, and relieve the catarrhal process often present in these parts.

Local applications of nuclein solution (5 percent) twice daily, and also internally in doses of 1 teaspoonful every 4 hours, are valuable. Bicarbonate of sodium or aspirin applied locally may afford marked relief.

Treatment of Chronic Tonsillitis.—If the tonsils are not enlarged the crypts should be emptied by the curette and obliterated by some caustic such as silver nitrate or preferably by the galvanocautery. If the tonsil is enlarged it should be removed with the snare or guillotine. If this is not permitted, daily gargling with antiseptic solutions should be insisted upon and applications of strong tincture of iodin or trichloracetic acid should be made to the crypts. Daily cold bathing especially of the neck, is excellent. It is important to pay attention to the general health in regard to food, exercise, clothing, and tonics.

Treatment of Phlegmonous Tonsillitis.—Hot applications should be applied to the angles of the jaw; at the earliest possible moment, the abscess should be opened with a sharp pointed (but guarded) tenotome, the incision being parallel with the anterior pillar of the fauces, and directed toward the middle line. In all cases the diet should be light and nutritious.



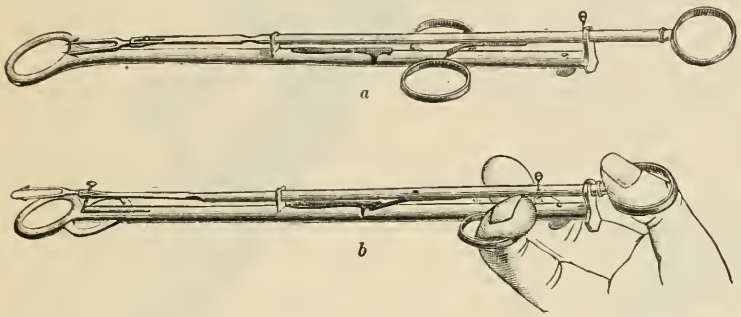
Line of Incision in Quinsy.—(*Veau.*)

TONSILS, HYPERTROPHY.—Chronic enlargement of the tonsils is very common in strumous children, in whom it is frequently associated with adenoid growths in the vault of the pharynx. At times it appears due to oft-repeated attacks of acute tonsillitis.

The symptoms to which it may give rise are a nasal tone of voice; a peculiar vacant expression, acquired by the child constantly breathing with the mouth half open; regurgitation of fluids through the nose; snoring during sleep; distressing dreams, from the imperfect aeration of the blood; and recurring attacks of acute or subacute tonsillitis; deafness from implication of the eustachian tube and middle ear in chronic inflammation, may sometimes be nduced, and even an alteration in the shape of the

chest, and possibly phthisis. The tonsils appear irregularly enlarged, often almost occluding the fauces, but, unless inflamed, are of a natural color, or perhaps slightly paler than natural.

Treatment.—In young children the affection may be cured by persistent painting with the tincture of perchlorid of iron or tincture of iodin, combined with the internal use of cod-liver oil and syrup of the phosphate or the iodid of iron. In older children, or when the tonsils are much enlarged, they should be excised, either with the knife or, better, with the guillotine, and this should be done before the voice has become seriously affected or other disturbance has ensued. The hemorrhage attending the operation, though usually slight, has at times been alarming. Gargling with cold water will generally stop it; but if this fails, ice or astringents, as tannic acid, or pressure with a pencil guarded with lint will nearly always succeed. Should a bleeding vessel be seen, it should be tied or twisted. In exceptional cases the common carotid has had to be tied. Should adenoid growths be present, they should be removed at the same time as the tonsils. See ADENOID VEGETATIONS, PHARYNGITIS, RHINITIS.



TONSILLOTOME.—(*Zuckerkandl.*)

TOOTHACHE.—This is a symptom of caries, periostitis, exostosis, inflamed pulp, or neuralgia, and ultimately the patient should be sent to a dentist. Temporary treatment, however, is often demanded. If there is a cavity, it should be carefully cleansed with warm water and plugged with a pledget of absorbent cotton soaked in creosote, phenol, chloroform, oil of cloves, cocain, or other local anesthetic. A mixture such as the following may be used:

℞. Cocain hydrochlorid, gr. iij
Carbolic acid, ʒ j
Collodion, ʒ j.

A small quantity to be applied to the dried-out cavity upon an absorbent-cotton plug.

Coley states that of all medicinal remedies for toothache none is so successful as sodium salicylate. He believes it is especially useful in those cases when the pain is started by "taking cold." A dose of 15 grains will usually relieve the pain very promptly, and if this is repeated every 4 hours, the inflammation may entirely subside, leaving, of course, a carious tooth to be disposed of according to circumstances. The addition of belladonna is often advantageous Fifteen grains of sodium salicylate with 10 minims of tincture of belladonna, will often procure refreshing sleep instead of a night of agony. It is especially valuable with children, when extraction of teeth is to be avoided, if possible, lest the development of the maxilla should be injured. See DENTAL ANODYNES; DENTITION (Disorders); TEETH, etc.

TORMINA.—Griping pains in the abdomen. See COLIC, DYSENTERY.

TORTICOLLIS (Wry-neck).—An affection due to irregular contraction of the muscles, twisting the head. The sternomastoid is the muscle usually at fault—sometimes the only one—but the others and the cervical fascia often aggravate the evil. It may be primary, caused by disease of the muscle itself (this is usually distinguished as the congenital variety); or secondary, arising from inflammation of some of the structures near the joints, vertebræ, lymphatic glands, etc., or from a disordered condition of the nerve.

Congenital torticollis is rarely noticed until some time after birth. This arises partly from the shortness of an infant's neck, partly from the fact that the deformity itself is not nearly so well marked at this time of life as it is later. Its origin is uncertain. Probably it is due to partial rupture of the muscle at the time of parturition; at least a tender, ovoid mass is not infrequently found, shortly after birth, in the sternal head of the sternomastoid, just where the tendinous and muscular fibers meet; and in several cases wry-neck is known to have been present later in life. The back of the head is drawn down; the chin is directed toward the opposite side, so that the face looks somewhat upward, and the muscle itself stands out like a tense cord, with a hollow in front and behind. The sternal portion is usually the chief offender, and in severe cases the mastoid process may be dragged down so far as to lie immediately over and scarcely an inch from the sternoclavicular articulation. As a result, the cervical vertebræ become twisted and deformed; secondary curves make their appearance in the back; the under side of the face does not grow in proportion to the rest; the line of the eyes becomes oblique; and, if the condition is not remedied before puberty, even the breast fails in its development.

Treatment of Congenital Torticollis.—Unless the patient is treated by position while still an infant, division of the sternomastoid is generally required, followed by a course of systematic exercises in the milder cases, and the use of a supporting brace in the most severe. The sternomastoid is best divided immediately above the clavicle, as here it is furthest removed from the important structures that lie beneath it. A puncture should be made at the inner side of the tendon, a director passed behind

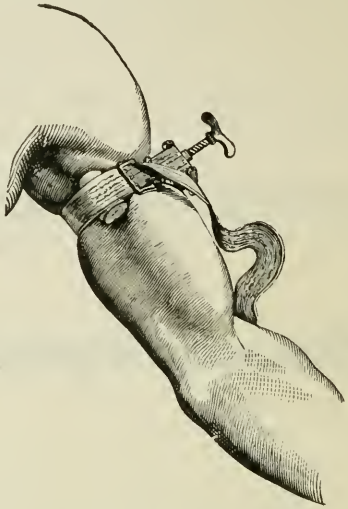
it, and the division made toward the skin with a blunt-pointed tenotome. The tense bands of contracted cervical fascia that now start forward will yield to stretching; it is not safe to divide them. The head should be straightened, and held thus by a bandage and sand-bags. The puncture should be allowed 3 or 4 days to heal before the exercises are begun or the instrument is applied. Some advise the division of the muscle about the middle, believing that this is a more safe procedure; while others again recommend the division of the tendon by open incision, as in this way the danger of puncturing and admitting air into a vein is avoided. If the subcutaneous division, however, is carefully done in the manner here advised, there need be no fear of air entering the veins; sudden death has, however, occurred at the hands of some excellent surgeons, and others have met with alarming symptoms.

Acquired torticollis may be due to rheumatism or exposure to cold, or it may be symptomatic of inflammation of the lymphatic glands, the vertebræ, or other structures of the neck, the muscles (for in this case the splenius and others are in a state of tonic spasm as well) contracting to save the affected part. In many of these cases the diagnosis of the exciting cause is exceedingly difficult, and very great care is required, as cervical caries is by no means uncommon. Tonic torticollis of this character may always be distinguished from the congenital variety by its relaxing completely under an anesthetic, and by the absence of any shortening of the cervical fascia.

Treatment of Acquired Torticollis.—In spasmodic cases conium, Indian hemp, bromid of potassium, etc., may be tried. These failing, the spinal accessory nerve may be stretched just above the spot where it enters the sternomastoid. In very intractable cases a piece of the nerve may be excised, and if the posterior cervical muscles are also involved in the spasm, excision of portions of the posterior division of the first 4 cervical nerves may be simultaneously or subsequently undertaken. Tenotomy of the sternomastoid should in these and in hysteric cases on no account be performed.

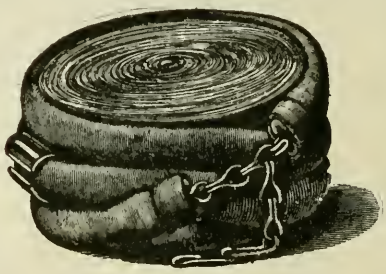
TOUCH.—See SENSATION (Disorders).

TOURNIQUET.—An instrument for controlling the circulation by means of compression. It usually consists of 2 metallic plates united by a thumb-screw and a strap provided with a pad. The strap is fastened about the part, the pad being placed over the artery to be occluded. The screw is placed diametrically opposite the pad, and the strap is tightened by separating the metallic plates of the screw. Dupuytren's tourniquet is one for compressing the abdominal aorta, consisting of a semicircle of metal with a pad at one extremity. Esmarch's tourniquet consists of a stout, elastic-rubber band applied above the proximal turn of an elastic bandage passing around the part to be exsanguinated. It has several disadvantages: It may cause paralysis; it encourages sloughing, especially if used to check primary hemorrhage before amputation; oozing following its removal is often very great; it is intensely painful. It is better to apply an Esmarch bandage first. Petit's tourniquet is used chiefly for the groin and the arm below the axilla. Its pad, or a roller about 1 1/2 inches in thickness, is placed upon the main vessel, the band buckled closely to the limb, and the screw



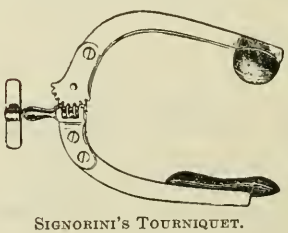
PETIT'S TOURNIQUET.

turned so quickly as to compress the artery as soon as the veins and thus avoid passive congestion. To prevent the skin being dragged, a bandage around the limb is advantageous. Signorini's



ESMARCH BAND.

tourniquet has a pad at each end (one for pressure, the other for resistance), and is operated by a screw and ratchet in the middle so that the arc can be opened or closed at will. It is chiefly for use upon the femoral artery in the groin, the larger pad being placed beneath the tuberosity of the ischium. Lister's tourniquet is of large size, and intended for use on the abdominal aorta. It is to be placed on the patient's right side, so that the vessel does not slip off the fourth lumbar vertebra, is to be screwed up only at the last moment, and then only with enough force to interrupt the circulation.



SIGNORINI'S TOURNIQUET.

In emergency a tourniquet can be devised from a handkerchief tied around a limb and twisted tightly. A stone or block or pad may be placed inside and on the bleeding point.

TOWNS' TREATMENT.—See LAMBERT TREATMENT for NARCOTIC ADDICTION.

TOXALBUMIN.—A proteid substance resembling a ferment rather than a poison. Any of the poisonous albuminoids that are produced or separated from the albumin of the tissues by the agency of bacteria, and entering the circulation constitute the cause of the general symptoms of infectious diseases. Toxalbumins have been obtained from cultures of a number of bacteria—among others from those of diphtheria, typhoid fever, cholera, tetanus, glanders, tuberculosis, anthrax, and pneumonia; likewise, also, from cultures of the staphylococcus pyogenes aureus, and the swine-plague bacillus; from those of certain germs found by Booker in the stools of the summer diarrhea of infants, and from those of two toxicogenic germs isolated by Vaughan from drinking-water. It is possible that poisonous albuminous substances are also produced by animal parasitic organisms. Thus Viron has isolated a toxic proteid from the fluid of hydatid cysts.

TOXEMIA.—See AUTOINTOXICATION, GASTRITIS (Toxic), POISONING.

TOXICOLOGY.—See POISONING.

TOXINS.—See SERUM THERAPY AND VACCINE THERAPY.

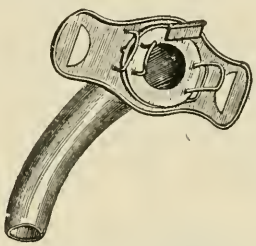
TRACHEA, INJURIES.—See NECK (Injuries).

TRACHELORRHAPHY.—See CERVIX UTERI (Laceration).

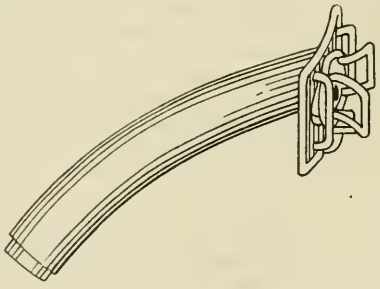
TRACHEOTOMY.—Tracheotomy is frequently required. It may be performed for the relief of obstruction, whether it is temporary (as in croup, diphtheria, edema of the glottis, or muscular spasm) or permanent (as in syphilitic stenosis); for the removal of foreign bodies; to give rest to the larynx in cases of painful ulceration; or as a precaution in operation in order to prevent the entry of blood.

The trachea may be opened either above or below the isthmus of the thyroid; but, unless there is some special indication to the contrary, the former should always be selected. The anterior jugular and inferior thyroid veins are in close relation with the lower part. The innominate artery bifurcates almost on it, and sometimes reaches far up into the neck. The thyroidea ima may cross it. It lies very much further from the surface and is much more easily displaced to one side. In infants, too, the thymus may cause a certain amount of difficulty.

The high operation, the only one that will be described here, may be done either with or without an anesthetic. Chloroform should, as a rule, be given to children, as otherwise their struggles are likely to embarrass the operator. In adults, however, it is not necessary as after the skin incision has been made no pain is felt, and chloroform is liable to increase the dyspnea, if present, to a dangerous extent, and necessitates the operation being rapidly performed; whereas the more deliberately it can be done, the less are the risks attending it. A small pillow having been placed beneath the neck as so to render it prominent, make an incision from the cricoid cartilage, exactly in the middle line, for from 1 1/2 to 2 inches downward, according to the age of the patient, fatness of the neck, etc. Divide the skin and superficial fascia, and, having found the interval between the sternohyoid muscles, continue the incision between them, carefully avoiding any large veins. The isthmus of the thyroid will now be seen in the lower part of the wound as a bluish-red body, and if sufficient room does not exist between it and the cricoid cartilage, draw it down gently with a blunt hook; or if this cannot be done readily, notch it in the middle line or divide it. The drawing downward of the isthmus is greatly facilitated by dividing transversely on the cricoid the layer of fascia, which extends from the cricoid cartilage to the isthmus. By doing this, moreover, the wounding of the veins between the layers of fascia will be avoided. The first 2 or 3 rings of the trachea having now been fully exposed, and all arterial hemorrhage arrested by ligature or pressure forceps, thrust the sharp hook into the trachea immediately below the cricoid cartilage, and, steadying it in this way, divide the first 2 or 3 rings by thrusting in the knife with the back of the blade directed downward and by cutting toward the cricoid. Venous hemorrhage, except from a large vein, which, of course, should be tied or clamped, need not delay the opening of the trachea, as it depends on engorgement of the right side of the heart, and will disappear after 2 or 3 inspirations through the tracheal wound. The wound in the trachea being held open by the tracheal dilator, pass the outer tube, made wedge-shaped by pressing it between the finger and thumb, into the trachea, and then immediately insert the inner cannula, as until this is done air cannot pass freely through the tube. Secure the tube *in situ* by tracheotomy tapes tied behind the neck. When the operation is performed for croup or diphtheria, the tube should not, as a rule be inserted at once, but the wound held open by



TRACHEOTOMY TUBE.



PARKER'S TRACHEOTOMY CANNULA.

the dilator, and any false membrane removed by a feather passed both down into the trachea and up into the larynx, or if this does not succeed, by a Parker's suction-tube apparatus. The bivalve cannula in general use is likely, on account of its shape, to produce ulceration of the anterior wall of the trachea, on which, from its curve, it must necessarily impinge; it has even been known to perforate the wall and to enter the innominate artery. This can be prevented by the improved shaped cannula invented by Parker. Should the breathing cease during the operation, the trachea should still be opened, the obstructing membranes removed, and artificial respiration persevered in for some time.

Dangers and Difficulties of the Operation.—When the operation can be done deliberately, and on a patient with a thin neck, it is attended with no great difficulty; but when, as is frequently the case, it must be undertaken in an emergency, possibly with insufficient light and with no skilled assistant at hand, or on a young child or infant with a fat neck, and must be completed rapidly to prevent death from suffocation, it is perhaps one of the most trying that the surgeon is called upon to perform. The dangers into which the inexperienced and unwary may then fall are the following.

1. *The hyoid bone or the thyroid cartilage* may be mistaken for the cricoid cartilage, and the incision made through the thyrohyoid membrane or into the thyroid cartilage. This mistake could hardly occur except in a fat-necked child, and then only through carelessness in not determining the position of the cricoid cartilage before beginning the operation.

2. *The interval between the sternohyoid muscle may be missed,* and the dissection carried to one or other side of the trachea. The thyroid body and even the carotid artery has in this way been wounded. To avoid such a disaster the head should be held perfectly straight and the incision made accurately in the middle line; one side of the wound should not be retracted more than the other; and the index-finger should be used from time to time to make sure that the dissection is being made over the trachea.

3. *Too short an incision may be made,* and consequently be a source of embarrassment in drawing down the thyroid isthmus, and in defining the trachea before it is opened. The incision should never be less than 1 1/2 inches long, even in a child.

4. *One or more large veins may be wounded,* and the steps of the operation be considerably impeded by hemorrhage. Their walls are very thin; great care, therefore, is necessary to avoid injuring them.

5. *The knife may perforate the posterior wall of the trachea* and enter the esophagus. Caution, therefore, is necessary, and some advise that the knife should be held, while incising the trachea, with the forefinger placed on one side, 1/2 of an inch from its point, so that it cannot penetrate too deeply.

6. *The knife may slip to one side* instead of entering the trachea. This can hardly happen if the trachea is fixed by the sharp hook and drawn well forward into the wound while being perforated.

7. *The innominate vein and even the innominate artery have been wounded* in incising the trachea during the performance of the low operation. The knife, therefore, should be introduced with the back of the blade toward the sternum, and the incision made from below upward.

8. *Blood may enter the trachea,* and if allowed to remain there, will coagulate, and the clots being drawn into the bronchi and acting as plugs may cause suffocation. This danger should be guarded against by tying all bleeding vessels, and thoroughly exposing the trachea before incising it, lest there should be a vessel in front of it. Should only a little blood enter the trachea, it can be coughed up; but if the amount is large, the patient should be turned on his side, and the head depressed, the wound of course being held open by retractors, to allow the blood to run out; or if this does not suffice, an attempt must be made to remove it by suction. When there is a general oozing of blood from the wound, the introduction of the tube will prevent more escaping into the trachea.

9. *The tracheotomy tube may be forced between the fascia and the front wall of the trachea; or one valve of the tube may be passed inside the trachea and the other outside.* To escape these accidents, the incision in the trachea should be free, and its edges well retracted, or one edge may be held up by a sharp hook. To insure both valves entering the trachea, they should be pressed well together; this may be conveniently done by Sankey's forceps.

10. *The tube, when a membrane is present, may be passed between the tracheal wall and the false membrane,* a danger that may be guarded against by removing the membrane before introducing the tube.

11. *The tube has been passed upward into the larynx instead of downward into the trachea.* No excuse and, it is to be feared, no remedy is to be found for such gross ignorance (Walsham).

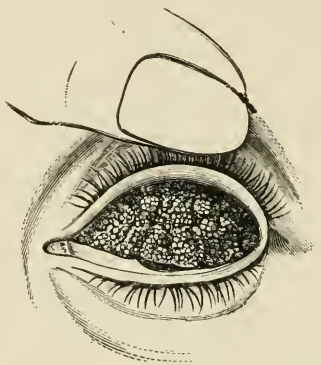
After-treatment.—In the simplest case—chronic laryngeal stenosis, for instance, in which there is no pulmonary complication—all that is needed, provided the tube fits, is something to warm and moisten the air before it enters the lungs, and a dry absorbent dressing around the orifice to diminish the amount of discharge and lessen the risk of bronchopneumonia and cellulitis. The patient should be kept as quiet as possible in a semirecumbent position, and well protected from drafts. A bronchitis kettle may be used, but it is better, for a time, at least, to protect the orifice with a thin, flat sponge, wrung out of hot water, so as to filter the air thoroughly. The wound should be powdered with iodoform, and the flanges of the cannula prevented from pressing upon it by little pads of absorbent wool. The frequency with which the tube requires changing depends upon the amount of irritation it causes; a rubber one can often be introduced on a proper dilator by a second

day. In cases such as these there is very little of that tenacious mucus that is so troublesome in croup or diphtheria. For the first few days the patient should be fed through the rectum; the movements of the trachea in swallowing are very painful (cocain sprayed over the wound prevents this to some extent), and there is great risk of fluid trickling down the larynx and passing by the side of the tube into the lungs. This may happen even after the cannula has been removed, if the larynx has not thoroughly recovered; but usually there is no danger after the wound has healed and the patient has grown accustomed to the change of respiration and learned how to cough. If the rectum becomes irritable or thirst is distressing, an esophageal tube should be used instead. Tracheotomy tubes, if worn permanently, should be frequently changed and carefully inspected from time to time. Their duration of life varies very much, and instances have been known of their breaking and of the end falling down into the bronchi. It is always well to protect the orifice with a suitable respirator.

In diphtheria the after-treatment requires even greater care. The air must be warmed and moistened, and the cot surrounded by screens, but the top should be left open. The tube must be kept clean by means of feathers dipped in a solution of bicarbonate of sodium or potassium, and if there is any membrane discovered floating in the trachea or larynx, it must be cleared away in the same manner. Parker recommends that the solution should be sprayed from time to time over the wound to prevent the viscid mucus collecting and drying around the orifice. The frequency with which the inner cannula requires changing depends upon the success with which this is carried out. At first it may need it almost every hour, but it must be remembered that the process is an exhausting one, and, for a time, very alarming to a child, so that every endeavor must be made to keep the passage free without. Each cannula should have a double set of inner tubes, so that when one is removed and a feather has been passed down the outer to make sure it is clear, the second can be introduced without delay. The outer need only be removed once a day. To clear them they should be placed in a hot solution of soda, and well scrubbed. The time the tube should be retained depends upon the course of the disease; but, in any case, the metal cannula should be replaced as soon as possible by a rubber one (it can usually be done by the third or fourth day), and this should not be worn longer than is absolutely necessary. Before discarding it an attempt must be made to educate the larynx again, and to reduce the amount of air passing through the tube, by using one that is perforated on the convexity or very much shortened. The child, of course, must be watched night and day by some one who can use dilating forceps and replace the cannula at once if there is any real danger.

Prognosis.—Care must be taken to distinguish between the consequences of the operation and those of the disease for which it is performed. Much depends upon the age of the patient; in an infant it is always serious, the structures involved are so small and delicate, and there is such great risk of pulmonary complications, independently of croup or diphtheria. If the lungs are already collapsed and partially consolidated, if the patient is exhausted by prolonged battling against imminent asphyxia, or if he is dying from the diphtheritic poison, the operation can do no good, and tracheotomy must not be blamed for the result, for it may hasten the end. If it is to be of any real service, or if the wound is to be used not merely to relieve a symptom but to attack the disease by removing false membrane and giving the patient pure air—not that which has been befouled by passing over a poisoned surface—it must be performed while there is still a reasonable hope. See LARYNGOTOMY.

TRACHOMA (Granular Lids).—A disease of the conjunctiva, characterized by the unrestricted formation of follicles which, instead of being absorbed as in follicular conjunctivitis, produce permanent granular masses, spreading over the surface of the entire lid, and presenting, in extreme



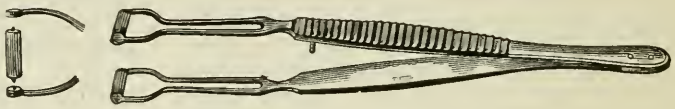
TRACHOMA.

cases, the characteristic appearance of a bunch of grapes of a deep red color. The upper lid is generally first affected. When the follicles are abundant, the conjunctiva is destroyed. Ulceration takes place, and the necrosed membrane is replaced by scar tissue. The disease is chronic, and progresses many years, new nodules forming while others are ulcerating and cicatrizing. The bulbar conjunctiva is not usually involved.

Course.—The disease begins with conjunctivitis, followed by follicular formation and growth of vascular tissue over the cornea, due to friction of the roughened lid, causing keratitis and consequent corneal opacity. The upper third of the cornea is most affected, and there is a distinct line of demarcation between the healthy cornea and the vascular tissue, which never entirely disappears. This condition is called **pannus**, and is fully considered under diseases of the cornea. The second stage of trachoma is ulceration of the follicles. The secretion, until now slight, becomes mucopurulent, and the follicles, instead of being distinct, have a ragged appearance, and are ulcerated. The entire conjunctiva is congested, and the lashes are matted together with the secretion. After

some months the disease passes into the third stage—**cicatrization.** The granulations have now disappeared, there is little secretion, and the conjunctiva is no longer actively inflamed and rough, but is dry and dirty-white, thickened, and rolled into fine folds. This atrophic condition is called **parenchymatous xerosis.** The entire lid is now shorter from above downward, so that the lids when closed gape to a slight degree, and are turned in. The lashes are sparse and irregular, and trichiasis results. Running parallel to the under surface of the upper lid and 2 mm. from it a thick scar is sometimes seen.

The subjective symptoms in the first stage are pain, itching and burning of the lids, lacrimation, photophobia, and asthenopia. Later on there is dimness of vision, which increases in the third stage. There are also the annoying symptoms caused by the inverted lashes.



Knapp's Roller Forceps.

Cause and Distribution.—Poorly nourished and scrofulous persons are most frequently affected. Unhygienic habits and contagion in crowded districts are marked factors in the production of the disease. Trachoma is rare in mountainous regions and increases toward the lowlands. The peculiar susceptibility of some of the Continental emigrants is possibly due to their unsanitary habits, rather than to any inherent racial peculiarity of temperament. According to Burnett and others, negroes are particularly immune from trachoma.

There is unanimity of opinion as to the infectiousness of trachoma, and, although there is an inclination to consider the disease as due to a special organism, the reports of bacteriologic investigation have not been harmonious. The trachoma bodies of Prowazek-Greeff, almost always found in the acute stages of trachoma and absent if the condition is not trachoma, have apparently the best claim to specificity. These bodies or granules are found inside the cells and, when stained by the Giemsa method (on a blue field) resemble tiny red cocci, though they are considered by the investigators to be protozoa. They seem to group themselves near one margin of the cell nucleus.

Prognosis is unfavorable. The disease continues for many years, and there is rarely complete recovery. The dryness of the conjunctiva is very annoying, and by the irritation and exposure of the corneal epithelium, with consequent opacity, vision is affected. Entropion and trichiasis are disagreeable sequels.

Treatment.—The patient should be informed of the infectious nature of the disease, and warned not to wipe his eyes on public towels. To the strumous and poorly nourished, change of environment and constitutional treatment are of great value. The conjunctival sac should be washed several times a day with boric acid or a weak solution (1:8000) of mercuric chlorid. If the symptoms are acute, the temples should be leeched, cold applications instituted and atropin instilled. As the inflammatory symptoms subside, a 50 percent solution of boroglycerid in glycerin should be applied twice daily. It may be alternated with glycerol of tannin or copper sulphate, or alum in pencil form. Prolonged application of silver nitrate leaves distressing scars and discolors the conjunctiva, and is not advised. Those who derive good results from this salt use it with great care, and only after long experience. Boroglycerid is more efficacious and can be given to the patient to drop in the eye at home during the intervals of visits to the physician's office. There is diversity of opinion relative to the value of protargol in this affection. Its use has not been followed by good results. Mercuric chlorid in solution of 1:250 may be brushed over the everted lids. Operations destroying much conjunctiva defeat their own purpose, as the previous destruction of this membrane by the disease is already the cause of many disagreeable complications. In cases in which the granulations are very profuse and have not yet ulcerated, the disastrous sequels may be averted by expression. A favorite method consists of squeezing the granulations with roller forceps, but it is not advised as a routine practice. Tension may be relieved by splitting the external canthus and cutting the canthal ligament. Hyperemic and soft granules must be more carefully handled. Massage with iodoform ointment may be used, and is less painful to the patient, and often gives good results in a very short time. Pannus should be treated by massage, peritomy, or jequirity inoculation. See Cornea (Diseases). Distortion of the lids must be corrected and corneal opacities treated. Constant instillations of glycerin or some bland oil are said to be palliative in xerosis.

TRAGACANTH.—The exudation of several species of *Astragalus*. A natural mixture of gum arabic and bassorin. A demulcent employed mainly as a vehicle for resins and insoluble powders. It is a constituent of 7 of the 9 official troches, and is a better agent than acacia for making emulsions of cod-liver oil. **T., Mucilago,** tragacanth 6, glycerin 18, water to 100 parts. Dose, 1/2 ounce or more.

TRANCE.—A form of catalepsy, characterized by a prolonged condition of abnormal sleep, in which the vital functions are reduced to a minimum, and from which the patients ordinarily cannot be aroused. The breathing is almost imperceptible, and sensation is abolished. The onset and awakening are both very sudden.

Etiology.—Common trance occurs principally among females between 12 and 30 years of age; and the subjects are seldom in perfect health. Various hysteric manifestations are seen, and anemia often exists. Trance has been due to exhausting diseases, as typhoid fever and influenza; to excessive brain-work, or to mechanic obstruction to the circulation of the brain.

Symptoms.—During a trance the subject is usually pale, the limbs are relaxed, the eyelids closed, and the eyeballs directed upward, deviating, and sometimes diverging, from the middle line. The mental functions are in complete abeyance. The pallor of the face is the result of profound depression of the vascular system. The duration of trance may be from a few hours to weeks, months, or even a year. The postmortem examinations of persons who have died in trance throw no light on its nature.

The diagnosis must be made from apoplexy, coma, and death. The presence of life may be determined (1) by the absence of any sign of decomposition, (2) by the normal appearance of the fundus of the eye as seen with the ophthalmoscope; and (3) by the persistence of the electric excitability of the muscles. This excitability disappears 3 hours after death. See COMA.

Treatment.—Food may be given by the nasal tube, or by enema. Warmth should be applied to the extremities, and the development of bedsores prevented. Strong faradization is the most powerful cutaneous excitant. Nerve stimulants, such as ether or valerian, may be given by the bowel. Alcohol must be given with caution and in small quantities. Strong-coffee enemata are often more useful. Recurrence of attacks may be prevented by the improvement of health, physical and moral.

TRANSFUSION.—The operation of the transfusion of blood is not without dangers, and offers no advantages over the infusion of saline solutions either beneath the skin or intravenously. See, therefore, INFUSION. The indications and modus operandi of transfusion are as follows:

The indications for transfusion are certain cases of violent hemorrhage.

Methods.—There are two methods of transfusion —(1) direct transfusion, (2) indirect transfusion.

In the **direct method** blood from an animal is conveyed, by means of a specially devised apparatus, directly from one person or one animal to that of another. According to the **indirect method,** the blood is first withdrawn, and afterward injected into the vein of another.

The direct method is preferable, and is the one generally used. Aveling's apparatus is recommended. The operation as described by Wharton is as follows: The bulb and tube are first placed in a shallow basin containing warm normal saline solution (0.7 percent) and the bulb and tube are filled with this solution to displace any air that they contain. The person supplying the blood places his arm near the arm of the patient, and the operator exposes a prominent vein on the patient's arm at the bend of the elbow, opens it, and inserts into it one of the cannulas filled with saline solution, with the point directed toward the body, and at the same time an assistant introduces the other cannula into a vein at the bend of the elbow of the one who supplies the blood. The cannulas are held in position by assistants, and the tube is quickly connected with them—the stop-cocks being closed before it is taken out of the saline solution to prevent the entrance of air; then upon opening the stop-cocks a direct communication is established between the circulation and the donor. By slowly compressing the bulb (at the same time keeping the tube closed on the side of the donor) the blood is forced into the circulation of the patient. The wounds should be subsequently dressed antiseptically.

Crile's method of arteriovenous anastomosis is described by Da Costa as follows: The vascular system of the donor is united to the vascular system of the recipient, intima being connected to intima. This is accomplished by means of a German silver tube. The vein of the recipient is drawn through the tube, is everted, and is tied into the second groove of the tube.

The end of the tube with the everted vessel over it is passed into the vein of the recipient and fixed temporarily by a ligature. The left arm of each subject is usually employed and the radial artery of the donor is anastomosed to a superficial vein of the recipient. Every small branch over the artery is carefully tied in order to prevent obscuration by blood. The artery is bared for a distance of about 3 cm., tied distally, lightly clamped with a screw clamp proximally, and divided. The vein of the recipient is bared, clamped, and divided, the tube (dipped in sterile olive oil) is inserted into the vein, the cuff of everted vessel is formed over the end, and the artery is pulled over the tube and cuff of vein and held by a ligature tied into the first groove.

Indirect Transfusion of Blood.—According to this method blood is withdrawn from the vein of the donor by venesection, and is received in a clean glass or porcelain vessel, which is placed in water at a temperature of 110° F. It is defibrinated by whipping with a bundle of straws, and is passed through fine linen; it is then injected by means of an ordinary syringe attached to a cannula which has been previously inserted into a vein of the patient. Care should be exercised to prevent air from being introduced with the blood. The apparatus devised by Allen and modified by Hunter is the one most frequently used. See INFUSION.

Autotransfusion.—The driving of the blood from the periphery to the center—the heart and the brain—in order to maintain the circulation, as in bandaging of the limbs in postpartum hemorrhage.

Reciprocal transfusion is the exchange of equal volumes of blood between a patient suffering from a febrile disease and one who is convalescent from that disease, the blood of the latter being supposed to contain an antitoxin.

TRAUMATIC FEVER.—See ASEPTIC FEVER.

TREMOR.—An involuntary trembling or agitation of the body or of some of its parts. Tremors are seen principally in the arms, head, hands, tongue, or facial muscles. They are *coarse* or *fine,* according to the amount of movement involved. They are *passive or static* when they are present during rest; if produced or increased by voluntary movements they are called movement or *intention tremors,* and are suggestive of disseminated sclerosis, lead poisoning and senility. In addition they may be local or general, rapid or slow, regular or irregular.

Etiology.—Tremor is often observed as one of the nervous phenomena of chronic alcoholism and delirium tremens and is generally observed in acute poisoning by lead, mercury, arsenic, and in chronic poisoning by chloral and by opium. It is a symptom of paralysis agitans, invariably present, and appears in association with both paralysis and contracture, and it is found in hysteric subjects. It attacks the aged, chiefly in the arms and head. *Simple tremor* often occurs without assignable cause, sometimes occurring as the result of emotions, such as fright. It is commonly present in debility, *asthenic tremor*, and passes off as strength is regained. In acute disease, such as typhoid fever, tremor indicates a profound toxemia.

Diagnosis.—In order to ascertain whether the tremor be passive or intention, the patient is observed as he performs some voluntary act, such as drinking a glass of water—an intention tremor will be markedly accentuated. Any tremor of the extremities is exaggerated by extension. The tremor in **disseminated sclerosis** is irregular, and the movements are sudden and jerky and much increased by voluntary efforts at restraint. They are absent during rest, but occur upon movement. In **paralysis agitans** the tremor is regular and rhythmic, and, save early in the progress of the disease, occurs during both rest and movement. **Senile tremor** occurs at first only on movement, and during rest almost or entirely ceases. When severe, it may occur both in movement and in rest. It is more influenced by movement than is the tremor of paralysis agitans.

The movements in senile tremor are exceedingly fine, beginning in the hands and often extending to the muscles of the neck, causing slight movement of the head. Alcoholic tremor occurs only during movement, and chiefly affects the tongue, hands, arms, and face. *Toxic tremors* may also be seen in elderly men who are persistent smokers, and they may result from excessive use of tea and coffee, or from drug habituations. There is a peculiar form of tremor observed among smelters and others exposed to the fumes of mercury. It is sudden or gradual in onset, and is usually accompanied by salivation. The arms are first involved, and then the entire muscular system. If allowed to go on, paralysis, mania, and idiocy may result.

The tremor of *exophthalmic goiter* is similar to the toxic temors. It is fine and rapid and is elicited by the extreme extension of the fingers.

Fibrillary twitchings of the facial muscles may be induced by chronic alcoholism, paresis or profound neurasthenia. It occurs in other regions, as well in progressive muscular atrophy. See Blepharospasm.

Closely allied to tremors are choreiform movements. See Chorea.

Treatment.—This will depend upon the causal condition. Little result from treatment can be expected. Nerve tonics and sedatives may be tried in simple and senile tremors.

TRENCH FEET.—See War Surgery.

TRENCH FEVER.—A group of imperfectly classified and ill-understood conditions has been noted in soldiers occupying trenches on the battle line under the designation "trench fever." The onset is quite abrupt, with severe frontal and postorbital headache, followed by rachialgia and pains in the extremities.

The fever rapidly rises to 102°–104° F. and falls rather abruptly to normal about the fourth day. A second rise is frequently noted, so that many of the temperature charts have a saddle back character.

There is no rash and the disease is often diagnosed as influenza, although there are no catarrhal manifestations to justify such diagnosis. The spleen is frequently palpable. The pulse is often slow, thus resembling the group of dengue-like fevers.

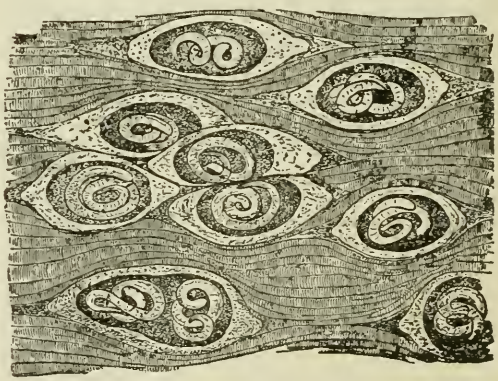
Besides the influenza-like type of trench fever another type has been described as the long period one. In this there are frequent relapses, as many as five or six. The fever rise at such times is very short, only lasting a few hours or a day or so. A characteristic pain noted in trench fever is a cutaneous hyperesthesia over the shins.

Houston and McCloy have thought it possible that the *Enterococcus* is the cause of these fevers. It has been suggested that lice might transmit the disease (Stitt).

TREPHINING.—See Skull (Surgery).

TRICHIASIS.—See Eyelids.

TRICHINIASIS (Trichinosis).—A disease produced by the ingestion of meat, pork, or sausage containing the trichina spiralis. The parasites lie coiled up in capsules between the muscular fibers of the meat. After their entrance into the human body their presence gives rise to nausea, vertigo,



Trichina Spiralis.—(*Ziegler*).

fever, diarrhea, prostration, stiffness and painful swelling of the muscles, edema of the face, and in some cases perspiration, insomnia, delirium, and death from exhaustion or some complication, as pneumonia. The blood always shows an eosinophilia. The stages of the disease are the *intestinal stage*, *migration stage*, and *encapsulation stage.*

The parasite is found in two forms—intestinal trichina, which is sexually mature, and muscle trichina, which is sexually immature.

The intestinal trichina is a small, hair-like worm, the male measuring 1/18 inch, and the female 1/8 of an inch in length; the head is smaller than the rest of the body; the tail of the male has a bilobed

prominence, between the divisions of which the anal opening is placed, and from which a single spiculum can be protruded; the female has a blunt, rounded tail, the reproductive outlet being situated toward the anterior part of the body; the ova are very small, containing embryos that are produced viviparously at the rate of at least 100 each week after the entrance of the female into the intestinal canal.

The muscle trichina develops its sexual apparatus after it has entered the intestinal canal of the host. The viable embryos discharged from the female are in a state of motion, and at once migrate from the intestines to the muscular structure of the individual, and here set up inflammatory action; they becoming surrounded by a capsule or shell in which they are coiled. After a time, in the muscle, the trichina undergoes a further change: lime salts are deposited in and about the capsule and in the parasite itself, and minute specks of lime are seen distributed throughout the muscular structure. The development of the parasite from the period of the impregnation up to the time of sexual maturity is, under favorable conditions, less than 3 weeks. Within 2 days from the ingestion of the infected pork occurs the maturation of the muscle larvæ; in 6 days more the birth of embryos occurs, and in about 2 weeks the migrating progeny have arrived at their habitat, the muscular structure.

The prognosis depends upon the amount of infection in the pork or beef. Mortality is between 20 and 50 percent.

Treatment.—The preventive treatment consists in eating no pork that has not been so prepared as to kill any trichinæ that might exist. If the parasites have been recently taken—within the first 4 or 5 days—emetics and purgatives to remove them from the stomach and intestinal canal are indicated. After thorough action from these, attempts may be made to destroy such of the parasites as have escaped the action of the emetic or purgative. For this purpose glycerin 1 part, water 2 parts, is much in favor; or a trial can be made of carbolic acid and tincture of iodin, as suggested by Bartholow. Quinin has given good results.

After migration has begun, the vital powers should be sustained by nourishing food, stimulants, and tonics, as there are no drugs that have any influence upon the embryos in their migration through the muscles.

TRICHLORACETIC ACID.—A monobasic organic acid ($CCl_3.COOH$) obtained from the oxidation of chloral hydrate with nitric acid. It should be kept in dark well-stoppered bottles in a cool place. While penetrating deeply it does not cause as much pain as many other escharotics. It is used locally in lupus, condylomata, etc., and for cauterization of the nose or throat.

TRICHOPATHY (Trichosis).—Any morbid affection of the hair. See ALOPECIA, CANITIES, HIRSUTIES.

TRICHOPHYTOSIS.—See RINGWORM OF THE SCALP.

TRICRESOL.—A mixture of the three isomeric cresols, respectively named the ortho-, meta-, and paramethyl phenols; it also contains the hydroxyl group, which seems to be a characteristic constituent of antiseptics and germicides. It occurs as a white liquid of creosote-like odor (sp. gr. 1.052 to 1.049), and is soluble in water. Tricresol possesses very high germicidal power, and is said to be practically nontoxic, and less irritating to wounds than either carbolic or sublimate solutions. A 1:1000 solution dropped into the eye produced not the slightest irritation. Such solutions may, therefore, be advantageously employed as menstrua for the stock collyria, especially for those of cocain, physostigmin, and atropin, which are most liable to contamination. Tricresol is particularly fatal to pyogenic cocci, a 1 percent solution invariably killing them in 1/2 minute in watery solutions, and in 1 1/2 minutes in rich albuminous fluids (Grüber). See PHENOL.

TRIFACIAL NERVE, AFFECTIONS.—This important mixed nerve of the face supplies, by its motor trunk, the muscles of mastication; by its sensory portion, the skin of the face, the mucous membrane of the mouth and nasal cavity, the conjunctiva and cornea, also the anterior part of the tongue with gustatory fibers. The gustatory fibers reach the lingual fibers of the fifth by the chorda tympani nerve.

Lesions.—1. There may be lesions of the pons, especially hemorrhage, or spots of sclerosis invading the trigeminal nucleus.

2. Injury or disease at the base of the skull, especially acute and chronic meningitis and caries of the bone; tumor; syphilis; new formations compressing the trunk or Gasserian ganglion. Fracture of the base rarely affects this nerve.

3. Tumors or aneurysms pressing on the first division (ophthalmic) of the nerve through the cavernous sinus, on the second division (superior maxillary) and on the third division (inferior maxillary) by invasion of the sphenomaxillary fossa.

4. There may be inflammation of the nerve, which is rare.

The sensory division may also be affected in hysteria and in lesions of the posterior part of the internal capsule. The gustatory fibers of the trigeminus may be influenced by peripheral lesions of the facial nerve, from which the chorda tympani is derived.

Symptoms. Paralysis of the Sensory Portion.—The distribution of the anesthesia varies according as the whole trigeminus or only a half is involved. In total anesthesia there is loss of sensation in half the corresponding side of the head, including the conjunctiva and cornea, mucosa of the lips, tongue, hard and soft palates, and nose of the same side. Hence on the tongue or mucous membranes there are often ulcers that come from unconscious laceration by the teeth. There is loss of taste and impairment of smell. The muscles of the face are also insensible, hence their movements are slower. The so-called trophic phenomena are also observed, and among them the much-discussed *neuroparalytic ophthalmia*, an ulcerative keratitis, beginning, always in the lower segment of the cornea, and passing over into purulent inflammation of the whole eyeball. It seems, on the whole, more

likely that the inflammation is primarily due to the action of irritants that in health are excluded by the proper closure of the eyelids, though the inflammatory process itself may be trophically influenced. The salivary, lacrimal, and buccal secretions may be diminished, and the teeth may become loose. Herpes is a trophic result that may develop in the course of the nerve, is painful, and may last a long time. So, too, the anesthesia may be preceded by tingling. The skin of the face is sometimes swollen.

Paralysis of the motor portion, which supplies especially the muscles of mastication, the masseters, temporals, and pterygoids, is not common. It is most frequent in diseases of the base of the skull, compressing this branch. Difficulty in chewing is the result. If on one side, the patient can only chew on the other; if on both sides, he cannot chew at all. The lower jaw hangs down and cannot be moved from side to side because of the paralysis of the pterygoids. If on one side, the external pterygoid cannot push the jaw toward the sound side; and when depressed, the jaw is pushed by the muscle of the sound side toward the paralyzed side. Cases have occurred associated with cortical lesion; from one of these Hirt inferred that the motor center for the trigeminus is in the neighborhood of the lower third of the ascending convolution.

Spasm of the muscles of mastication occurs in connection with muscular cramp, the muscular contraction of tetanus (trismus), sometimes in tetany and meningitis, and reflexly through painful affections of the jaw or teeth, or from irritation near the motor nucleus. It is at times hysteric. Clonic spasm occurs in muscles supplied by the fifth nerve, constituting "chattering teeth." It occurs usually in connection with general conditions, such as chorea, but it may arise as a local symptom in women late in life (Tyson).

Diagnosis is not difficult. Sensibility is tested in the ordinary way. The preliminary pain must not be mistaken for neuralgia. Gustatory sense is tested in the anterior end of the tongue by applying weak acid or salt solutions and comparing the effect on the two halves. The motor power is tested by biting on a piece of wood or by moving the jaws against resistance.

Treatment must depend upon the cause, which should be carefully sought. Syphilitic new formations are the lesions most commonly amenable to treatment. In the absence of such causes the treatment must be symptomatic. Stimulating liniments and faradization through the electric brush are often useful. Galvanism may also be used, brushing the part with the kathode. The anesthetic part should be carefully protected against irritants.

TRIGEMINAL NERVE.—See Trifacial Nerve.

TRIGGER FINGER.—Trigger finger or snap finger is an acquired deformity in which one or possibly two fingers can be extended only by great effort or by using the other hand, when the finger flies out like the blade of a penknife. Over 90 percent of the cases are caused by some condition that offers a limited obstruction to the play of the tendon in its sheath, *e. g.*, contraction of the sheath, enlarged sesamoid, ganglion, a growth on the tendon, or, most frequently, a localized fibroid thickening of the tendon, the lesion usually being situated over the metacarpophalangeal joint, at which point the "tendon callus" can often be felt. In less than 10 percent of the cases the trouble is due to an alteration in the relations of the joint surfaces the result of injury or disease. The treatment is removal of the obstruction. In the usual variety it is necessary only to incise the theca over the fusiform enlargement of the tendon (Stewart).

TRIONAL.—Diethylsulphonethylmethyl methane. It is a powder consisting of shining tablets, which dissolve in 320 parts of cold water, readily in alcohol and ether, and have a distinctly bitter taste. Trional is administered in fine powder dissolved in liberal quantities of some liquid. Dose, 10 to 30 grains daily. Trional differs from sulphonal only in the substitution of an ethyl for a methyl group. It is an efficient hypnotic, and is less liable to produce ill effects than sulphonal, but must be given in doses fully as large. In cases of slight psychic excitement accompanied by obstinate insomnia it is peculiarly efficient. See Lambert Treatment for Narcotic Addiction.

TRITICUM (Couch-grass).—The dried rhizome of *Agropyron repens.* It is emollient, diuretic, and antiphlogistic; and is useful in cystitis and irritable bladder. It is best administered in a decoction made from 2 to 4 ounces of the plant in 2 pints of water, and reduced one-half by boiling. The dose of triticin is from 1 dram to 1 ounce in infusion. The dose of the fluid extract is from 1 dram to 1 ounce, well diluted.

TRITURATIONS.—A class of powders having for their diluent sugar of milk, and possessing a definite relation between the active ingredient and the diluent. The Pharmacopeia prescribes a general formula for these preparations, according to which 10 grams of the substance and 90 of sugar of milk are to be well mixed by a spatula, the latter being added in successive quantities, and both triturated in a mortar until the substance is intimately mixed with the diluent and finely comminuted. There is but one official trituration (trituratio elaterini), though the pulvis ipecacuanhæ et opii practically belongs to this class. Sugar of milk is employed as the diluent because of its hardness and its comparative insolubility.

TROCHES (Trochisci).—Also called *Lozenges,* and *Pastilles.* Small, flattened cakes of medicinal substances prepared from a mass consisting chiefly of medicinal powders, sugar, and mucilage. There are 9 official troches:

Title.	Constituents—100 Troches.	Each Troche Contains:
Trochisci: Acidi tannici..	Tannic acid, 6 gm.; powdered sugar, 65 gm.; powdered tragacanth, 2 gm.; stronger orange flower water, a sufficient quantity.	Tannic acid, 1 grain.

Title.	Constituents—100 Troches.	Each Troche Contains
Trochisci: Ammonii chloridi.	Ammonium chlorid, 10 gm.; extract of liquorice, 20 gm.; powdered tragacanth, 2 gm.; powdered sugar, 40 gm.; syrup of tolu, a sufficient quantity.	Ammonium chlorid, 2 grains.
Cubebæ.....	Oleoresin of cubeb, 2 gm.; oil of sassafras, 1 c.c.; extract of liquorice, 25 gm.; powdered acacia, 12 gm.; syrup of tolu, a sufficient quantity.	Oleoresin cubeb, ½ grain.
Gambir.....	Gambir, powdered, 6 gm.; powdered sugar, 65 gm.; powdered tragacanth, 2 gm.; stronger orange flower water, a sufficient quantity.	Gambir, 1 grain.
Glycyrrhizæ et opii.	Extract of liquorice, 15 gm.; powdered opium, 0.5 gm.; powdered acacia, 12 gm.; powdered sugar, 20 gm.; oil of anise, 0.2 c.c.; water, a sufficient quantity.	Powdered opium, ⅛ grain.
Krameriæ.....	Extract of krameria, 6 gm.; powdered sugar, 65 gm.; powdered tragacanth, 2 gm.; stronger orange flower water, a sufficient quantity.	Extract of krameria, 1 grain.
Potassii chloratis.	Potassium chlorate, 15 gm.; powdered sugar, 60 gm.; powdered tragacanth, 3 gm.; water, a sufficient quantity.	Potassium chlorate, ¼ grain.
Santonini.....	Santonin, 3 gm.; powdered sugar, 90 gm.; powdered tragacanth, 3 gm.; stronger orange flower water, a sufficient quantity.	Santonin, ½ grain.
Sodii bicarbonatis.	Sodium bicarbonate, 18 gm.; powdered sugar, 54 gm.; bruised nutmeg, 1 gm.; mucilage of tragacanth, a sufficient quantity.	Sodium bicarbonate, 3 grains.

TROPACOCAIN.—A powerful anesthetic and mydriatic, derived from a small-leaved coca of Java. It has the general qualities of cocain, but appears to be more active and much less toxic. The hydrochlorid is applied in 3 to 10 percent solution in 0.6 percent sodium chlorid solution. See Cocain.

TROPHIC DERANGEMENTS.—See Nervous Diseases (Examination).

TRUSS.—An instrument for maintaining a part in proper position in hernia or other malposition of organs.

Trusses should exert pressure sufficient to a little more than completely retain a hernia under all conditions and in all positions of the body. In reducible hernia continued use of a truss, particularly in young persons, may effect a cure. It is important that a truss should be fastened in position *before* rising in the morning and that it shall be removed *after* lying down at night. During the night a light or special truss may be worn, and also in bathing. When a portion of omentum constitutes the hernia, the gut being replaceable, it is very difficult to maintain reduction. A femoral hernia is always more difficult to keep reduced than an inguinal hernia; and in fleshy persons adjusting a truss is troublesome.

Trusses are always uncomfortable at first, a feeling which is soon overcome. If a truss fits, it retains the hernia reduced even in sitting so that the abdominal walls are relaxed, and when coughing and straining occur. If pain results from the use of a truss, or it does not retain the hernia, it is harmful. A spring which is too strong will enlarge the hernial opening, and may aggravate the case. A truss should be worn for a long time after an apparent cure.

To measure for a truss (MacCormac's rule).—In either inguinal or femoral hernia the lower part of the hernial opening is the point of starting for measurement; thence measure up to the anterior superior spine of the ilium on the same side, thence around the body 1 inch below the crest of the ilium to the other or opposite anterior superior iliac spine, and then to the upper part of the hernial opening.

Trusses are composed of different materials **elastic** as steel or vulcanite, and **inelastic,** as leather, calico, or jean. The last kind does not exert sufficient pressure, but is sometimes of service in a large irreducible or umbilical hernia.

The pad is usually made of hard rubber, vulcanite, or xylonite, or of cork covered with flannel, linen, and wash-leather. Water- and air-cushions may be used, especially if the surface is painful or irregular. Boxwood, ebony, ivory, or other firm, nonabsorbable materials are sometimes employed. The pad for an inguinal hernia is pear-shaped, and about 3 inches long, 2 inches at its broadest part, and about 3/4 of an inch in thickness. The outer surface is flat, and has two studs for attachment of straps. The inner surface is convex, looking upward as well as backward—especially so when the abdomen is protuberant—and it lies upon the internal ring and the inguinal canal, and although not touching, may come quite close to the pubic spine. When the hernia is congenital, the so-called rat-tailed shape is usual. The pad is prolonged downward between the thigh and scrotum, gradually tapering off. A double truss is sometimes here preferable, particularly if the deformity is direct or is an old oblique hernia, the rings of which have been dragged nearly opposite to each other. A double truss is not more inconvenient than a single one.

The pad for an oblique inguinal hernia is sometimes cut like a horseshoe with one side (which covers the inner pillar) longer than the other. The rupture is prevented from descending by the tension across the opening. For a direct hernia this principle requires that the shape of the pad be that of a ring, the center of which corresponds with the axis of the hernial opening.

For femoral hernia the pad is smaller, and is beveled a little on the outer side, to avoid pressure upon the femoral vein, and is also beveled above, so that it may fit well under Poupart's ligament and bring the walls of the canal together.

A shallow concave plate is used for umbilical hernia, the truss at the same time supporting the lower parts of the abdomen. Nipple-shaped projections only enlarge the hernial openings.

As a rule, the pad is rigidly fastened to the spring,

but a ball-and-socket joint is sometimes used, and in other trusses the pad may be shifted up or down and fastened in any position. The under-strap of a truss should always be fastened to the lower stud on the back of the pad, to prevent its riding up. It should be moderately tight when the patient is in the upright position.

To test a truss, the patient should sit on the edge of a chair, with the knees separated so that the structures around the ring are relaxed. He should then be directed to strain downward. If the rupture does not escape, the pad fits the opening and the pressure is sufficient. Too strong pressure tends to cause absorption of tissues beneath. If the skin beneath the truss or pad becomes sore or excoriated, it may be bathed in cologne water or alcohol to harden it, and dusted with violet powder.

An irreducible hernia may be inclosed in a hinge-cup made of rim-plate covered with leather, or may be supported in a laced bag-truss. Belts may be required for ventral or umbilical protrusions. For the congenital hernia of children a skein of Berlin wool may be used. For irreducible hernia in the aged a bag-truss, laced up on one side, or a cup made of soft leather supported by a metal rim, may be used. Sometimes the truss may be made of metal molded on a cast taken from the hernia while it is smallest. See HERNIA.

TRYPANOSOMIASIS.—See SLEEPING SICKNESS.

TRYPSIN.—The proteolytic enzyme of pancreatic juice. Its powers are manifested in an alkaline medium, converting proteids into peptones. Traces of trypsin are said to have been found in urine, but this is doubtful. It is recommended for spraying the throat in membranous or diphtheritic croup. Thirty grains are dissolved in 1 ounce of water, 10 grains of sodium bicarbonate are added, and the mixture is applied by means of a brush or as a spray.

TUBAL ABORTION.—Internal rupture of a tubal pregnancy, with extrusion of blood, and possibly of the ovum, through the fimbriated extremity of the tube into the abdominal cavity. See EXTRAUTERINE PREGNANCY.

TUBAL PREGNANCY.—See EXTRAUTERINE PREGNANCY.

TUBERCULIN.—Koch's lymph. A glycerin extract of cultures of the bacillus of tuberculosis. For a time tuberculin was thoroughly discredited. It has, however, become of interest again by reason of the efforts to extract from it a germicidal constituent free from toxins, also by the results obtained in tuberculosis with the blood serum of animals immunized by its repeated inoculation. It is extremely valuable in the diagnosis of tuberculosis in cattle and recently it has been gaining favor in the diagnosis of human tuberculosis. See TUBERCULOSIS (Pulmonary).

Test.—A hypodermic injection of 1 to 10 mg. of pure tuberculin is given. "Reaction" consists in a rise of temperature of 1 1/2 to 2° F. within 12 hours after injection.

Modifications.—The ophthalmo-reaction of Wolff-Eisner and Calmette. See VACCINE THERAPY.

Cutaneous Reaction (of von Pirquet). Technic.—After the skin of the fore-arm has been scrubbed with ether, two drops of undiluted tuberculin are dropped on it about 4 inches distant from each other. Then with a special vaccination-lancet a superficial scarification is made between the two drops on the dry surface. Finally the same scarification is made inside of the two drops. A few fibers of cotton are put on the drops so that they will not flow. After five minutes the cotton is

taken off, but no dressings are to be applied. The reaction is best examined after 48 hours. It is considered positive when the tuberculous scarifications are clearly different from the control place, but the ordinary reactive area must measure at least 1/6 of an inch.

Remarks on the Technic.—Scrubbing the skin with other substances than ether is not advisable, because if one applies a watery solution of an antiseptic character (or alcohol) the skin does not dry very quickly and so the drop of tuberculin runs, and is diluted; ether alone allows a very quick drying.

Old tuberculin in full strength has the advantage over diluted tuberculin in that no preparation is necessary, and that the substance keeps an indefinite time, as it contains a large amount of glycerin and some carbolic acid. The old tuberculin used is the extract of tubercle bacilli which was indicated by Koch in 1891. It is perhaps best to use the original preparation bought of Lucius and Bruning in Hoechst a/M, but similar preparations are also manufactured in America.

The special vaccination lancet, advised by v. Pirquet for this purpose differs from an ordinary one in the form of its tip, which is not pointed but has a crescent shape like a small chisel. This tip is made of platinum, so that it can be cleaned by exposing it to heat. The abrasions are not made as in vaccination, by scratching; but by turning the instrument quickly. As the point is about 1/12 of an inch, it gives a round abrasion of the same diameter. The turning should be made with a slight pressure, the intensity of which must vary with the quality of the skin. In small children very slight pressure is sufficient; in adults one must exert more. The abrasion should be quite superficial, taking off the epidermis only, and no blood should escape. The abrasion which is made first is used for the control of the traumatic redness. Each scratch on the skin causes a slight traumatic reaction, the intensity of which depends on the individual. It is therefore necessary to compare the tuberculin points with an

ordinary scratch of the same size. One could apply for that purpose some fluid, such as physiologic salt solution or bouillon, but as it was proved that scratches with these different fluids show no more reaction than a scratch with no fluid, it is simpler to make it without the fluid. The fibers of cotton are only to be used if the drops are large. Pirquet usually allows them to fall from a dropper, but one can also do the following: The tuberculin is kept in a glass tube with a long glass stopper; the point of the lancet is moistened with the end of the glass stopper; in this way there is practically no drop left, and the cotton need not be used The best moment of control is after 48 hours; but it is advisable to look at the points several times, say after one, two and seven days.

Description of the Reaction.—(1) Traumatic reaction: The vaccination and control points show the same condition at first. Within a few minutes a hive-like appearance is noticed, with a slight red margin; this disappears after some hours. After 24 hours one finds in the control point a brown scab with a slight redness around it which disappears in 48 hours.

(2) Vaccination points with negative reaction act like the point of control, only at times they are a little bit more elevated. In case there is any doubt of a positive reaction, the vaccination is to be repeated.

(3) The positive reaction. (a) *Time of latency* (3 hours to several days). During the first hours no specific action of the tuberculin is noticed, but only the traumatic one. In most cases the reaction is in its full height in 24 to 48 hours. (b) *Growth.* The inflammatory reaction begins usually as a slightly elevated papule at the point of scarification, which increases in height and diameter; the final diameter of a positive reaction is on an average about 1/2 inch, but is sometimes one inch or more. There are also great individual differences in the exudation. If the papules are very large, the central part is also usually very elevated, with sometimes small serous blisters, or even one large blister on the top of it. The color too is very different; a a rule, strong individuals with a good general color of the skin show papules of intense redness, while anemic individuals show slightly colored reactions. Sometimes there is scarcely any hyperemia, and one notices the papule on palpation only. This is often the case in colored people. On the other hand, reactions may occur which consist only in redness, and show no exudation. This is especially the case in miliary tuberculosis or in tuberculous emaciation. The outlines of the papule are generally distinct, and circular in outline; but sometimes it shows irregular rays, which point in the direction of the lymphatic vessels. In cases of scrofulo-tuberculosis, one often finds very small papules near the reaction but not in direct connection with it. The hyperemia does not generally extend over the margin of the exudation; but in intense reactions one often meets after 48 hours a slightly reddened margin surrounding the central exudation, which margin may be even 2 inches in diameter. (c) *Reformation.*—Generally papules begin to decrease 48 hours after the vaccination. The redness at first changes to violet and then to a brownish color followed by pigmentation which may persist for a month or longer, whereas the exduation disappears within the first week. (d) *The Slow and Secondary Reaction.*—There are cases in which the positive reaction appears only after two, three, or six days. They have a somewhat different meaning from the early reaction, and are very nearly related to the cases of "secondary reaction," in which the positive issue of a second vaccination occurs five to ten days after the first one.

Other Actions of the Cutaneous Test.—In v. Pirquet's method of making only very superficial abrasions, a general reaction of the organism practically never occurs; a slight elevation of temperature being noted in about 1 percent of cases. However, minimal amounts of tuberculin certainly enter the general circulation, for we often see that the sensitiveness to tuberculin is increased after a vaccination. The cutaneous reaction has practically no contraindication. One can use it at every age and in spite of every degree of fever.

Histologic Findings.—The inflammation of the cutis shows a tuberculous inflammation but without tubercle bacilli. It contains specially a large number of mononuclear cells.

The Meaning of Positive and Negative Reactions.—A positive reaction means that the organism contains antibodies against tuberculosis. As these antibodies are only acquired by an infection of the individual, it means consequently that the organism has had to struggle against the infection with tuberculosis. The reaction itself does not say at all what the result of that struggle was. It may be that the infection led to a very large focus formation of the microorganism, or it may be that only some glands became tuberculous. That every positive reaction means infection with tuberculosis, has been proved by a great number of postmortem examinations. In autopsies of 164 children who had given a positive reaction, in 161 a tuberculous focus was found, and only in three cases the pathologic investigation was negative. It is very probable that even in these cases some small focus escaped detection. The cutaneous reaction is practically the same as Koch's fever reaction; and we know, that in cattle, with every distinct positive reaction we find some tuberculous lesion also, the size of which may be very variable. An intense positive reaction means that a tuberculous infection has occurred recently, or that in an old tuberculosis some progress or some reinfection has taken place. As to the extent and the localization of the focus, we can say nothing from the size of the reaction, but we must use all methods of physical examination to determine where the lesion is.

(2) A negative reaction means in general that the patient has no tuberculous affection. One cannot absolutely depend on a single negative issue, and it is safer to repeat the reaction after a week. In case it is then negative again, we can say almost with certainty that the patient does not contain a tuberculous focus. This certainty, however, is never an absolute one, because there

are several reasons why a patient in spite of his tuberculous focus may contain few or no antibodies. In this way the following reasons for a negative issue have to be noted. (a) Last stage of lung tuberculosis or emaciation from tuberculosis of other organs. In very progressive tuberculosis the reaction often fails, so that it was even found that one could use a negative reaction in a certain tuberculosis as a sign of an unfavorable prognosis. Stress should not be laid on the issue of the cutaneous reaction in progressive tuberculosis. (b) In acute miliary tuberculosis and in tuberculous meningitis the reaction generally fails one or two weeks before death, but here also this is not invariable, as we see cases in early childhood retaining a positive reaction up to the last day of life. (c) During tuberculin treatment: If a patient is treated regularly with an ascending amount of tuberculin injections, he loses his cutaneous reactivity after a certain point of immunization is reached. (d) During measles with the onset of the exanthem, the positive reaction of tuberculous patients disappears and reappears only about a week afterward. This point up till now has found no exception, so that one is able to make the diagnosis of measles if a tuberculous child loses its reactivity during an exanthem of a doubtful character. (e) Besides these example there are some cases with little or no reactivity in spite of a tuberculosis, in which we cannot yet indicate the reason why the antibodies are lacking. As a rule, cases with a very slight reactivity, that is with a small papule or a late or secondary papule formation, denote some slight and inactive tuberculous lesions, but one cannot depend on this rule in every case.

As to the practical application, adults and children must be considered separately. In adults slight affections of tuberculosis are so common that the presence of a positive reaction alone does not tell us very much. There are only two things in adults which can be used: (1) A very intense reaction after the first trial, which indicates a fresh infection or reinfection; (2) a repeated negative issue of the trial, by which one is able to exclude tuberculosis. In children the infection with tuberculosis is not so common as in adults, and the younger the children are, the more dangerous is the infection. Thus, in an apparently healthy child of 10 years, showing no organic lesion, a positive reaction will not disturb us, whereas in a child of one year every positive reaction means a serious danger. In children, furthermore, the positive reaction gives a great aid to the diagnosis of some disease in question, as at this age infections with several kinds of bacteria are not so common as in adults, and therefore one can be almost certain that some symptom in question, say a bronchitis, if the tuberculin reaction is positive, is due to the same microorganism.

The cutaneous tuberculin reaction should be used in private practice only if some symptom leads to the suspicion of tuberculosis; for instance, if children are pale or without appetite, or have a bronchitis, some skin affection, etc. In hospitals, however, the test has been recommended as a routine examination of every child accepted, in the same way as we examine the urine in every case. Finally in orphan asylums which treat children up to 5 or 6 years, the cutaneous test should be used as a prophylactic means to segregate the tuberculous children from those who are free from tuberculosis. See Serum Therapy and Vaccine Therapy.

Moro's Inunction Test.—An ointment of 50 percent tuberculin in lanolin is rubbed into the skin of the chest or abdomen which is felt exposed for 15 minutes. In a few hours to three days, papules and probably erythema will appear if the individual is affected.

The methods of von Pirquet and Moro are entirely innocuous.

TUBERCULOSIS.—An infectious disease due to the introduction into the system of the bacillus tuberculosis, discovered by Koch in 1882. It has a very wide-spread, almost a universal, distribution, and it is estimated that fully one-seventh of all mankind die of it.

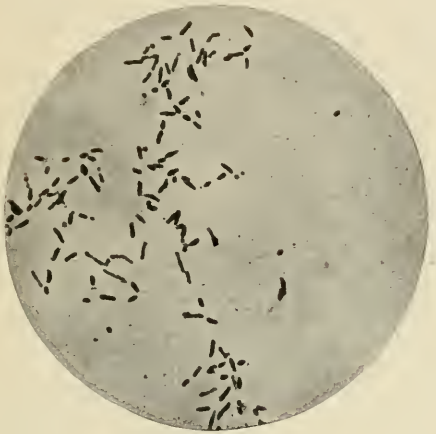
Etiology.—The bacillus, the essential **etiologic factor,** gains entrance into the body with the inspired air, with the food, and by direct inoculation. The commonest **mode of introduction** is by inhalation; in consequence, the respiratory tract is the most frequent seat of tuberculosis. The bacilli become disseminated in the air chiefly through the agency of the sputum of persons afflicted with pulmonary tuberculosis. The sputum of such individuals contains countless bacilli, which are held in it as long as it is moist, but are scattered through the air when the sputum becomes dry and pulverulent. When tuberculosis is acquired through the food—an occurrence not rare in childhood—it localizes itself primarily in the intestinal tract. The food that most often conveys the disease is milk from tuberculous animals, more rarely tuberculous meat. Direct inoculation does not play an important rôle in the causation of the disease.

The status of **heredity** as a factor in the propagation of tuberculosis is not yet fully settled. Isolated instances of apparently hereditary transmission, both in man and in animals, are recorded and demonstrate that the disease *may be* inherited; but in the majority of cases the acquisition of tuberculosis is postnatal. There is, however, a manifest tendency of the disease to attack the offspring of tuberculous parents, which, as it is not the result of hereditary transmission, must indicate the existence of a predisposition or susceptibility, which is transmitted from parent to child.

The bacillus of tuberculosis is a short, rod-shaped, nonmotile bacterium, 3 to 4 micromillimeters in length, and from 1/6 to 1/8 as broad as it is long, often slightly curved, and when properly stained with anilin dyes, occasionally has a beaded appearance. Its characteristic staining property is due to the fact that after being stained with carbolfuchsin it is not subsequently decolorized by immersion in a strong solution of nitric acid.

Methods of Staining. *Ziehl-Neelsen Method.*—Float the cover-glass preparation upon Ziehl's carbolfuchsin—saturated alcoholic solution of

fuchsin, 10 c.c.; 5 percent phenol water, 90 c.c. Heat until vapor arises (about 3 to 5 minutes), wash in water, and decolorize in 15 percent nitric, or 5 percent sulphuric, acid, then in 60 to 80 percent alcohol to remove the remnant of color. Wash well, dry, and mount in balsam. In the case of tissue-sections stain cold for 15 minutes, and decolorize as detailed; upon removal from the alcohol, counterstain with methylene-blue, wash, dehydrate, clear, and mount.

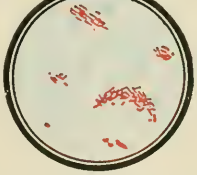


Bacillus Tuberculosis, from a pure Culture. (×1000).—(*Williams.*)

Gabbett's Modification of Fränkel's Method.—Stain in Ziehl's carbolfuchsin for about 2 minutes without heating, wash in water, stain in 25 percent sulphuric acid (100 c.c.) and methylene-blue (2 c.c.) for 1 or 2 minutes, wash in water, dry, and mount. In the case of sections dehydrate with alcohol, clear, and mount. A good and quick method but not so reliable as the preceding.

Koch-Ehrlich Method.—Stain the cover-glass preparation for 24 hours at the temperature of the room, or for 15 minutes with heat in anilin water, alcoholic solution of fuchsin, gentian-violet, or

Tubercle Bacilli in Sputum.—(*Greene.*)



Tubercle Bacilli in Urine. — (*Greene.*) Observe tendency to form groups.

methyl-violet (prepared by adding to anilin water enough of a concentrated alcoholic solution of the dye to produce opalescence). Then immerse the preparation in 33 percent nitric acid, and when it assumes a yellow-green tint, transfer to 70 percent alcohol. Counterstain 1 to 5 minutes in methylene-blue, malachite green, or picric acid for fuchsin; in Bismarck brown for gentian-violet or methyl-violet. Wash in water, dry, and mount in balsam. Prolonged action of the nitric acid will decolorize the bacilli.

. *Unna's Method.*—Stain for from 10 minutes to several hours in polychromic methylene-blue (Grübler's) wash in water, and treat with a 33 percent aqueous solution of tannic acid for from 2 to 5 minutes. Wash thoroughly, and transfer to absolute alcohol, gold-orange alcohol, or to 25 percent nitric acid; follow with dilute alcohol, water, and absolute alcohol. Clear in bergamot oil. This process double stains tubercle bacilli and leprosy bacilli.

Diagram of the Minute Structure of Tubercle. (*Walsham.*)

And see Urine Examination.

The lesion produced by the growth of the bacillus of tuberculosis is known as the **tubercle** (miliary or gray tubercle or nodule). This is a small, grayish, translucent nodule, from 1/10 to 2 mm. in diameter, firmly embedded in the surrounding tissues. By the coalescence of neighboring tubercles large masses, the so-called **tubercular infiltrations**, are produced. Histologically, a typical tubercle consists of 3 groups of cells—the epithelioid, the giant cells, and the round or lymphoid cells. The first are oval in shape, have a vesicular nucleus, and are the result of the proliferation of the fixed connective tissue and endothelial cells; perhaps, also, of epithelial cells. The formation of the oval cells is the first effect produced by the tubercle bacillus. The giant cell is a large, multinuclear mass, usually situated in the center of the tubercle. It may be the product of repeated nuclear multiplication in a single cell, without division of the cell protoplasm, or the result of the coalescence of several adjacent cells. The round cells are leukocytes that have emigrated from the blood-vessels, and they may be so numerous as to conceal the other cells (**lymphoid tubercle**). The bacilli are found in the giant cells, between and in the epithelioid cells, and, in later stages, in the round cells. New blood-vessels are not formed in the tubercle.

The tendency of the tuberculous formation is to undergo a peculiar form of coagulation, known as **cheesy necrosis**. This gives rise to a structureless, yellowish-white mass, which microscopically shows

an almost total absence of nuclei in the central area, while at the periphery, nuclei, both normal and in various stages of degeneration, are found. The necrotic tissue does not, as a rule, take any stain. For this degeneration two factors are responsible—the absence of blood-vessels and the action of peculiar poisons elaborated by the bacillus. The breaking down of tuberculous areas in the interior of organs gives rise to *cavities*, which may be seen in muscles, bones, brain, lymphatic glands, and elsewhere, but are most pronounced in the lungs, where they may attain a very large size. On surfaces—skin and mucous membranes—tuberculosis often leads to the formation of *ulcers*, which are characterized by an irregular, eroded appearance, and by the presence of tubercles. Tuberculous areas occasionally become secondarily infected with pyogenic or saprophytic organisms. The tubercle bacillus itself is capable of producing pus, but the majority of the so-called tuberculous cold abscesses are merely collections of fatty and disintegrated cells and tissue detritus.

Tuberculosis is primarily a local disease—extension takes place by continuity and contiguity along the lymph channels, along the respiratory and intestinal tracts, and through the blood. It is usually possible in secondary tuberculosis to demonstrate the original focus, but in the case of tuberculous lymphatic glands the source of infection is not always discoverable. This has been explained by assuming that infection may take place *in utero*, and the bacilli lie dormant in the lymphatic glands for varying periods after birth (**latent tuberculosis**). The possibility has also been suggested that the bacilli may penetrate a mucous membrane, be carried to the nearest lymphatic gland, and unfold their activity there.

In the human subject **tuberculosis** appears under various forms, presenting clinical differences, but identical from the pathologic standpoint. Since the discovery of the tubercle bacillus such diseases as scrofula, lupus vulgaris, Pott's disease, many forms of chronic joint-disease, and the anatomic tubercle have been proved to be tuberculous in nature. The most frequent seats of tuberculosis are the lung, the intestinal tract, the lymphatic glands, the serous membranes, the bones, the skin, the testicle, the epididymis, the brain, the Fallopian tubes, the uterus, and the spleen. Tuberculosis is very frequent in the lower animals, attacking especially the domestic herbivora and fowls and wild animals kept in captivity. In cattle the lesions take the form of nodes and conglomerates, which, on serous membranes, may be pedunculated (**pearl disease**). Histologically, there is in bovine tuberculosis a greater tendency to the formation of fibrous tissue than in the human form. The symptoms of tuberculosis vary with the localization of the disease.

A few **general phenomena** are common to nearly all forms—viz., emaciation, loss of strength, anemia, fever, and sweats. Amyloid degeneration may occur in various organs when the disease is associated with prolonged suppuration. In the diagnosis of tuberculosis the demonstration of the presence of the bacillus is of the highest importance.

TUBERCULOSIS, ACUTE MILIARY (Diffuse General Tuberculosis).—An acute and rapid form of tuberculosis in which the tubercle bacilli are distributed throughout the entire system without seeming predilection for any special organ.

It generally occurs in persons between 12 and 20 years of age.

Three varieties are observed (1) general infection; (2) general infection with pulmonary symptoms; (3) general infection with cerebral and spinal symptoms.

Etiology.—It arises most commonly from a caseating focus in some portion of the body—especially in a lung or a lymphatic gland—which breaks down, distributing the bacilli to other parts of the system by the blood current. The natural defenders of the body—the leukocytes, serum, and internal secretions—are thus overpowered before a reactionary force sets in. Typhoid fever, la grippe, or any disease that lowers the vitality may aid in causing the onset.

Pathology.—All the organs are involved, and contain small, miliary, discrete tubercles resembling mustard seed. They are very abundant in the lungs, brain, and may be detected on the choroid or retina by means of an ophthalmoscope.

Symptoms.—The general or typhoid form of acute tuberculosis is very often mistaken for typhoid fever. The onset usually lasts a few days or weeks, with loss of flesh and strength, night-sweats, slight fever, especially in afternoon, cough, rapid respiration, feeble pulse, flushed cheeks, and, later, delirium and stupor.

Instead of the regular diurnal variation of temperature it may be very irregular, jumping suddenly from 99° to 104° F., marked by rapid delirium, and possibly convulsions. The general symptoms depend upon the organs mainly involved.

Focus of Disease in the Lungs. Phthisis Florida, Galloping Consumption.—There are two forms: (1) the lobar form of miliary tuberculosis following chronic bronchitis, chronic pulmonary tuberculosis, whooping cough, measles, etc.; (2) pneumonic or bronchopneumonic phthisis. There are a severe cough with an acute pain in the side, accompanied by a purulent expectoration, often tinged with blood; intense dyspnea; cyanosis; subcrepitant râles over the basis of the lungs; the lungs may give a normal note on percussion except over the seat of focus, which is seldom found. Tubercles may be found in the choroid.

Focus of Disease in the Meninges. Tuberculous, Meningitis.—There are intense headache, high fever, delirium, convulsions, stupor, coma, irregular pupils, local paralysis, irregular, slow pulse, and other symptoms of inflammation of this tissue. See Meningitis, (Tuberculous).

Focus of Disease in the Intestines or Peritoneum.—There are intense pain over the affected area, tympanites, sudamina, harsh, dry skin, diarrhea, disturbed digestion, and dilated pupils.

Diagnosis.—Tubercle bacilli are often found in the blood therefore it should be examined in doubtful cases.

Acute General Tuberculosis.	Typhoid Fever.
1. Epistaxis not common.	1. Epistaxis and diarrhea.
2. Irregular temperature with rapid exacerbations.	2. Temperature shows a regular diurnal variation.
3. Rash infrequent.	3. Rose-red spots on abdomen.
4. Hurried respiration, cyanosis, dyspnea.	4. Respiratory rhythm regular.
5. Moist subcrepitant râles.	5. Dry râles, sonorous and sibilant.
6. Intestinal hemorrhage rare.	6. Intestinal hemorrhage common.
7. Tubercles often present in meningeal variety.	7. No tubercles on retina or choroid.
8. No Widal reaction.	8. Widal reaction.

Typhoid fever is generally more protracted in duration and there is a leukopenia, while in acute tuberculosis upon the incidence of mixed infection there is a leukocytosis. It is differentiated from intermittent fever by the temperature, absence of hematozoon of malaria, and negative therapeutic test.

Prognosis.—The disease always terminates fatally.

Treatment is purely symptomatic. If the meninges are involved, excruciating pain must be combated by hypodermics of morphin, 1/4 grain every 3 or 4 hours. A combination of bromid of potassium (30 grains) and morphin (1/4 grain) may be given to produce sleep. In all varieties a light, nutritious diet should be given.

TUBERCULOSIS, OCULAR.—Since the employment of the tuberculin tests, ocular tuberculosis has been found to be much more common than was formerly supposed. The consensus of opinion to-day seems to be that tuberculin (*q. v.*) is of decided value not only in the diagnosis but also in the treatment of tuberculosis of the eye. For a positive diagnosis a local reaction must be obtained with the tuberculin test. If two tests are negative, tuberculosis can be excluded with reasonable probability. According to Darier, a violent local reaction in the eye may be controlled by guaiacol injections (1 to 2 percent) subconjunctivally. If the reaction is positive tuberculin injections, forced feeding, rest, fresh air, etc., should be instituted at once. If in 2 to 3 months, no decided improvement is noticed, the human tuberculin should be supplanted by the bovine strain as a mixture of the two should be substituted, for the bovine strain may be the agent of infection. If the eye disease is secondary to glandular infection the bovine strain should be used; if secondary to pulmonary infection, the human is generally indicated.

As adjuvant to the tuberculin injections, Darier advocates the use of guaiacol in inunctions or subconjunctival injections, the guaiacol being preferable in the form of the cacodylate. See special headings: Conjunctivitis, Cornea, Iritis, etc.

TUBERCULOSIS, PULMONARY (Phthisis).—A specific infectious disease, due to the tubercle bacillus; characterized by the formation of tubercles in the lungs, which have a tendency to undergo necrosis; and manifested clinically by dyspnea, progressive loss of flesh and strength, night-sweats, hemoptysis, evening rise of temperature, and the expectoration of sputum containing tubercle bacilli.

Chronic Ulcerative Phthisis. Symptoms and Signs of the Early Stage. Subjective Symptoms.—(1) Progressive weakness and emaciation without apparent cause; (2) nocturnal sweats; (3) cough, especially in the morning, with expectoration of a whitish or yellowish mucus often tinged with blood (hemoptysis); (4) morning nausea; (5) local chest pains or tightness across affected area; (6) dyspnea; and (7) laryngitis.

Objective Symptoms.—(1) Diminished expansion over the affected area; (2) slightly increased tactile fremitus; (3) impaired resonance on percussion; (4) inspiration harsh and high pitched, and expiration prolonged; frequently "cogged-wheel" respiration; (5) exaggerated vocal resonance; (6) presence of mucous râles (often subcrepitant) at the apices of the lungs, sometimes posteriorly over base of lungs, and best heard when the patient coughs; (7) afternoon rise of temperature, with flushed face, usually after 4 o'clock; (8) a rather rapid and feeble pulse; and (9) generally the appearance of tubercle bacilli in the sputum.

Symptoms of the Late Stage.—The symptoms of the early stage exaggerated: Bacilli more abundant, the weakness and emaciation become more profound, night-sweats excessive, higher temperature and hectic symptoms, diarrhea, mucus often greenish, containing small, nummular lumps, cheesy in character, and containing many bacilli.

Predisposing Causes.—

1. **Hereditary tendency** is probably the most potent etiologic factor in the determination of tuberculosis. A phthisical chest may be thus inherited.

2. **Sequel of certain diseases** is the next most common cause. Of predisposing diseases may be mentioned pneumonia, typhoid fever, influenza, bronchitis, asthma, pleurisy, diabetes, and cirrhosis of the liver.

3. **Occupations,** such as coal-mining, glass-workers, mattress-makers, stone-cutters, street-sweepers, and close confinement in shops.

4. **Improper habits,** such as from alcohol, neglect of proper amount of food and sleep, exposure, overstudy and sedentary habits.

5. **Residence** in a low, damp, ill-ventilated, imperfectly drained, dusty locality; sleeping with a person suffering from tuberculosis.

6. **Age.**—From 20 to 35 is the period of life at which the disease is most often manifested.

7. **Cold climate** is a predisposing factor.

Method of Entrance of Tubercle Bacillus into the System.—(1) **Respiratory tract,** as from inhalation

of dust which carries the bacilli; (2) **Gastrointestinal tract,** as from infected milk (common in children); (3) **Inoculation;** (4) **Direct parental transmission** through the placenta (very rare).

Pathology.—There is no doubt some underlying condition of the system that the eye has not been able to perceive, or some chemic change produced in the fluids and tissues of the body that causes certain *foci of least resistance,* and renders the affected parts vulnerable to the attack by the tubercle bacillus. When the bacilli come in contact with such tissue, they are distributed throughout these foci by the lymph, blood, wandering connective-tissue cells, and leukocytes. The characteristic inflammatory process is usually a slow one, and the dominant action tends toward degeneration, with but a slight apparent attempt to form new tissue from the newly formed granulation cells.

The characteristic lesion produced by the bacillus of tuberculosis is a **tubercle,** which is a minute nodule, often the size of a millet seed, grayish or whitish in color, and quite translucent. If a section is made of a tubercle, it will be seen to have a certain arrangement: in the center of the nodule are a few large cells, with many nuclei (20 to 30), and two or three times the size of the surrounding granulation cells, called "giant cells," in which are lodged tubercle bacilli. The central portion of a tubercle has very few cells. Immediately surrounding the central portion of the tubercle are arranged a considerable number of epithelioid cells (wandering connective-tissue cells), and beyond them concentrically are found an abundance of small, round, granulation cells, between which are densely packed myriads of bacilli and many leukocytes. A few giant cells may be seen scattered throughout this area.

Guiteras compares the arrangement of cells from within outward to a "raked field." Cheesy necrosis, with subsequent liquefaction, begins in the center of the tubercle, usually in the giant cells and spreads peripherally. If calcification sets up in the area of granulation cells, there will be spontaneous recovery. Usually septic organisms gain entrance into the tubercle, causing rapid fatty degeneration and excessive ulceration of the surrounding tissues, with the development of cavities. The blood changes show a moderate degree of anemia.

Diagnosis rests upon the physical signs and the presence of tubercle bacilli in the sputum.

Inspection.—The chest is long and flat, the subclavicular region depressed, and the clavicles are very prominent. The angles of the scapulæ bulge, and the ribs are at an oblique direction downward from the sternum. There is diminished expansion over the affected area.

Palpation shows increased vocal fremitus.

Percussion shows impaired resonance or dulness below the clavicle and between the lower border of the scapulæ. If a cavity is present, a tympanitic note will be obtained.

Auscultation.—The inspiration is harsh, high pitched; the expiration prolonged and harsh; cogged-wheel respiration. There is increased vocal resonance. There are mucous râles over the apices of the lungs anteriorly, and over the base of the lungs posteriorly. Pectoriloquy with large râles and amphoric breathing may be detected if there is a cavity.

In doubtful cases the tuberculin test may be resorted to.

Krause claims to be able to make a diagnosis of early tuberculosis especially in children by means of the fluoroscope or radiography before it can be made by any other method.

Acute Phthisis.—A form of phthisis clinically resembling pneumonia in its early stages, usually terminating in death within a few weeks.

Fibroid Phthisis.—A slow form of phthisis in which the physical signs and symptoms gradually develop.

Complications of All Forms of Phthisis.—Pulmonary hemorrhage, pneumonia, pleurisy, diarrhea, extension to other organs, as the larynx, brain, kidneys, liver, peritoneum.

Distribution of Tubercles in the Body.—(1) Lungs (adult); (2) Lymph-glands, bones, and joints (in children); (3) intestines; (4) peritoneum; (5) kidneys; (6) brain; (7) spleen; (8) liver; (9) generative organs; (10) pericardium; (11) heart.

Prognosis is in the main unfavorable, although under proper treatment, change of climate, and other favorable conditions life may be prolonged for years.

Treatment.—In the treatment of pulmonary tuberculosis the first and most essential element is confidence on the part of the physician in the resources of his art. The prognosis is yearly becoming more favorable as the probability of recovery under good management is better realized, and the principles of treatment become better understood. It is, moreover, necessary for the attendant to be assiduous and minute in his care of the details of treatment, for upon these depends success or failure. Each patient must be an individual study, and the general plan should be modified in accordance with his reaction to remedies, and with the progress of the case. It is necessary to dwell upon these points, for they are often neglected.

Of the remedies useful in the management of pulmonary tuberculosis drugs occupy a distinctly secondary position. The chief reliance is to be placed upon hygienic measures—the scientific use of air, sunlight, water, food, rest, exercise, etc. —that will improve nutrition and increase vital resistance. Especially does this apply to the preventive regime that should be instituted from birth, if possible, in the case of those specially liable to the disease by heredity, whether the ancestral taint be tuberculosis itself or some other condition—for example, syphilis or carcinoma—likely to produce hypotrophy in the offspring. The patient's daily life must, therefore, be controlled as far as circumstances will permit. The treatment of tuberculosis among the well-do-do is thus both easier and more successful than among the poor. For both classes sanatoriums are often to be preferred; but the personal, mental, and

moral equation must be considered in deciding this.

The principal subjects of care are:

1. Place of residence, including both climate and dwelling-house.
2. Clothing.
3. Rest and exercise in general; including exposure to light and air, occupations and amusements.
4. Food.
5. The use of water, internally and externally.
6. Special pulmonary exercise, including the use of air at modified pressure.
7. The regulation of secretions and excretions.
8. The use of drugs (1) to improve general nutrition, (2) to improve special functions, (3) to antagonize the tuberculous processes, (4) to meet special indications.

These may first be considered in a general way, and later the modifications for special cases and stages of the disease may be indicated.

Place of Residence.—The subject of climate is more fully considered under CLIMATOLOGY (*q. v.*). Climatic treatment is desirable whenever possible. In many cases it is best to find a place where the patient can spend his life, and follow his vocation. Whether for this, or for temporary sojourn until health is regained, the place should be one where the patient can be out-of-doors most of the time and at all seasons of the year; though moderate change of location with seasons is sometimes beneficial for the sake of physical and mental variety. In many cases, especially in early tuberculosis, and in cases characterized by persistent high temperature, an ocean voyage, preferably of not less than a month's duration is the best therapeutic measure available.

With reference to climate the majority of patients fall into one of two principal classes—the robust and those needing protection. This may depend upon original constitution or upon the type and stage of the disease.

As a rule, the robust are benefited by cold and altitude, and some, in addition, by a certain degree of hardship—roughing it, as in lumbermen's camps and upon cattle-ranches. Good judgment is needed in the gradual increase of hardship, as sudden change from coddling to the opposite extreme would be likely to prove fatal. Among counterindications to altitude that need to be insisted on are (1) readiness of disturbance of cardiovascular balance, (2) cardiac weakness, (3) small size of heart, (4) neurotic or erethistic temperament, (5) persistent high temperature.

Those that need protection do better, as a rule, in warm or equable and comparatively dry places at the sea-level or but little elevated. Between these classes is a third to whom cold and moderate elevation, say not over 2000 feet, proves stimulating and restorative. In all cases purity and reasonable dryness of the atmosphere is a desideratum. The best of judgment is necessary in the choice of climate, and routine direction of every patient to one place or one class of places is productive of much harm. When patients cannot go far from home, something may still be done to improve their surroundings. Thus, both for air and light, the country is preferable to the city, a wide street to a narrow one, a detached house to one shut in on both sides. A hillside is better than a valley, a dry, sandy soil than moist clay. When the subsoil water approaches within 6 feet of the floor of the cellar, the first floor of the house should be sufficiently elevated; a cemented cellar is desirable. The air of the house should not be too dry, as air devoid of moisture provokes cough, and may induce hemorrhage. It should be constantly renewed, preferably through open windows. Other means of ventilation should be provided for bad weather. The temperature should be equable and not too warm. Except when special indications require it otherwise, 65° F. is a desirable standard. The temperature of the bedroom, which should be occupied only at night, and by no other person, should rarely exceed 60° F. The bedroom should have a high ceiling, and be as large and as sunny as possible, 1500 cubic feet of air-space being the minimum. There should be several windows for constant ventilation during the day. If there is a fire in the room, it should be in an open grate. The furniture should be as simple as possible. Electric light is preferable to any other, and lamp or candle to coal-gas.

When there is no counterindication, at least one window should be open at night, the patient being protected from draft.

The clothing should be warm, but light, loose, and not oppressive. As far as possible it should be of open texture, and should be changed with climate, seasons, and weather. Woolen or silk underwear, or a mixture of wool and cotton so arranged as to absorb the perspiration quickly and as quickly yield it to the outer air, should be worn both winter and summer. Protection is needed for the entire body, including the extremities; and the stockings are as important as the undershirt. Corsets, close-fitting waists, low-bosomed gowns, and tight belts are to be forbidden. Close-fitting scarfs, fur boas, and the like, around the neck are harmful, as are wadded flannel and buckskin "chest protectors," plasters, and similar abominations so often discovered upon stripping the patient for examination. In our northern climates extra wadding in and between the shoulders of the coat worn in the late fall and early spring, and a cape to the winter overcoat are often desirable. Sealskin and other heavy wraps are to be avoided. Patients with weak circulation should be well wrapped when driving, and when necessary, should use muffs and foot-warmers. Waterproof outer garments are in some cases a less evil than a wetting; they should be removed immediately on going indoors. As little clothing as possible should be worn in bed, the bed-covers being varied as necessary. A long woolen night-gown of light weight, or a "union" suit of the same material is the best in most cases. Hair mattresses with spring supports are best. Metal is better than wood for the bedstead, being more easily cleansed. Night-dress, underwear, and bed-covers must be changed even more frequently than ordinary cleanliness requires.

Rest and exercise must be considered together, the usual fault of physicians and patients alike being to insist too much upon one or the other. Individualization, the key to successful treatment generally, is in this matter specially necessary. When there is as yet no demonstrable lesion, and one merely suspects tuberculosis, a weak patient—especially a young, anemic girl—should be put to bed, if possible, and the Weir Mitchell "rest cure," or some modification—with massage and electric applications, and perhaps a daily drive or other nonfatiguing outing—be instituted. Later, and, on the other hand, from the beginning in a fairly robust person, active physical exercise should be gradually begun and increased, and preferably such as will keep the patient out-of-doors. Sports of various kinds, especially those which gently exercise the chest muscles, and afford pleasant diversion to the mind; systematic gymnastics, especially of the respiratory muscles; walking, bicycling, horseback riding, and even driving in an open carriage, are to be recommended; always in moderation, and according to the patient's condition. When there are extensive lesions, especially if there is constant and decided elevation of temperature, rest is absolutely necessary; and exercise should be the least and gentlest. It is not always necessary to rest indoors; a hammock swung in sun or shade, according to season and climate, a steamer-chair on porch or deck, are frequently preferable to couch and bedroom or cabin. As the patient improves, the period of rest is to be diminished, and exercise is to be quantitatively and qualitatively increased. Besides these illustrative extremes (and, indeed, in every case, as it passes through its stages of betterment or deterioration), there are many varieties of physical and mental conditions to which the physician's advice as to judicious alternation of rest and exercise must be adapted. Thus, when a patient with moderate lesions and no fever is unable to leave the city, a good plan of outdoor exercise is to have him walk slowly along the street in the opposite direction to the car-track, so that before fatigue occurs he may ride home. Or he may ride to a park (such as Fairmount in Philadelphia), and there walk and sit, again walk and sit, and, finally, after an hour or so, ride home. In many cases where the character of the country permits, ascents proportionate to the age and strength of the patient may be prescribed. They should be made with slow and measured steps and rests by the way. To expand the lungs while climbing, the elbows may be approximated behind the back, and a walking-stick may be supported between them. Whether walking on a level or climbing, the patient should be instructed to breathe deeply and slowly. Whether with the weak or the comparatively strong, fatigue is always to be avoided; exercise, therefore, should be instituted in a mild form and gradually increased.

Open-air treatment is of decided value. Exposure to **open air** and to **sunlight** should be as frequent, as long, and as thorough as the climate, season, weather, and patient's condition and endurance permit. The roof or back yard may be used on pleasant days. Even if circumstances compel housing, the endeavor should be made to get the sun and fresh air into the room where the patient sits or reclines. He should rest, warmly wrapped, before the open window. At night the windows should be kept open. The importance of this treatment cannot be too often reiterated.

In choosing an **occupation** for one thought to be liable to tuberculosis, or in the management of a patient already showing symptoms of the disease, the desirability of open-air life must be borne in mind. Many persons recover through change of business. Quite in point is Benjamin Franklin's celebrated instance of the man who contracted consumption while a shoemaker, and recovered while riding as post-boy between New York and the Connecticut River (about 140 miles) in all seasons and weathers. Most patients are kept indoors too much on account of weather. While care is necessary, it is best to be out whenever possible.

Amusement is quite as important as occupation, and requires equally good judgment. When the patient has tastes and means for a pleasant avocation, his desire should be gratified. In any case the endeavor should be made to divert the mind from self by reading, music, games, theater, concert, and lecture (when this does not involve too long a stay in an overcrowded hall), or whatever means are available. Undue excitement, however, is to be avoided.

Food is to be carefully chosen with due consideration of the habits and digestive capacity of the patient. Nutrition, nutrition, nutrition, is the essential of treatment; and food the essential of nutrition. Two mistakes are to be avoided—overfeeding and underfeeding. Often the patient lacks appetite, but is able to digest and assimilate much more food than is required in health. In such cases it is wise to feed up to the limit of digestive capacity, and for this purpose twice daily, after a preliminary lavage with a warm solution of sodium bicarbonate (1 dram to 1 pint), about a quart of fully peptonized milk, with one or two eggs, an ounce of beef-powder, 30 drops of dilute hydrochloric acid, and 5 or 10 grains of pepsin may be introduced through the stomach-tube. The ingredients are to be thoroughly mixed, and the temperature of the mixture should be about 100° F. In addition to the gavage, the patient may be allowed to eat a midday meal of such permissible food as pleases his palate. Other patients will need only to be encouraged to eat sufficient food, and gavage will be unnecessary. In other cases the digestive capacity and the exercise taken become important factors in permitting the amount of food given to be increased. The assimilative power is impaired, and until, by proper management, this has been restored, it will be necessary to restrict the quantity and kinds of food. As a general rule, subject to modification in individual cases, patients having good prospects of recovery or partial recovery should be fed as bountifully as possible; while those in the later stages, with the

end nearing, especially when active exercise has been interdicted, should not be given large quantities of food. In the average case the meals should be comparatively frequent—say 6 *per diem*, at intervals of about 3 hours. At three of these meals there should be taken as much as one in good health ordinarily eats. The others may consist of a plate of soup or a glass of milk or of cream or a half-dozen oysters or a sweetbread or a squab or something similar. It is often well to drink a glass of hot milk just before going to bed; and in some cases milk or a liquid preparation of so-called peptones or a glass of a good wine of coca should be at hand to be taken if the patient awakes during the night. A half-hour before meals 1/2 of a pint or a pint of hot water is often of use in preparing the gastric mucous membrane for the reception and disposition of the food. Simplicity in diet is necessary. Nitrogenous and fatty elements should predominate, sugars and starches be reduced to a minimum.

Cod-liver oil, plain, or emulsionized with the aid of pancreatin, is one of the best of fatty foods. It may be given in doses of 1/2 of an ounce or less after meals. In some cases beef or mutton fat, butter, olive oil, and the like, serve equally well, and, being utilized in the ordinary way, seem less like medicine. Milk, preferably hot, is to be taken freely; if possible, a quart and a pint of milk and a pint of cream daily. Koumiss, kefyr, and the like may be substituted for plain milk or alternated with it. Soups, such as bouillon, oyster broth, clam broth, mutton broth, beef broth, turtle soup, barley, rice, bean and pea soups and purées, celery broth made with milk and thickened, are useful. Beef, underdone, roast or broiled; mutton or lamb roast, or broiled chops; sweetbread; brain; poultry, broiled, roast, or stewed; nearly all kinds of game; fresh fish; salt codfish; salt mackerel; eggs, steamed, boiled, poached, beat up with milk, should be the principal articles of diet. Nothing should be fried. The green vegetables—lettuce, spinach, asparagus, watercress, and the like—are of great service; as are, likewise, the legumens—peas, beans, lentils, etc. Fresh fruits of all kinds are to be freely used in the absence of special counterindication. Of starchy foods, rice, well cooked, and occasionally sago, tapioca, etc., are the best. Potatoes, turnips, carrots, beets, and other starchy and sugary roots and tubers are to be avoided altogether or used very sparingly, for occasional variety. The infrequent potato should be "roasted in the jacket" until it becomes ready to fall into powder when opened; or, if necessary, "twice baked." Other desirable vegetables are tomatoes, onions, and celery. Cereals—hominy, oatmeal, cracked wheat and similar preparations—may be used in moderation if well digested. Bread should be reduced to the minimum consistent with comfort—toast, zwieback, and pulled bread being preferable to ordinary bread. Hot bread, cakes, pies, pastry, sweetmeats, made dishes, rich gravies, crabs, lobsters, and, among meats, pork and veal are to be strictly avoided.

The best beverage is water, to be taken freely; the purer the better. Mineral waters offer no special advantage unless needed as laxatives or diuretics. In some cases alcohol is of the highest use, in others useless, and in others harmful. It should not be given as a routine. When given, it should be used in comparatively large quantities —from 4 to 8 ounces of good whisky daily. When the patient is taking sufficient other food, the heart is acting well, and the digestion is good, alcohol is usually unnecessary. When there are fever, impaired appetite, poor digestion, and feeble action of the heart, alcohol usually helps temporarily. While by no means advocating this plan, reference may be made to three cases of remarkable recovery—*i. e.*, restoration to good health of patients with decided pulmonary lesions—upon the old treatment of whisky and cod-liver oil—the quantities ordered having been "as much as you can stand." The period over which the treatment extended in these cases varied from a few months to several years.

Water is to be used freely both internally and externally. Not only the drinking of hot water before meals, but, if necessary, lavage of stomach and intestines with physiologic saline solution or some alkaline detergent solution of about the same specific gravity is to be practised in order to keep the alimentary canal clean, as free as possible of ptomains and other toxins, and the mucous membrane active. In addition pure, cold water, carbonated or still, as may be most palatable, is to be imbibed freely between meals; and may also be taken with meals, in moderate quantity, if preferred. Wine and water (claret or Burgundy) is better than plain water with meals.

Hydrotherapy is of the greatest importance not only as a curative, but also as a prophylactic measure.

Water should also be freely used externally, not merely for cleanliness but as a direct stimulant to the skin and its vessels, and immediately to circulation, respiration, and general nutrition. According to the patient's age, temperament, and strength, the stage of the disease, the condition of the heart and vessels, the individual reaction, the climate, season, and weather, various hydrotherapeutic measures are useful. For details, treatises on hydrotherapy should be consulted. As a prophylactic measure cool or cold sponging on rising in the morning is generally applicable. Those who react well may substitute for add a gentle shower bath or douche—at first for 20 or 30 seconds, later for a minute for more. This is to be followed by forcible, dry friction; and the patient having dressed and having swallowed, not hastily, a glass of hot milk, should take a walk, not long enough to cause fatigue, and then return for breakfast. In unpropitious weather, indoor exercise, gradually increased in activity, may be substituted.

Delicate and sensitive persons not inured to cold bathing must be accustomed to it gradually, tepid water being used at first. In every case the physician should prescribe the temperature

of the water and the details and duration of the bath, douche, or other application, with the same care that he gives to the dosage of medicine.

Counterirritation is sometimes useful in the early stages of pulmonary tuberculosis, and especially when there is softening. Cantharidal collodion or a mixture of tincture of iodin, croton oil, ether, and collodion may be employed. The best plan is to irritate successive small portions of the skin over the seat of lesion, allowing one spot to heal before the next application is made.

Pneumotherapy, or the use of air at modified pressures, is among the most important, as it is the most neglected, of our means of defense against pulmonary tuberculosis. The literature of the subject should be carefully studied by every physician. In many cases the use of appropriate apparatus under the physician's direction will obviate the necessity of seeking a change of climate.

There are two forms in which condensed and rarefied air may be utilized. These have been termed the *absolute* and the *differential* methods. The first is carried out by the use of pneumatic chambers modeled after the diving bell, the first of which was constructed for Tabarie in 1838. The patient remains for an hour or more in air gradually raised to a pressure far exceeding the normal (from 1 1/2 to 2 atmospheres), and then gradually lowered. Rarefied atmospheres are theoretically useful, but have not been used in medicine in these chambers. The disadvantage of this method is that its use is limited to certain resorts. The differential method is carried out by apparatus of two different types. In one, the patients remain in the ordinary atmosphere and inhale from or exhale into (or both) cylinders containing condensed or rarefied air. In the other, patients enter an apparatus in which the air about them is condensed or rarefied, while they inhale from and exhale into the ordinary air. The type of instruments of the first class is the gasometer of Waldenburg—the modification of S. Solis-Cohen being the most convenient for use at the patient's home. The type of instruments of the second class is the pneumatic tub of Hauke; the pneumatic cabinet of Williams being the most elaborate.

The physiologic and therapeutic effects of the two types of instruments do not differ; the questions to be considered being merely of expense and mechanic convenience. While the pneumatic cabinet is theoretically capable of the same variation in use as the gasometers, in practice it is impossible to alter its pressure rhythmically with the patient's respiration; hence the air it contains must be either rarefied or condensed during an entire sitting; the patient thus both inhaling from and exhaling into air relatively higher or lower than that surrounding him. The most common use is to rarefy the air of the cabinet, and the patient thus continuously respires relatively condensed air.

In the gasometer instruments any of the following 8 modifications are perfectly practicable:

Inhalation from	Exhalation into
1. Condensed air.	Unaltered atmosphere.
2. Condensed air.	Condensed air.
3. Condensed air.	Rarefied air.
4. Rarefied air.	Unaltered atmosphere.
5. Rarefied air.	Condensed air.
6. Rarefied air.	Rarefied air.
7. Unaltered atmosphere.	Rarefied air.
8. Unaltered atmosphere.	Condensed air.

In pulmonary tuberculosis the expedients numbered 1, 2, and 3 are those employed, and chiefly 1 and 3. The most useful is generally 3; which fact alone serves to give this method the preference over the pneumatic cabinet.

If desired, the air inhaled, which is drawn from out-of-doors, and filtered through cotton on its way to the cylinder, may be artificially cooled, warmed, dried, or moistened. The air may be impregnated with the vapor of any medicinal substance, by passing it through a solution in a wash-bottle, by suspending in the condensation cylinder a vial or a sponge containing the drug, or by inserting a sponge or cotton wad, appropriately moistened, in the mouth-piece. The pressures (positive or negative) employed, which are to be gradually increased as the case progresses, range from 1/75 to 1/30 of an atmosphere (1/5 to 1/2 pound to the square inch); and are regulated by weights or counterweights as condensation or rarefaction is desired. The inhalations and exhalations are to be made as slowly and perfectly as possible, the rate of respiration being reduced to 10 or less a minute, if possible; the volume of air inhaled or exhaled being brought up to 200, 250, 300, or even 400, cubic inches as recovery progresses. From 5 to 20 minutes continuous respiration is followed by a rest of the same length, and a repetition of the process. The patient should stand, if able to; the clothing should be loosened, outer garments being removed, and, if necessary, the physician or an attendant should assist respiration by pushing the patient's shoulders back during inspiration, and pressing the arms against the sides of the chest during expiration. The treatment is time consuming and requires intelligent care and supervision; but should not therefore be omitted. When patients can afford to buy or rent an apparatus for use in their own homes, a member of the family or a nurse can readily be instructed in its use. It is worth all the drugs in the Pharmacopeia as a therapeutic measure in pulmonary tuberculosis.

Briefly, inhalation of condensed air produces the following effects: Diminution of muscular effort; increased dilatation of alveoli; increased volume and penetrating power of tidal air; consequent increase of gaseous exchange and volume of expired air; increase of volume of pulmonary circulation; increased absorption of oxygen; increased peripheral circulation; increased metabolism. There result: Diminished frequency of respiration, increased expansion and ventilation, with great increase of vital capacity; diminished frequency, with increased force of heart's action and increased fulness of the pulse.

Exhalation into rarefied air produces the following effects: Contraction of the thorax is facilitated; expiration is made more complete; subsequent inspiration is easier and deeper; pulmonary congestion is diminished; the heart is more thoroughly emptied, and diastole is facilitated. The combination of these procedures is, therefore, an effective means of pulmonary ventilation and of relieving local stases. It acts as a stimulus and a regulation to respiration and circulation, and thus becomes an effective means of restoring both local and general nutrition. The vital capacity of patients is permanently increased, especially by calling into use portions of lung not fully expanded; appetite is improved, and the greater quantities of food consumed are oxidized and utilized. Secretion is stimulated and excretion facilitated. Cough and expectoratiou are at first increased, from dislodgement of accumulated materials, afterward diminished. Sleep is promoted.

When there is elevation of temperature to 100° F., the method is to be employed only with caution, and not at all if the fever is continuous and marked local changes are in progress. Active softening without fever is also a counterindication. Pneumatic treatment should not be used when there is a large cavity with fluid or semifluid contents; but dry cavities present no objection. If hemorrhage occurs, inhalation should be intermitted, but may be resumed cautiously some time after the bleeding has ceased.

After patients have sufficiently recovered to omit the constant use of the apparatus described, the good effects may be kept up by use of S. S. Cohen's pneumatic resistance valve. By adjusting the springs as shown upon the scale above each valve to one of the fingers, 6, 5, 4, 3, there is secured a pressure approximately of 1/60, 1/50, 1/40, or 1/30 of an atmosphere, in resistance to inspiration or expiration or both, as desired; that is, practically, inspiration of rarefied air and expiration into condensed air. The effect is to necessitate greater muscular effort in respiration, and thus to secure regulated pulmonary gymnastics, with stimulation of circulation. It cannot take the place of the other method, but is applicable only with patients able to make the increased exertion; the gasometer being employed when patients need assistance in respiration. It is especially applicable as a prophylactic measure in the young and fairly robust, who need to be given a proper respiratory habit. The inspired air may be medicated by placing a few drops of any suitable volatile drug or mixture (eucalyptol, creosote, chloroform, ethyl iodid, terebene, etc.) on cotton in the receiver.

Sometimes patients may be induced to respire properly through the device of Dr. Ramadge: A tube (a section of ordinary "speaking-tube," with a proper mouth-piece will answer) about 4 feet long, with the far end slightly narrowed, which is to be placed out of the window every morning and noon, while slow, full respiration is practised for from 5 to 30 minutes.

The secretions and excretions are likely to be kept in good order by following the plans detailed as to clothing, outdoor life, food, rest, exercise, and the use of water and of air, but sometimes special treatment or medication is temporarily necessary. These measures do not differ in principle or method from those employed in other affections. Some authors recommend, however, the more or less constant administration of cardiant diuretics, such as spartein sulphate.

Tuberculin Treatment.—The present opinion with regard to tuberculin therapy is divided. There are excellent observers who claim that it is useless, and others who claim for it a distinct therapeutic value. Practically all are agreed that when given it should be administered in such small doses at first to render a general reaction unlikely and to increase the dose of subsequent administration at specific times with the greatest caution to prevent reactions. This will necessitate starting with doses considerably below the tuberculin tolerance of the individual. Subsequent doses are given at 5 and 7 day intervals, and by some observers, twice weekly. The initial dose, the increment of increase, the length of time between doses depend so largely upon the various factors present in a given case, that specific rules cannot be stated. Individualization is of such vital importance in the success of tuberculin therapy, that the failure to appreciate it has led to many failures in its use. Brown recommends the following beginning doses which have been used by the writer. For old Tuberculin (O. T.) and Bouillon Filtrate (B. F.) the usual beginning dose may be 0.0000005 or 0.000001 mil, though in a few, especially if febrile it may be 0.0000001 or 0.00000001 mil. Bacillen Emulsion (B. E.) and Tuberculin Residuum (T. R.) the initial dose should be 0.00001 gm. for afebrile and 0.0000001 gm. for febrile patients. In children and in febrile patients the dose is smaller than in afebrile adults. New Tuberculin (T. R.) is the mildest of all preparations and is very suitable for the beginning treatment of susceptible individuals (Citron). The various tuberculins have their advocates, Funk prefers Bacillen Emulsion. Certain observers have noted that this preparation tends to produce infiltrations at the site of injection. Meyer and Rupple have advised the employment of sensitized Bacillen Emulsion by which is meant an emulsion treated with tuberculous serum of a cow containing so-called anti-tuberculin, with the result that infiltrations are much less or entirely absent (Citron). If at any time during the course of treatment a reaction occurs the dose should be reduced to, or below, the doses which previously gave no reaction and the subsequent advance made more cautiously. The maximum dose to be reached varies in different individuals; in B. E. 5 mg. should not be exceeded, while in O. T. and B. F. 1 mil is the usual maximum dose (Brown). Whenever tuberculin is administered the patient should be under direct control of the physician and a careful record of the temperature range, general and focal reaction kept. Better results are obtained if maximum rest, fresh air and good food can be secured with the tuberculin therapy. It is contraindicated in the presence of high fever, marked asthenia, myocardial weakness

with excessively rapid pulse, advanced disease, hemorrhage and the presence of a serious complication such as empyema, etc. The selection of suitable cases for tuberculin treatment is a matter of considerable difficulty. It must be remembered that tuberculin is a poison which acts by stimulating the body forces. In a patient in whom the disease is acute and active the system is more or less overwhelmed with poisons produced at the site of the lesion and in such a case tuberculin is contraindicated. On the other hand, there are cases which are afebrile or have slight fever, slight constitutional disturbance and limited local involvement of a chronic nature in which the warfare between the infecting tubercle bacilli and the body forces seems to be waging in the balance, and the patient seems to gain but little under active, hygienic, dietetic care. In this type of case good results may follow careful use of tuberculin. Tuberculin has been used not only in pulmonary tuberculosis, but in the treatment of tuberculosis of almost every organ, viz., skin, eye, ear, larynx, bones and joints, genito-urinary system, etc., etc.

Preparations (Unofficial).—Tuberculinum (Tuberculin) (Koch), is a glycerin extract of the culture fluid upon which the bacilli have been grown, concentrated to 1/10 its original volume, and filtered through porcelain to remove the bacilli.

Tuberculin Residuum (T. R.) **(New Tuberculin)** (Koch), is prepared by drying living virulent cultures *in vacuo*, grinding them into a fine dust, and after extracting certain soluble constituents with saline solution the residue is rubbed up with water to form an emulsion, which is standardized so that 1 c.c. represents the active substance found in 10 mg. of the dried tubercle bacilli.

New Tuberculin (Bacilli Emulsion) (Koch), is a suspension of pulverized tubercle bacilli in glycerin and water, containing 5 mg. of the bacillar substance in each c.c. Initial dose, 1/100 mg., diluted with normal salt solution.

Tuberculin Denys (Bouillon Filtrate) (B. F.), consists of the filtrate from bouillon cultures of the tubercle bacillus, and contains all the soluble products elaborated by the bacilli while growing on bouillon. It differs from the original tuberculin in that no heat is used in its preparation and that it is not concentrated. Initial dose, 1/1000 mg.

Medication in pulmonary tuberculosis may be directed against some symptom, or may be directed generally to improving nutrition: *i. e.*, vital resistance. Next to cod-liver oil, the most efficient drugs are the creosote group and the iodin group.

The creosote group includes creosote, creosote carbonate, guaiacol, guaiacol carbonate, guaiacol salicylate, guaiacol benzoate, and potassium guaiacol sulphonate (known as thiocol). *The iodin group* includes metallic iodin, Lugol's solution, arsenic iodid, Donovan's solution, diisobutylorthocresoliodid (known as europhen), ethyl iodid, and iodoform.

Of good beechwood creosote large doses may be given by gradual increment without disordering digestion; but many of the commercial preparations contain gross impurities, and are unfit for internal use. Some patients cannot take large doses, or even small doses, of even the best creosote; in which case one of the substitutes mentioned may be used. Creosotecarbonate (creosotal), a syrupy liquid, is even better than creosote and is best given in hot milk, and in doses of from 5 to 60 minims, 3 or 4 times daily. The guaiacol salts are tasteless or nearly tasteless powders, and may be given as such or in capsule, in doses aggregating from 15 to 75 grains daily. Duotal or guaiacol carbonate is sometimes better borne than creosotal. It is given in doses of 3 to 7 1/2 grains three times a day. Beechwood creosote may be given in doses of from 1 to 40 minims 3 or 4 times daily. The average dose is 10 minims. It is best given in milk, about 2 hours after meals. It may be shaken up with a tablespoonful of cod-liver oil, which some patients like, comparing the taste to fat smoked mackerel. Creosote or guaiacol may be given with alcohol, in the form of sherry wine or rum, with or without the addition of gentian or glycerin; or in emulsion with cod-liver oil or olive oil; or in capsule with morrhuol or cod-liver oil. These drugs should not be given in capsule without an oily vehicle. They may be given with milk as a rectal injection or in oily solution of 10 percent or more by intratracheal injection or hypodermically. The dose is generally to be somewhat below the point of tolerance, the urine being carefully watched. Cases of sudden nephritis and other forms of poisoning are on record. Inunctions of guaiacol are valuable, especially in children. Gomenol is said to be a valuable substitute for creosote.

Preparations of the creosote group are most useful in cases in which active inflammatory processes, catarrhal or tuberculous, are in process, and in cases with persistent high temperature, though they may be of service at all stages. Their action has not been satisfactorily explained. They probably have a good local influence during their elimination by the bronchial tract.

Of *the iodin group*, iodoform is the most useful. It is best given in pill (sugar-coated) form. An excellent combination is iodoform and reduced iron, made into pills containing 1 grain of each, the dose being gradually increased to 3 or even 5 pills at a time, after meals, thrice daily. It may sometimes be useful to combine other drugs than iron with the iodoform, in which case gelatin capsules may be used, Peruvian balsam being employed as the vehicle. Iodoform may also be given by inunction, in cod-liver oil or lanolin, as advised by Flick, who employs europhen also in this way. It is most useful in the early stages of the disease or during periods of quiescence in the chronic forms. Creosote and iodoform may be given to the same patient in alternate doses or on alternate days, when the signs in various portions of the lungs so differ as to indicate an advanced or active process here, and a quite recent or sluggish process there.

Cinnamic acid by intravenous injection is highly praised by Landerer, who reports a large proportion of successful cases. The dose is from 1/2 milligram, gradually increased to a maximum of

25 milligrams of *sodium cinnamate*, or cinnamylate dissolved in physiologic salt solution. The injections are repeated about every 48 hours, and continued for several months. The drug acts by increasing leukocytosis. During the past few years good results have seemed to follow the use of a solution of *palladium chlorid* (made with the aid of nitro-hydrochloric acid) of a strength of 15 grains to the ounce, in doses of from 3 to 10 drops thrice daily in water, half an hour before meals. In several cases it seems to have been useful as a substitute for iodoform, rather than for creosote. If given for too long a time, or in too large doses, it causes rapid and irregular cardiac action. Extract of kalagua is the most recent drug that comes well recommended. It is given in doses of from 9 to 20 grains *per diem*.

Mercuric succinimid in intramuscular injections—extolled so highly by Barton Wright and others—has according to recent report proved not only worthless, but injurious.

Of the drugs employed for the *stimulation of general nutrition* strychnin, arsenic (especially in the form of sodium cacodylate), iron, nuclein preparations, and the hypophosphites are the most useful. The best results usually follow from small, long-continued doses and alternation of remedies; though individual cases are benefited by rapid increase to the point of tolerance.

Digitalis is often useful as an adjunct to the roborant treatment, especially in cases of small heart and feeble circulation. In some instances nitroglycerin may be well combined with it. Digitalis has also special indication during acute processes, as long ago pointed out by Beddoes. In acute phthisis or in febrile exacerbations of chronic phthisis, it should be pushed to the point of tolerance. A good preparation, free from irritating impurities, is necessary. Pepsin preparations given at the same time will help gastric toleration. When the leaves or tincture cannot be used, Merck's German digitalin, as recommended by Beates, may be tried.

Oxygen is useless as a remedy, and may hasten death; but is among the best of palliatives in the latest stages. Combined with nitrous oxid, its inhalation relieves dyspnea and promotes the sense of well being.

Nitrous oxid is among the best palliatives for the relief of cough, of insomnia, and of hectic fever. It is usually best to give it during the forenoon, at two periods separated by about 2 hours. Each inhalation may consist of from 3 to 8 gallons, air being allowed to enter through the nostrils and by the side of the mouth-piece. The patient breathes more freely and more deeply after the inhalation, and cough is quieted, but unconsciousness is not produced.

Certain symptoms require special medication.

Indigestion is to be treated on general principles, but carefully.

Diarrhea is often troublesome, especially toward the end. Diet is to be regulated, milk being excluded, if necessary. Among useful drugs are beta-naphthol, benzonaphthol, beta-naphthol-bismuth, bismuth salicylate, bismuth subnitrate or bismuth carbonate in large doses, bismuth subgallate, hematoxylin, silver nitrate, cupric sulphate, zinc phenolsulphonate, plumbic acetate, and solution of potassium arsenite in small doses. Often morphin or opium is necessary. Before any drug is given the bowel should be thoroughly irrigated with saline solution, and a good cleansing from above with calomel or castor oil and aromatic syrup of rhubarb is often useful.

Vomiting is often the result of cough, especially when there is much effort. In some cases it is nervous, and can be relieved by strychnin given at bedtime. Strontium bromid is among useful gastric sedatives. Otherwise general principles apply.

Night-sweating can usually be checked by atropin in massive or divided doses of from 1/480 to 1/40 grain at bedtime; it should be tried first in small doses, and increased, if necessary. Other useful drugs are picrotoxin, from 1/60 to 1/10 grain hypodermically, if necessary; strychnin sulphate or strychnin nitrate in the same dose; homatropin, of which the dose is said to be from 1/2 grain to 2 grains; agaracin, from 1/8 to 1/2 grain, 2 or 4 times daily; camphoric acid, from 10 to 20 grains in capsule at bedtime; ergot; aromatic sulphuric acid. Dusting with zinc oxid, or sponging with a saturated solution of quinin in alcohol or with a saturated solution of alum in alcohol often helps to control this symptom.

Hemorrhage varies from slight blood-spitting to considerable flow. It may be due to oozing from small vessels, to perforation of a large vessel, or to rupture of an aneurysm within a cavity, and the management varies accordingly. In many cases the bleeding ceases spontaneously, especially if the patient is kept at rest, and doubtless the popularity of many remedies is thus to be explained. If there is more than a mere trace of blood in the sputum the patient should be put to bed and given cracked ice, which is to be allowed to melt slowly in the mouth from time to time. According to the severity of the case, some or all of the following measures are to be adopted:

An ice-bag may be applied to the precordium, and kept on constantly, especially if there is an elevation of temperature. Tincture of aconite may be given in sufficient dosage to quiet the heart and to reduce and keep the pulse-rate to 60 a minute. Crystallized calcium chlorid may be given in solution in doses of 15 grains every second hour, for about 4 days; it is then to be intermitted for 4 days or more, and used again, if need be. In the interval lead acetate, in doses not exceeding 5 grains, thrice daily for 3 days, may be given, to be followed for 2 days by aromatic sulphuric acid in doses of 30 drops, well diluted, thrice daily or oftener. Hydrastinin hydrochlorid in doses of 1/24 to 1/8 grain hourly or less often is sometimes useful. Among drugs to be recommended are also the turpentine group, of which erigeron is among the best. Fluidextract of matico is recommended by Da Costa. Codein may be given by the mouth in doses of from 1/8 to 1/2 grain every second hour or less often; or morphin acetate may be given by the mouth in doses of 1/8 grain

every hour or two; or morphin sulphate hypodermically in dose sufficient to prevent coughing absolutely in severe cases.

Atropin sulphate, from 1/200 to 1/60 grain, may be given hypodermically at the beginning of the attack, and will often cut it short.

The patient must be forbidden to speak, except in a labial whisper. Cold liquid food should be given in small quantities at intervals of about 2 hours. The bowels should be moved daily, without straining, by enema, glycerin suppository, or saline purge, as necessary. In desperate cases tannin has been injected into the lung, as also have gelatin solutions.

Fever is best treated by rest (not necessarily indoors) with cold applications, of which the precordial ice-bag is the best. The coal-tar antipyretics may be cautiously used as palliatives, if necessary. Digitalis is often useful. Nitrous oxid is to be tried.

Cough should not be interfered with unnecessarily. It should be sufficient to expel the accumulations of mucopus in the trachea and larger bronchi. The expectorated matters are to be properly received disinfected, and disposed of (see COUGH). Cough may be checked, when excessive, by opium, hydrocyanic acid, chloroform, or bromids. When unproductive, it needs to be made freer. The ammonium compounds are not often useful. As a rule, terebinthinates and balsamics, menthol, eucalyptol, terebene, terpin hydrate, and myrtol are the best agents for this purpose, internally or by inhalation. Steam inhalations are to be avoided, but dry inhalations of any volatile oil, of creosote, of well-diluted formaldehyd, or of ethyl iodid are serviceable. No apparatus except a containing phial is usually necessary, but various convenient forms of inhalers are manufactured. When cough is due to ulceration of the larynx, it is to be treated skilfully, as described under LARYNGITIS (Chronic).

Dysphagia, as a rule, is due to ulceration of the epiglottis, which requires local treatment. The food should be semisolid and bolted hastily. Cocain or other local anesthetic may be used with caution before meals. Rectal feeding or feeding through a nasal tube may have to be employed.

Pain in the chest may often be relieved by rubbing in a few drops of a solution containing one or more of the following agents with camphor (liquefaction taking place on mixing): Chloral, menthol, guaiacol, oil of gaultheria. Counterirritation with iodin or croton oil, or even the thermal point, is sometimes necessary.

TUBERCULOSIS, SURGICAL.—See BONES (Diseases), JOINTS (Diseases), LYMPHATIC GLANDS (Diseases), etc.

TUMENOL.—A dark brown fluid, obtained by treating the unsaturated hydrocarbons of mineral oils with concentrated sulphuric acid. It is said to be a nontoxic and nonirritant protective and palliative to the skin. It is recommended in eczema, excoriations, erosions, superficial ulcerations and burns. The tincture is an efficient application in all forms of pruritus. Tumenol is of no service in erysipelas, and not a parasiticide.

TUMORS, CLASSIFICATION.*—In deference to the needs of the various registration authorities, a distinction between malignant and nonmalignant new growths is made in the general and local tables. The tumors are here classified, however, according to their structure and the type of normal tissue thay most closely resemble. To facilitate returns under the general tables, the malignant growths are marked by two asterisks. In certain cases malignant and nonmalignant growths are unavoidably associated under one head, as, for instance, under sarcoma; the name is then marked with one asterisk.

Cysts are placed in a separate class, and may be returned severally among the local affections of organs; or among new growths, if connected therewith; or as malformations, if congenital; or as parasites, if parasitic.

Class I.—Tumors composed of one of the modifications of fully developed connective tissue.

(The name of the typical normal tissue is printed first in each case; that of the tumor second.)

1. **Adipose Tissue.** Lipoma (fatty tumor).
   - (*a*) Circumscribed.
   - (*b*) Diffuse. *Synonym*, fatty outgrowth.
   - (*c*) Multiple.
   - (*d*) Nevolipoma.
   - (*e*) Fibrolipoma.
2. **Fibrous Tissue.** Fibroma.
   - (*a*) Firm or hard fibroma (desmoid tumor).
     Fibrous epulis.
     Fibrous polypus of nose.
     Fibroma of nerves. *Synonym*, false neuroma.
     Keloid.
   - (*b*) Soft or areolar fibroma.
     Molluscum fibrosum.
3. **Cartilage.** Chondroma.
   - (*a*) Ossifying. *Synonym*, spongy or cancellous exostosis.
   - (*b*) Nonossifying.
     *Enchondroma (when growing in bone).
     Ecchondrosis (when growing from cartilage).
   - (*c*) Myxochondroma (when undergoing mucous softening).
4. **Bone.** Osteoma.
   - (*a*) Developing from cartilage.
     Cancellous or spongy exostosis.
   - (*b*) Developing from membrane.
     Compact or ivory exostosis.
   - (*c*) Of teeth.
     - (1) Growing from the cement.
       Dental exostosis.
       Hypertrophy of cement.
     - (2) Growing from the dentin.
       Odontoma.
5. **Mucous Tissue.** *Myxoma.
   Mucous polypus.
6. **Neuroglia.** *Glioma.

Class II.—Tumors more or less closely resembling in structure one of the more complex tissues or organs of the body.

(The name of the typical tissue or organ is placed first; that of the tumor second.)

1. **Muscle.** Myoma.
   - (*a*) Unstriped (leiomyoma).
     Fibromyoma, uterine fibroid, fibroid tumor of prostate.
   - (*b*) Striped (rhabdomyoma).
     *Myosarcoma.

*Revised nomenclature of the Royal College of Physicians, 1896.

2. **Nerves.** Neuroma (true neuroma).
   (*a*) Medullated.
   Plexiform neuroma (in part). Bulbous nerves. *Synonym*, amputation neuroma.
   (*b*) Nonmedullated.
3. **Blood-vessels.**—Hemangioma, angioma, or nævus.
   (*a*) Capillary. *Synonyms*, port-wine stain; mother's mark; telangiectasis.
   (*b*) Venous. *Synonyms*, erectile tumor; cavernous nævus.
   (*c*) With adipose tissue (nævolipoma).
4. **Lymphatic Vessels.** Lymphangioma, lymphatic nævus, congenital cystic hygroma of neck, macroglossia.
5. **Lymphatic Glands.** Lymphadenoma.
   Hodgkin's disease.
6. **Papillæ of Skin or Mucous Membrane.** Papilloma.
   (*a*) Squamous papilloma (wart).
   (*b*) Columnar papilloma (villous growth).
   Of rectum. Of bladder.
7. **Secreting Glands.** Adenoma.
   (*a*) Racemose adenoma (spaces lined with glandular or spheroid epithelium).
      (1) Resembling normal gland tissue (true adenoma).
      (2) With excess of firm fibrous stroma (adenofibroma; adenoid tumor).
      (3) With stroma of imperfectly developed fibrous tissue (adenosarcoma).
      (4) With stroma containing mucous tissue (adenomyxoma).
      (5) With large cysts throughout the tumor (adenocystosarcoma; cystosarcoma).
      With simple cysts. With intracystic growths.
   (*b*) Tubular adenoma (spaces in tumor lined with columnar or cubic epithelium).
   (*c*) Adenoma of ductless glands (thyroid adenoma).
   (*d*) Ovarian adenoma.

Class III.—Tumors composed of cells of an embryonic type sometimes tending to develop into one of the forms of connective tissue.

*Sarcoma:
1. Composed of small round cells.
   (*a*) With homogeneous intercellular substance (granulation sarcoma; encephaloid sarcoma).
   (*b*) With reticulate stroma (lymphosarcoma).
   (*c*) Ossifying sarcoma (osteoid sarcoma; osteoid cancer).
   (*d*) Chondrosarcoma (malignant chondroma).
   (*e*) Gliosarcoma.
2. Composed of large round cells.
   With alveolar stroma (alveolar sarcoma).
3. Composed of oval cells.
   With mucous intercellular substance (myxosarcoma).
4. Composed of large spindle-cells (fibroplastic tumor).
   (*a*) Ossifying.
   (*b*) Chondrifying.
5. Composed of small spindle-cells.
   (*a*) Developing into fibrous tissue (recurrent fibroid tumor).
   (*b*) Ossifying.
6. Composed of round and spindle cells.
7. Containing giant cells (myeloid sarcoma).
8. Melanotic sarcoma (pigmented sarcoma).
9. Plexiform sarcoma (cylindroma).
10. Psammoma (brain-sand tumor).

Class IV.—Tumors composed of epithelial cells arranged in the spaces of a stroma of more or less perfectly developed and vascular connective tissue.

**Carcinoma, or True Cancer.
1. Glandular or spherical carcinoma.
   (*a*) With little stroma and abundant vessels (encephaloid cancer).
   (*b*) With dense fibrous stroma (scirrhus, or hard cancer).
   Variety: Atrophic cicatrical scirrhus.
   (*c*) With colloid degeneration of cells (colloid cancer—reticular or alveolar cancer in part).
   (*d*) With a myxomatous stroma (carcinoma myxomatodes).
2. Squamous carcinoma. *Synonyms*, epithelioma; squamous epithelioma.
   Note.—Chimney-sweeper's cancer is to be returned under squamous carcinoma.
3. Rodent cancer or rodent ulcer.
4. Columnar carcinoma. *Synonyms*, Columnar epithelioma; adenoid cancer.
   (*a*) With colloid degeneration of cells (colloid cancer in part).
   (*b*) Arising in ducts (duct cancer).
5. Thyroid carcinoma (resembling in structure the thyroid gland).

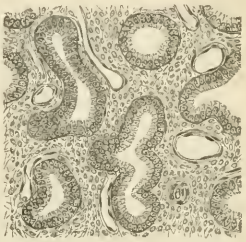
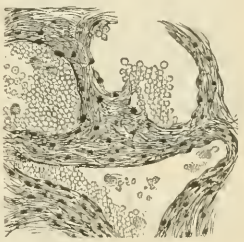
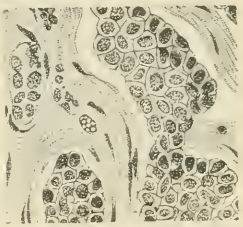
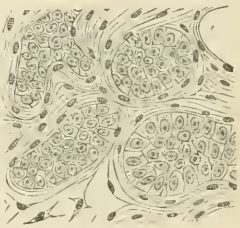
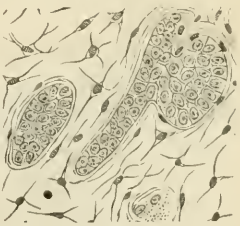
Class V.—Cysts.

1. **Cysts Arising from the Distention of Preexisting Spaces**
   (*a*) *Spaces lined with secreting epithelium (retention cysts).*
      (1) Acinous or glandular cyst of breast, pancreas, and other glands.
      (2) Duct cyst of the breast, pancreas, testicle, and other glands.
      (3) Galactocele.
      (4) Spermatocele.
      (5) Mucous cyst. Ranula. Labial cyst.
      (6) Sebaceous or atheromatous cyst (wen).
      (7) Ovarian cyst from Graafian follicles.
   (*b*) *Spaces lined with flattened endothelium (distention or exudation cysts; lymphatic cysts).*
      (1) Bursal cysts.
      (2) Ganglion.
      (3) Serous cysts.
2. **Cysts in which the Fluid is Contained in a Space of New Formation.**
   (*a*) Blood cyst. Apoplectic cyst in brain.
   (*b*) Degeneration cyst. In brain. In tumors.
3. **Cysts of Congenital Origin.**
   (*a*) Inclusion cyst. Dermoid cyst.
   (*b*) Cysts arising in the remains of fetal structures.
      (1) Unobliterated branchial clefts.
      Deep cysts of neck.
      (2) Unobliterated canal of His.
      Sublingual cysts in part.
      Subhyoid cysts in part.
      Cysts in front of larynx.
      (3) Remains of Wolffian body.
      Encysted hydrocele in male (in part).
      Cysts of the broad ligament in female (in part).
      (4) Partially unobliterated processus vaginalis testis.
      Encysted hydrocele of cord.
      (5) Partially unobliterated canal of Nuck.
      Hydrocele of canal of Nuck.
      (6) Cysts of postanal gut.
4. **Parasitic Cysts.**

TUMORS, TABLE OF

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Adenoma.				
1. *Acinous.*	Acini lined with spheroidal epithelium, with varying amount of connective tissue, as in a normal gland.	1. *Acinous.* Firm, rather hard consistence; inelastic; lobulated; light-gray or slightly yellow color; movable; encapsulated; generally single; rounded; when on mucous surfaces, flat and irregular.	Gray or yellowish-white; of variable density; often intermingled with cysts.	1. *Acinous.* Cherry or walnut; in the breast; large.
2. *Tubular.*	Tubules lined with cylindrical epithelium.	2. *Tubular.* Soft; frequently pedunculated; grayish-white or reddish color; translucent.		2. *Tubular.* Small.
Angioma.				
1. *Telangiectatic.*	1. *Telangiectatic.* Dilated blood-vessels.	1. *Telangiectatic.* Surface often covered with small, granular elevations, resembling a strawberry; often well circumscribed.	Red color; affecting in part the corium; in part the subcutaneous adipose tissue.	Patch on the skin the size of a millet-seed to several inches in extent.
2. *Cavernous.*	2. *Cavernous.* Spaces lined with endothelial cells and filled with blood, like corpora cavernosa of penis.	2. *Cavernous.* Soft, doughy; nonpulsating; leaden or blue color.		2. *Cavernous* Usually small.
Carcinoma.				
1. *Scirrhous* (hard, spheroidal-celled).		1. *Scirrhous.* Hard, irregular, tuberous; adherent to surrounding tissues; ulcerated. Nonencapsulated. *Ulcer.*—Irregular in outline and depth; margins hard, nodular, everted.	1. *Scirrhous.* Firm; white; often traversed by fibrous septa; creaking under the knife; cupped. Scraping exposes a milky fluid, the so-called "*cancer-juice.*"	1. *Scirrhous.* Moderate.
2. *Encephaloid* (soft, spheroidal-celled).	Large epithelial cells containing one or more nuclei, without visible intercellular matrix, grouped into acini (*cancer-nests*). Vessels have walls of norma thickness and constitution, and ramify in the stroma, and not among the cells themselves.	2. *Encephaloid.* Soft, globular, or bossellated; elastic, compressible; fluctuating; nonencapsulated.	2. *Encephaloid.* Resembles brain-tissue.	2. *Encephaloid.* Considerable.
3. *Colloid* (probably a degeneration of one of the preceding varieties).	Three varieties are described histologically: (*a*) squamous, made up of squamous or flat epithelium; (*b*) cylindrical, containing columnar cells; (*c*) glandular, composed largely of polyhedral cells, like those of secreting glands.	3. *Colloid* (usually mucoid). Soft; jelly-like; contains mucoid material; semitranslucent; glistening; at places diffluent.	3. *Colloid.* Amorphous; jelly-like.	3. *Colloid.* Large or small.
Chloroma.	A form of round-celled sarcoma (*which see*).	Small nodules.	Greenish or dirty color on section.	Small.

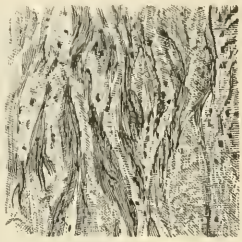
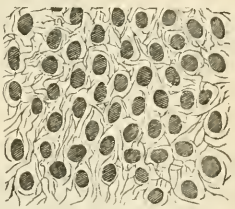
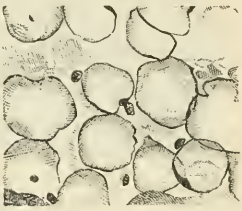
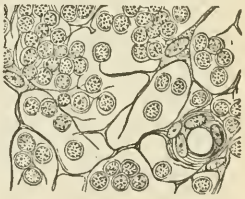
TUMORS, TABLE OF

Seats of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
1. *Acinous.* Mamma, lip, ovary, testis, prostate, thyroid, parotid, lacrimal gland, sudoriferous and sebaceous glands. 2. *Tubular.* Rectum and other portions of intestines; uterus.	Mucous. Fatty. Colloid. Cystic.	Young adults.	Slow.	Benign; the flat adenoma may become malignant.	Rare.	
1. *Telangiectatic.* Skin, mucous membrane, brain, bones, and mamma. 2. *Cavernous.* Liver, kidney, spleen, uterus, bones, muscle. (*Illustrated*).		Usually congenital.	Usually slow.	Benign.	Common.	
1. *Scirrhous.* Mamma; alimentary tract (especially the pyloric end of stomach); glands of the skin (rare); rectum, uterus. 2. *Encephaloid.* Testicle; ovary; mucous membranes. 3. *Colloid.* Stomach; intestine; ovary; mamma; thyroid. (*The illustration is of Myxomatous Carcinoma.*)	Horny. Fatty. Cystic. Colloid. Mucoid. Hyaline. Caseous. Pigmentary. Ulcerative. Calcareous (rare).	Adults past 40 years of age.	Slow, but may be rapid.	Malignant. Metastasis takes place by means of the lymphatics, but carcinoma of the stomach and intestines invades the liver by the portal blood-paths.	Common.	  
Periosteum of skull.	Fatty.	Young adults.	Rapid.	Malignant.	Rare.	Same as *Round-celled Sarcoma.*

TUMORS, TABLE OF

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Fibroma.	1. *Hard.* White, fibrous tissue, consisting of fibers and few connective-tissue corpuscles; blood-vessels few. 2. *Soft.* Few fibers, many cells.....	1. *Hard.* Ovoidal or spherical; lobulated; nodular or bossellated; pedunculated or sessile; firm, elastic; encapsulated; glistening white, yellowish, or slightly red color; unattached to overlying tissues; single or multiple. 2. *Soft.* Soft, compressible; sessile or pendulous; single or multiple; encapsulated.	1. *Hard.* Smooth, glistening, firm; grayish-white color. 2. *Soft.* Moist, not so glistening; more reddish.	From a grain of shot to fetal head or much larger.
Glioma.....	Round cells, with large nuclei, embedded in a scanty, granular, intercellular substance. After the type of the neuroglia of the brain.	Soft, gelatinous, glue-like tumor; not distinctly outlined; somewhat translucent. Usually single.	Like brain-tissue, but usually a little harder and more reddish in color.	Small, rarely larger than a fist.
Lipoma.....	Adipose tissue (fat-vesicles larger than normal) bound together by delicate connective tissue.	Circumscribed; lobulated, soft, doughy, pseudo-fluctuating, inelastic; attached to the skin—hence dimpled; ovoidal, spherical, or flattened; occasionally pedunculated; usually surrounded by a thin capsule; usually single; when multiple, usually hereditary.	Like adipose tissue...	From size of hickory-nut to very large size.
Lymphangioma..	Aggregation of dilated lymphatic vessels and lymph-spaces supported by connective tissue.	Soft, doughy, transparent sacs or vesicles, filled with lymph; often feels like a series of tangled cords.	.....	From a cherry to fetal head.
Lympho-sarcoma	Hyperplasia of the lymphoid cells of the lymphatic glands.	Glands for a time preserve their shape, but soon extends to neighboring itssues.	.....	Large.
Myoma. 1. *Leiomyoma.*	Smooth, non-striated, muscular fibers, such as occur in the uterus, with varying quantities of fibrous tissue; few blood-vessels. The fibers are composed of spindle-shaped cells containing large, rod-shaped nuclei.	Rounded or pyriform, well-circumscribed; hard; firm; smooth or nodular; white or flesh-colored; encapsulated or non-encapsulated; often multiple.	A striated appearance as in the fibroma.	Often quite large.
2. *Rhabdomyoma.*	Striated muscular fibers, often undeveloped, being spindle-shaped, and associated with sarcomatous tissue.	Large roundish masses or small nodules.	.....	Very large if in kidney; small in heart.

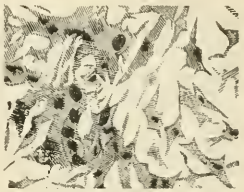
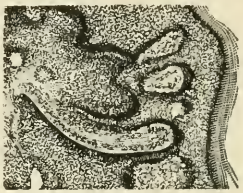
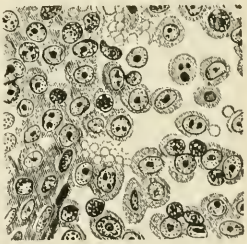
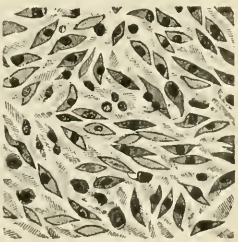
TUMORS, TABLE OF

Seat of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
Uterus; periosteum; ovary; labium majus; mamma; testicle; tendons; aponeurosis; neurilemma of nerves; around articulations; subcutaneous tissue; rectum.	Ulceration. Calcification. Myxomatous. Fatty. Telangiectatic.	Chiefly in adults from 35 to 55 yrs. of age.	Slow.....	Benign.....	Very common.	
Brain; retina; spinal cord; optic and auditory nerves; suprarenal capsules.	Mucoid. Fatty. Calcareous. Telangiectatic.	Particularly in children.	Slow.....	Benign, except in the eye, where it is usually combined with sarcoma.	Rare	
Back of neck; shoulders; back; nates; inside of arm and thigh; submucous and subserous connective-tissue.	Calcareous. Myxomatous. Cystic. Inflammation. Ulceration (rare).	Chiefly during adult life.	Slow.....	Benign.....	Very common.	
Posterior and inner surfaces of thigh; genitals; anterior abdominal wall, neck, nates, axillæ, groin, penis, tongue, cheeks, lips, liver, kidney.	.....	Usually congenital.	Slow.....	Benign.....	Rare.	
Neck, groin, axilla, mediastinum, etc.	.....	Young adults.	Rapid....	Very malignant.	Rare.	
Uterus, esophagus, intestine, prostate, stomach.	Calcareous. Fatty. Myxomatous. Cavernous.	Mature or advanced life.	Slow.....	Benign.....	Very common.	
Kidney, ovary, testicle; tongue, heart.	.....	Congenital.	Rapid....	Malignant in the segmental organs and kidney, ovary, testicle when combined with sarcoma.	Rare.	

TUMORS, TABLE OF

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Myxoma.....	Delicate network of stellate cells enclosing a mucoid intercellular substance. *Type*—Wharton's jelly; vitreous humor.	Round or lobular; soft, gelatinous; semi-translucent; encapsulated; elastic; may be fluctuating.	Pinkish or yellowish-gray, exuding a glairy fluid, or a trembling, gelatinous mass.	Usually small.
Neuroma.....	Medullated or non-medullated nerve-fibers. Very rarely may contain ganglionic cells; usually combined with fibrous tissues.	Spheric, ovoid, oblong, or bulbous, sometimes plexiform; firm; painful on pressure; few or many (even hundreds).	Often resembles fibroma.	Small.
Osteoma.....	Osseous tissue (cancellous or compact bone).	Hard; often lobulated; sometimes spheric; may be spinous or spiculated; pedunculated or sessile; usually single; may be multiple and symmetric.	Like bone-tissue.....	Variable; grain of coffee to cocoanut.
Papilloma.....	Hypertrophied papillæ of the skin; varying amount of connective tissue surrounding two or more central blood-vessels, and covered by several layers of epithelial cells.	Circumscribed; hard (on the skin); soft (on mucous membrane); surface smooth, brush-like, or cauliflower-like; single or multiple.	.....	Usually small; may be large.
Psammoma.....	A form of sarcoma (*nest-celled*). Connective tissue composed of flat, elongated cells of great size and in which are embedded gritty concretions that are composed of calcium carbonate.	Hard, circumscribed; light color.	White; gritty on section.	Small.
Sarcoma.				
1. *Round-celled*..	Embryonic or immature connective tissue. Blood-vessels without walls, or thin-walled, ramifying among the cells. Small or large round cells, embedded in a small amount of granular or homogeneous intercellular substance.	Soft; vascular; whitish; somewhat translucent; on pressure after some hours exudes a milky fluid; round or ovoid, or oblong.	Resembles brain-matter; of a yellow, gray, or brick-dust hue.	Often very large.
2. *Spindle-celled.*	Cells varying much in size, spindle-shaped, with long, fine tapering extremities, separated by very little intercellular substance. Often have a fibrous appearance (Recurrent Fibroid).	Firm; reddish; does not exude milky fluid. Shape as foregoing.	Fibrous or flesh-like aspect; pinkish color.	May be large.

TUMORS, TABLE OF

Seat of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
Nasal cavities; mamma; intermuscular spaces; submucous and sub-serous tissues; back; thighs; lip; cheek; labia; clitoris; prepuce; scrotum; axillæ; parotid; ear; more rarely periosteum, bone, heart, and nerve-sheaths.	Fatty Ulceration. Telangiectatic.	Any age; may be congenital.	Slow.....	Benign.....	Common.	
Cut ends of nerves; as in stumps of amputation, on skin.			Slow.	Benign.	Somewhat rare.	
Cranial bones, maxilla, orbit; ends of phalanges; juxta-epiphyseal portions of long bones (tibia, femur, humerus, etc.); dura mater; muscle; aponeurosis; lungs.		Congenital or early life.	Slow.	Benign.	Not common.	
Skin of hands and genitalia; larynx; bladder; rectum; nose.		At all ages.	Slow or rapid.	Benign.	Common.	
Membranes of brain, choroid plexus; pineal gland; spinal cord; nerves.	Calcareous.	Early life.	Rapid.	Malignant.	Rare.	
Periosteum; bone; lymphatic glands; subcutaneous tissue; testicle; eye; ovary; lungs; kidneys; intermuscular septa.	Mucoid. Fatty. Ulceration. Calcareous. Ossification. Telangiectatic. Cystic.	Youth, or before 35th year.	Very rapid.	Malignant. Early metastasis. Dissemination by the blood-vessels and not by the lymphatics.	Common.	
Subcutaneous tissue; fasciæ and intermuscular septa; periosteum; interior of bones; eye; antrum; breast; testicle.	As foregoing.	As foregoing.	Rapid.	Malignant by recurrence.	Common.	

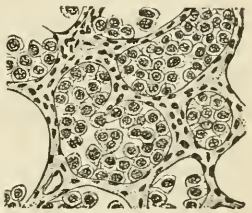
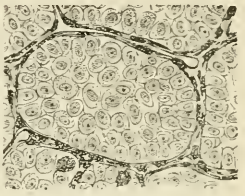
TUMORS, TABLE OF

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Sarcoma (*Contd.*)				
3. *Giant-celled (Myeloid.)*	Masses of protoplasm containing two or more nuclei—up to 20 or 50—with a varying amount of round and spindle cells.	Jelly-like consistence or firm, like muscle. Shape as foregoing.	Smooth, shining, succulent; no appearance of fibrillation; greenish or livid red or maroon color, varied by pink or darker red spots, due to extravasation of blood.	Large.
4. *Alveolar.*	Alveolar space filled with sarcoma cells; the trabeculæ composed of spindle-cells.	Very vascular; soft.		Small or large.
5. *Melanotic.*	Sarcomata of various kinds in which brownish or black pigment becomes deposited as amorphous granules in the cells as well as the connective tissue and blood-vessel walls of the tumor.	Rounded, nodular, dark colored tumors of varying size and consistency, usually hard.	Brownish or black.	May be large.
Dermoid Cyst...	Cyst wall contains hair-follicles and sebaceous glands. *Contents.*—Disintegrating epithelial cells, hair, sebaceous matter, teeth, etc.	Globular; tense; smooth; freely movable.		May be large.

TUMORS, ETIOLOGY.—It is not improbable that different tumors arise as a result of the action of various causes. As, however, we know very little concerning the exact etiology of any particular tumor, certain general considerations are permissible. The older theories, attributing the occurrence of tumors to alterations in the humors of the body, particularly of the blood, and similar hypotheses, may be at once discarded. The following hypotheses are deserving of consideration:

1. *The Durante-Cohnheim Inclusion Theory.*—This theory is based upon the supposition that, during embryonic development and the specialization of the cells entering into the formation of organs and adult tissues, more embryonic elements are produced than are necessary, and that these cellular elements become quiescent in the tissues, where they may remain, constituting embryonic "rests" or "remnants," from which, later, tumor formation takes place. Such embryonic rests or remnants would be exceedingly likely to occur where developmental processes are complex, as, for example, where different forms of epithelium join. Such points of tumor election undoubtedly occur, as is shown by the development of cancer at the various orifices of the body and at points of epithelial transition, such as the lip, cervix uteri, etc. This theory also explains to advantage the occurrence of chondroid tumors in or from bone, and of melanotic sarcomata from quiescent pigmented cells in moles, and affords a most acceptable explanation for the development of dermoid cysts. The theory, however, is wanting in several ways. In the first place, admitting the occurrence of these remnants, it would appear that a further etiologic factor is necessary in order to stimulate them to renewed activity. Another objection is afforded by the fact that many localities in which complex developmental processes occur, such as the heart and the nervous system, are singularly free from tumors, and that when they do occur in such tissue, they are not commonly situated at points at which the complexity of development is most marked. Epithelial rests are sometimes demonstrable, and yet no tumor formation occurs. The occurrence of tumors as

TUMORS, TABLE OF

Seat of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
Lower and upper jaw; lower end of femur; head of tibia.		Usually in adults over 40.	Slow.	Comparatively benign. Metastasis rare.	Rarer than the preceding forms.	
Skin; eye; bone; lymphatic glands, pia mater of brain. Often springs from warts.		In the young.	Rapid.	Malignant.	Rare.	
Where pigment occurs normally; the eye and the skin, the pia; secondarily, especially in the liver.	As other sarcomata.	As other sarcomata.	Usually rapid.	Very malignant.	Common.	
Outer angle of orbit; over root of nose; ovary; testicle.		Congenital.	Slow.	Benign.	Common.	

the result of trauma (to be considered later) is inconsistent with this theory.

2. *Injury and inflammation* appear to be, in a certain percentage of tumors, important etiologic factors. Persistent or long-continued irritation seems to favor the development of tumors belonging to the epithelial group. As examples of such tumors the following may be mentioned: Carcinoma of the scrotum in chimney-sweeps; epithelioma of the arm in workers with paraffin and tar; smoker's cancer of the lip or tongue and cancer of the tongue apparently due to injury by a carious tooth; and epithelioma originating in the margins of chronic ulcerative processes. Among the nonmalignant epithelial tumors the development of which appears to be favored by injury or irritation may be cited the papillomatous masses due to the accumulations of irritating discharges, particularly around the anus and external genital organs, when the parts are not kept properly cleansed. Sarcoma following fracture or injury of bone, and fibroneuromata of the severed ends of nerves after amputation, may be mentioned as connective-tissue tumors offering strong support to this theory. The occurrence of tumors at points particularly liable to injury is another argument in its favor.

Numerous objections have been made to the acceptance of this theory. In about 85 percent of all tumors no history of injury can be obtained. On the other hand, the frequency with which injuries are received is out of all proportion to the total number of tumors occurring. Parts particularly subject to injury, such as the hands and feet are not commonly affected, and the nipple, which is frequently injured, is rarely the seat of a tumor.

3. *Parasitic Influence.*—The germ theory has been invoked to explain the formation of tumors, particularly the malignant neoplasms, in which metastases are conspicuous. By some the essential parasitic body is believed to be an animal parasite belonging to the protozoa and resembling, if not identical with the coccidia. Others believe that the infecting body is a vegetable organism belonging to the blastomycetes. In further sup

port of the parasitic origin of tumors the demonstrable autoinoculability of cancer is adduced. Thus, it has been shown that cancer of one labium may attack the point of contact upon the opposite labium; cancer of the cervix may attack the contiguous vaginal vault; and cancer reaching the peritoneal surface may show a similar inoculability.

4. *Parasitism of Cells.*—It is not impossible that normal cellular elements may take on a certain parasite-like property that, in the presence of reduced resistance afforded by other elements, permits of their extension beyond normal limits. Thus, in cancer cellular elements that we believe to be of epithelial origin are found abundantly infiltrating connective tissues. Normally, epithelium does not so extend, nor, in most instances, even when introduced experimentally, does it acquire any such property. Should further experiment show that conditions may arise under which epithelium can acquire or manifest the faculty of intraconnective-tissue growth, without the intervention of any other factor, we may assume that the manifestation of this parasite-like character leads to the development of cancer.

5. Adami presents a most fascinating argument in favor of his view that whatever may be the origin of tumors, the most important element in their production is the fact that the cells forming the neoplasm give up the habit of function and acquire the *habit of growth.* Reproduction is of course an essential function in all cells, but in addition to proliferative power every cell is endowed with the inherent capacity to perform some specific duty, in the consummation of which it utilizes more or less of the energy that it is able to transform from the nutrition supplied. If the cell ceases to perform this specific function, whatever that duty may be, the energy previously converted in that direction is now transferred to the reproductive capacity of the cells, thereby leading to proliferation in excess of the normal. The originator of this suggestive hypothesis fully recognizes the necessity for some reason accounting for the cell's acquisition of the habit of growth at the expense of the habit of function. The fact that malignant neoplasms of epithelial origin, and particularly those arising from the mammary gland and uterus, appear at a time when function is on the decline, is fully in support of Adami's view. He further maintains that irritation, parasitic or otherwise, may so modify the cell that proliferation becomes excessive and secretion or other specific function proportionately diminishes.

6. *Predisposing Causes.*—The foregoing brief consideration of the most plausible reasons advanced to explain neoplastic growths indicates our ignorance of the essential etiologic factor in tumor formation. There are, however, certain predisposing elements worthy of consideration. Some of the conditions previously considered may be active only in this way. Trauma and inflammation may predispose to tumor formation, just as they predispose to infection, and long-continued irritation or prolonged ulceration may act only as predisposing elements. With regard to age, it may be said, in a general way, that physiologic activity favors the development of sarcoma, while senescence, or physiologic decline, predisposes to the occurrence of cancer (Da Costa). The influence of inheritance cannot be entirely ignored, although it is probably slight (Coplin).

TUMORS, TREATMENT.—See special articles, Bones, Breast, Carcinoma, Epithelioma, Sarcoma, Stomach, Uterus, etc.

TURPENTINE (Terebinthina).—A turpentine means a vegetable exudation, liquid or concrete, consisting of resin combined with a peculiar essential oil named *oil of turpentine*, $C_{10}H_{16}$, and generally procured from various species of the natural order Pinaceæ. Of the many turpentines two only are official, viz.—

Terebinthina, *Turpentine*—a concrete oleoresin from *Pinus palustris*, the yellow pine, and other species of *Pinus*. It occurs in tough, yellowish masses, brittle when cold, crummy-crystalline interiorly, of terebinthinate odor and taste. Dose, 5 to 30 grains as a stimulant, antispasmodic or diuretic; 2 to 4 drams as an anthelmintic.

Terebinthina Canadensis, *Canada turpentine* (*balsam of fir*)—a liquid oleoresin obtained from *Abies balsamea*, the silver fir or balm of Gilead. A yellowish, transparent, viscid liquid, of agreeable, terebinthinate odor and a bitterish and slightly acrid taste, slowly drying on exposure, forming a transparent mass; completely soluble in ether, chloroform or benzol. Dose, 10 to 30 grains.

Turpentines are stimulant, diuretic, anthelmintic, and hemostatic; in large doses laxative and irritant, and externally used are rubefacient and antiseptic. Their virtues depend entirely on the volatile oil.

Oil of turpentine is employed externally as a rubefacient and counterirritant in many conditions producing pain and inflammation. Cloths wrung out of hot water and then sprinkled with the oil (turpentine stupes) are useful applications in sciatica and other neuralgias, lumbago, chronic rheumatism, chronic bronchitis, peritonitis with tympanites, pleurisy, and renal colic. It is one of the most efficient agents in hospital gangrene, applied in full strength to the part affected. The liniment is in constant use for sprains, neuralgia, and other slight local affections.

Internally it is best employed in ulceration and hemorrhage of the intestines and in passive hemorrhages from other organs. Active bleeding with a plethoric condition and hematuria are states in which it is contraindicated. It is often used with ether (1 to 3) in biliary and flatulent colic as an anodyne and antispasmodic.

Preparations.—**Oleum Terebinthinæ,** $C_{10}H_{16}$, commonly called Spirit or Spirits of Turpentine, is a volatile oil distilled from turpentine. A thin, colorless liquid of characteristic odor and taste; soluble in 3 times its volume of alcohol, mixes with other volatile and fixed oils, and dissolves resins, wax, sulphur, phosphorus and iodin. It is a mixture of several hydrocarbons (*terpenes*), each having the same formula as itself. **Oleum Terebinthinæ Rectificatum,** prepared by shaking oil of turpentine with an equal volume of solution of sodium hydroxid, distilling three-fourths, and

separating. This preparation should always be dispensed when oil of turpentine is required for internal use. Dose, as a stimulant or diuretic, 5 to 25 minims, in emulsion 3 to 6 times daily; as a cathartic or anthelmintic 4 drams or more, combined with other cathartics. A little glycerin and oil of gaultheria will disguise the taste. **Emulsum Olei Terebinthinæ** has of the rectified oil 15, expressed oil of almond 5, syrup 25, acacia 15, water to 100. Dose, 1/2 to 2 drams. **Linimentum Terebinthinæ**, *Turpentine Liniment*, has 35 parts of the oil of turpentine with 65 of resin cerate.

TUSSOL.—Mandelate of antipyrin. Tussol combines the antipyretic, analgesic and sedative action of antipyrin with the stimulant action of mandelic acid on glandular secretions. It is recommended in whooping cough. Dose, 1/2 to 8 grains according to the age of the patient.

TWILIGHT SLEEP.—The German word Dämmerschlaf (of which "Twilight Sleep "is the equivalent) is the term used by Krönig and Gauss of Freiburg, to designate a condition of partial analgesia with subsequent amnesia of events occurring while in this state. The agents employed are scopolamine, and morphin or narcophin (a mixture of morphin and narcotin meconates). The condition is employed for obstetric cases, and it has also been used in surgical operations.

Technic.—All outside stimuli must be minimized; with this end in view the room is darkened, the patient's ears are stopped with cotton, and the eyes are lightly bandaged. The drug is withheld until labor is well under way. The patient is then put to bed, and about 1/130 grain scopolamine hydrobromid is injected, with 1/6 grain morphin or 1/2 grain narcophin. In one hour 1/450 grain scopolamine hydrobromid is again injected. Thirty minutes later memory tests are made; for instance, the patient is asked if she has received any hypodermatic injections, and how many; some object may be brought to her attention, then after an interval she is asked whether she has seen it before. Injections of scopolamine hydrobromid, 1/450 grain, are repeated at intervals of 1 1/2 hours or longer depending upon the degree of amnesia present. The object is, primarily, *not to abolish pain but to abolish the memory of pain.* Water must be given freely.

The fetal heart beat must be carefully watched, and in case of weakening, delivery must be hastened by forceps. Chloroform is used as a re-enforcement just as the head is born.

Contraindications.—The following are generally agreed upon as contraindicating the use of Twilight Sleep:

1. Primary uterine inertia.
2. History of previous short and easy labors.
3. Hemorrhage in connection with labor or the puerperium.
4. Weak fetal heart beat.
5. Eclampsia.
6. Pelvic contraction.

Disadvantages.—The second stage of labor is prolonged and the use of forceps or the administration of pituitrin may be required. The children more frequently exhibit delayed respiration and marked cyanosis. Mental excitement and restlessness are present in some cases, necessitating restraint and rendering it difficult to maintain asepsis Cases of prolonged drug psychosis due to the scopolamine, have been reported.

Requisites.—A stable solution of scopolamine hydrobromid, prepared with mannite, or a fresh solution of a reliable tablet must be used. The patient must be in a hospital, or under the constant attendance of the obstetrician and a qualified nurse. Additional attendants may be required to restrain the patient. All preparations should be made for rapid delivery in case of need.

To an impartial observer, over a year after its sensational re-introduction to American practice (for hyoscin morphin was essentially the same in principle), it would seem that many of its erstwhile advocates are now limiting its use to patients who persist in demanding it after its dangers and disadvantages have been candidly explained. It is even stated that in fairness we must not promise the patient a painless labor. The fact is better realized that narcosis and analgesia are inconstant and incidental results of the treatment; in a successful case the patient may complain bitterly of pain, during the labor, but after the birth she will deny having ever experienced it. In 10 to 15 percent of cases the method is an admitted failure.

TWIN BIRTHS.—See Labor, Pregnancy (Multiple).

TWITCHING.—See Blepharospasm, Chorea, Tremor.

TYMPANIC INFLATION.—See Ear (Examination).

TYMPANITES.—The symptom which is popularly known as "drum belly," a distention of the abdominal walls caused by paralysis of the muscular coat of the intestines and their inflation with gas. In slight degree tympanites accompanies all forms of chronic gastric and intestinal disturbance. It is due partly to the formation of gas and partly to the paralytic condition of the intestinal walls. In acute intestinal obstruction and in intussusception tympanites is not marked. Indeed, in the latter disorder there may be marked depression and sinking instead of distention due to flatus. In peritonitis tympanites may be the occasion not only of discomfort, but also of danger to life. In intestinal tuberculosis tympanites is due to loss of tone of the muscular walls of the gut; and it may also occur in long-standing cases in which adhesions have taken place between the visceral and parietal layers. In typhoid fever tympanites of moderate grade is a frequent but not a serious symptom, but it is of grave import when excessive. The walls of the gut become infiltrated with serum, and gas accumulates in the small and large intestines, particularly in the latter. When extreme, the diaphragm is compressed and the action of the heart and lungs is very much interfered with. Tympanites undoubtedly favors perforation.

Treatment must be directed to the cause. When due to obstruction by cancer, operation

being contraindicated, the aspirating needle may be plunged through the abdominal wall. This procedure is not altogether free from danger, and, as a rule, affords little relief. The long tube introduced high up into the rectum is almost useless. It may be necessary to make an opening in the middle line of the abdomen and to secure the first coil of distended intestine and open it, leaving it *in situ* in the abdominal wall. Of drugs, asafetida is used as a carminative, affecting chiefly the lower bowel. In the intestinal indigestion of the aged, when associated with flatulence, and in the flatulent colic of children, asafetida is efficient. By rectal injection this drug is of much value in the tympanites of children and in that of adults in typhoid fever. The following pill is useful for flatulence in the aged:

℞. Extract of nux vomica, gr. v
Extract of physostigma, gr. iij
Asafetida, gr. xl.
Divide into 20 pills. Give 1 pill night and morning.

For speedy results in nonchronic cases, 30 minims of the aromatic spirit of ammonia may be tried, or brandy may be given. Hoffmann's anodyne, in combination with the compound tincture of cardamom, is often effective. Turpentine, creosote (alone or combined with galbanum), musk, ammonia, alcohol, charcoal, ginger, capsicum, cajuput, and peppermint may be administered.

TYMPANUM.—See Ear (Diseases).

TYPHLITIS.—A catarrhal inflammation of the mucous membrane of the cecum and ascending colon; it is characterized by pain, tenderness, constipation, and in certain cases by a characteristic vomiting. In the majority of cases it is due to the accumulation of feces in the cecum.

Symptoms.—Pain and tenderness in the right iliac fossa and along the ascending colon, with some prominence of this region; the bowels are distended with gas (meteorism) and are usually constipated, or small liquid stools may occur from time to time, due to the accumulation of hardened feces in the sacculated periphery of the cecum, leaving a central canal, through which the liquid contents of the upper bowel can pass. In severe cases the local pain, tenderness and swelling are greater and there is impaction of feces. There are decided fever, restlessness, and also nausea and vomiting. The vomited matters consist at first of the contents of the stomach, then of the duodenum, with bilious matter, and, ultimately, if the impaction persists, of material having the odor of feces. With these symptoms occurs great depression of the vital powers. Peritonitis is finally developed by contiguity of tissue or by rupture of the bowel.

The temperature, even in mild cases, is one or two degrees above the normal, and in some cases an eruption is seen upon the abdomen, consisting of one or two dark red spots the size of a pinhead, which are of short life and disappear on pressure.

The mild form lasts about one week. The severe form may terminate in subacute peritonitis, continuing about two weeks.

Diagnosis.—The mild form is distinguished from other intestinal affections by the localized pain, by tenderness and prominence, and by the constipation.

The severe form can only be distinguished from the other forms of intestinal obstruction by the history of the case and of the attack, and by the results of treatment.

The prognosis in the mild form is favorable. In the severe form it is grave, although not necessarily hopeless.

Treatment.—The patient should be kept in bed, and receive a strictly milk diet in very limited amounts for a few days. If the pain and suffering are intense, a hypodermic injection of morphin should be immediately administered.

For the removal of the impacted feces, which in the majority of cases is the cause of the inflammation, use the following:

℞. Magnesium sulphate, ℥ xij
Dilute sulphuric acid, ℥ ij
Tincture of opium, ℥ iv to vj
Spirit of chloroform, ℥ ij
Peppermint water, enough to make ℥ iij.
One teaspoonful every hour, diluted.

The following should be useful in some cases:

℞. Calomel, gr. ij
Sodium bicarbonate, gr. xxiv
Sugar of milk, ℥ ss.
Make 12 powders. Give 1 every hour until 12 have been taken, followed by 4 ounces of hot Hunyadi János water.

In severe cases opium is to be immediately given, by hypodermic injections of morphin guarded with atropin, continued until all symptoms of inflammation have subsided, when attempts to remove the accumulated feces may be made by irrigation of the bowel with warm soapsuds and by the cautious administration of magnesium sulphate in dram doses every 2 hours. Locally, hot dry applications or the ice-bag may be used. See Appendicitis.

TYPHOID FEVER (Enteric Fever). Definition.—A general infection, caused by the bacillus typhosus, characterized anatomically by hyperplasia and ulceration of the lymph follicles of the intestines, swelling of the mesenteric glands and spleen, and parenchymatous changes in the other organs.

Period of Incubation.—From 8 to 23 days.

Etiology.—The disease is widely distributed throughout the world, and especially prevails in temperate climates. Contaminated water, milk or food such as oysters bedded near sewer exits, or green vegetables fertilized by means of sewage or washed with infected water, and defective drainage are the most important factors in the etiology. It is most prevalent in the autumn months. Young adults are most prone to be attacked. Males and females are equally affected. Idiosyncrasy plays a rôle in some families. The

typhoid "carrier" is an important factor in the dissemination of the disease.

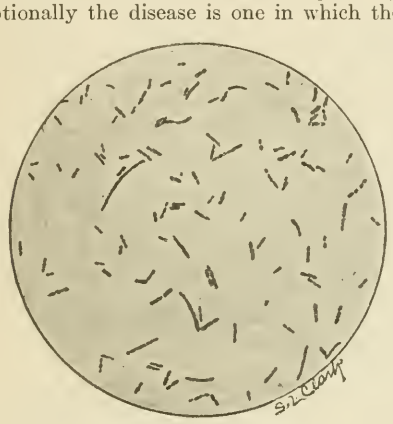
Description of Bacillus Typhosus.—A rather short, thick, flagellated, motile bacillus with rounded ends; it grows readily on nutritive media, and can be distinguished from the colon bacillus, which it closely resembles. It stains well with the ordinary anilin dyes. To stain for bacilli in tissues, allow the specimen to remain in Loeffler's alkaline methylene-blue solution for from 15 minutes to 24 hours, wash in water, dehydrate rapidly in alcohol, clear up in xylol, and mount in Canada balsam.

The Bacilli Outside the Body.—In drinking-water they retain their vitality for weeks, and in the soils for months. They are not destroyed by freezing.

Modes of Conveyance.—By "food, fingers, and flies" mainly.

Modes of Infection.—While infection usually takes place through the intestines, the researches of Chiari, Kraus, Hodenpyl, Flexner, and others, show that even in the early stages the bacilli are widely distributed throughout the system.

In the immense majority of cases of typhoid fever marked enteric lesions are present, but exceptionally the disease is one in which there is



Bacillus Typhosus.
Pure culture containing a few irregular forms.—(*Coplin.*)

a general infection, without special local manifestations; or the localizations may be other than enteric; or there may be a mixed infection of the typhoid bacillus with the colon bacillus, streptococcus, staphylococcus, pneumococcus, or bacillus of tuberculosis. In the tropics, more rarely in temperate regions, typhoid fever occurs in persons already affected with malaria.

Morbid Anatomy. Intestines. *Hyperplasia.*—The glands of Peyer in the jejunm and ileum, and to a variable extent those in the large intestine, are swollen, grayish-white in color, and may project to a distance of from 3 to 5 mm. This condition may disappear by a fatty and granular change in the cells, which are destroyed and subsequently absorbed, or it may pass on to—

Necrosis and Sloughing.—When the hyperplasia of the lymph follicles reaches a certain stage, resolution is no longer possible. The blood-vessels become choked, there is a condition of anemic necrosis, and sloughs form, which are subsequently thrown off. The process has a predilection for the area nearest the ileocecal valve.

Ulceration.—The separation of the necrotic tissue—the sloughing—is gradually effected from the edges inward, and results in the formation of an ovoid ulcer, the floor of which is formed by the submucosa and muscularis. The edges are usually swollen, soft, sometimes congested, and often undermined. These ulcers of the intestine are characteristic, and can be *differentiated from tubercular ulcers* in the same situation, as follows: In the **typhoid ulcer** (1) the main axis of the ulcer lies parallel with that of the intestine; (2) it lies opposite to the mesenteric attachment; (3) it has smooth floor and undermined edges; (4) it commonly leads to perforation. In **tubercular ulcer** (1) the long axis of the ulcer lies at right angles to that of the intestine; (2) it is not necessarily situated opposite the mesenteric attachment; (3) its floor is not smooth nor are its edges undermined, but rather funnel-shaped and irregular; (4) it is not apt to perforate, but it does not tend to heal, rather to spread.

Healing begins by the formation of granulation tissue at the base of the ulcer. The mucosa extends from the edge, and a new growth of epithelium is formed. Later the glandular elements are restored.

Perforation of the Bowel.—In 2000 autopsies performed in Munich perforation occurred in 114 instances, or 5.7 percent. In 80 autopsies performed at the Montreal General Hospital perforation was present in 22 cases. Perforation generally occurs within the last foot of the ileum. Multiple perforations may be present.

The mesenteric glands are greatly swollen; and spots of necrosis or suppuration may occur.

The spleen is invariably enlarged in the early stages of the disease, and rupture may occur spontaneously or as the result of trauma.

The liver shows signs of parenchymatous degeneration. Early in the disease it is hyperemic, and in a majority of instances is slightly swollen, Microscopically, the cells are very granular and are loaded with fat.

The gall-bladder not infrequently contains a pure culture of the bacilli, and acute cholecystitis is not very uncommon.

The kidneys show a degree of cloudy. swelling, with granular degeneration of the cells of the convoluted tubules.

Ulceration of the **larynx** has been noted in a considerable number of cases.

Changes in the Circulatory System.—Endocarditis is rare, as is also pericarditis. Myocarditis is more frequent. *Inflammation of the arteries*, with formation of thrombi, may take place, and bacilli have been found in them. Thrombosis of the femoral vein is common; most frequently on the left side.

Disposition of Bacilli in the System.—Typhoid bacilli have been found in the blood, in the spleen, in the liver, in the vegetations on the valve leaflets, in thrombi, and in the exudation from the men-

inges. They are always present in the affected areas of the bowel.

Symptoms. First Week.—The onset is rarely abrupt. Prodromal symptoms are generally present over a period of several days, and are manifested by a feeling of restlessness, vague pains, faint rigors, nausea, loss of appetite, pains in the head, back, and limbs, and nose-bleeding. The bowels may be constipated or diarrhea may be present; most frequently the latter.

There is a steady rise of temperature to 103° or 104° F. The pulse is rapid (100 to 110), full in volume, of low tension, and dicrotic. At this time there may be mental confusion, particularly at night. Toward the end of the first week the spleen becomes enlarged and a rash appears in the form of discrete, rose-colored spots, slightly elevated, and first seen on the abdomen. They disappear on slight pressure. The spots may also be found on the chest and back, and occasionally on the limbs and face.

Second Week.—The fever becomes higher or remains steady, the pulse is rapid and loses its dicrotic character, the face has a dull appearance, mental activity is slow, and the lips and tongue may get dry. The abdominal symptoms, if present, are diarrhea, tympanites, and tenderness. Hemorrhage or perforation may occur. In mild cases there is a gradual decline of the fever to the normal after the fourteenth day.

Third Week.—The temperature shows marked morning remissions, with a gradual decline. The pulse ranges from 110 to 130. Diarrhea and meteorism may now occur for the first time, and there is a special liability to hemorrhage and perforation.

Fourth Week.—The morning temperature has usually reached normal, but there is an evening exacerbation of one or more degrees, the diarrhea stops, the tongue becomes clean, and there is a craving for food.

The fourth week generally marks the beginning of convalescence. In aggravated cases the disease may continue over a period of 5, 6, or even 8 weeks.

The Fever.—In the stage of the invasion the fever steadily rises during the first 5 or 6 days. The evening temperature is about 1 degree or 1 1/2 degrees higher than the morning record. In certain instances there may be a difference of 3 or even 4 degrees. The temperature falls by lysis, and is not considered normal until the evening record is at 98.2° F.

A fever with regular remissions is considered of favorable prognosis. A sudden drop in the temperature may mark the occurrence of hemorrhage or of perforation of the bowel.

Post-typhoid Elevations. *The Fever of Convalescence.*—Frequently, after the temperature has remained normal for several days there is a sudden rise (102° to 103° F.), and a drop at the end of 24 or 48 hours. It is generally dependent upon errors in diet, constipation, or excitement brought on by visits of friends. It may, however, inaugurate a relapse, or mark the onset of a complication. *The fever of relapse* partakes of the same nature as in the original attack, but is milder, and rarely continues longer than 10 days or 2 weeks.

The Skin.—The characteristic eruption of typhoid fever has been described. Sometimes there may be areas of erythema, confined to the abdomen or chest. Sudamina are very common, and result from profuse sweating. The facial expression is dull and listless, but differs from that of malarial fever, as the anemia is not so marked.

The pupils are usually dilated.

Respiratory Symptoms.—Respirations are somewhat hurried, and frequently bronchial râles are heard. There may be an early acute bronchitis.

Circulatory Symptoms.—Dicrotic pulse (in first week), of low tension; heart-sounds at first clear and loud, but later the first sound becomes feeble, and along the left sternal margin or at the apex a soft systolic murmur may be heard.

Gastric Symptoms.—Loss of appetite is an early symptom; rarely nausea and vomiting occur. The edges of the tongue may be reddened, while the center is coated.

Intestinal Symptoms.—Diarrhea is present in from 25 to 30 percent of the cases. It is a mistake to believe that it is an invariable symptom in typhoid. Abdominal tenderness and distention and gurgling in the right iliac fossa occur in a large proportion of cases. Diarrhea is most common toward the end of the first week, but it may not occur until the second or even the third week. The stools, which range from 3 to 10 within the 24 hours, are thin, offensive, granular, and resemble pea soup. On standing they separate into a thin, serous layer, containing albumin and salts, and a lower stratum, consisting of epithelial debris, particles of undigested food, and triple phosphates. Blood-corpuscles may be found.

Nervous Symptoms.—Headache, slight deafness, and mental torpor may be present in the early stages; and later, in severe cases, profound stupor, muttering delirium, subsultus tendinum, and coma-vigil.

The blood presents no material changes until about the third week. At this time there is a reduction in the number of red corpuscles, which may fall as low as 1,300,000 to the cubic millimeter (Thayer), together with the hemoglobin, which is reduced in a greater relative proportion than the red cells. The absence of leukocytosis may aid in differentiating typhoid from septic and acute inflammatory processes.

The Urine.—Retention of urine is an early symptom in many cases. In the early stages, as in other febrile conditions, the quantity is reduced and of a higher color; later it becomes more abundant and possesses a lighter tint. Ehrlich has described a reaction that he believes is rarely met with except in typhoid fever. This so-called **diazo-reaction** is produced as follows: Two solutions are employed, kept in separate bottles, one containing a saturated solution of sulphanilic acid in a solution of hydrochloric acid (50 c.c. to 1000); the other a 0.5 percent solution of sodium nitrite. To make the test, a few cubic centimeters of urine are placed in a small test-tube with an equal quantity of a mixture of the solution of sulphanilic

acid (40 c.c.) and the sodium nitrite (1 c.c.), the whole being thoroughly shaken. One cubic centimeter of ammonia is then allowed to flow carefully down the side of the tube, forming a colorless zone above the yellow urine, and at the junction of the two a deep brownish-red ring will be seen if the reaction is present. With normal urine a lighter ring is produced, without a shade of red. It is very important to bear in mind that countless millions of bacilli may be present in the urine, which should always be disinfected.

Russo's Test.—This is also used as an aid in the diagnosis of typhoid fever, and it is said to be of more value than Ehrlich's diazoreaction. A few drops of methylene blue (1 : 1000) are added to the urine on the second day of the fever, an emerald-green tint results in the presence of typhoid; normal urine gives a light green or bluish-green color. The same reaction occurs in small-pox and measles, but it is absent in miliary tuberculosis.

Convalescence ordinarily begins at the fourth week. In certain cases it may be protracted, and may be marked by falling of the hair, great enfeeblement of the system, and transitory mental derangement.

Varieties of Typhoid Fever. 1. Mild and Abortive Forms.—In the mild form the symptoms are similar in kind, but less intense, than in the graver attacks, although the onset may be sudden and severe. The spleen is enlarged, and rose spots are marked. Diarrhea may or may not be present. The duration is about 8 to 10 days.

In the abortive form the symptoms of onset may be marked, with shivering and fever of 103° F., or higher. The date of onset is definite. Rose spots may develop from the second to the fifth day. At the end of the first week or the beginning of the second week convalescence is established.

2. **The grave form** is usually characterized by high fever and pronounced symptoms affecting the nervous system, the gastrointestinal tract, and the renal or pulmonary organs.

3. **Latent or Ambulatory Form.**—In this variety the onset is very mild, and the patient does not feel ill enough to go to bed. It is marked by languor and perhaps slight diarrhea. In certain cases delirium may be present. Death is common from neglect of treatment.

4. **Hemorrhagic Form.**

5. **A febrile form** recognized by Liebermeister is very rare.

Typhoid Fever in Children.—Infants under the age of 2 years are rarely attacked; cases are not infrequent in children between the second and tenth years. Epistaxis rarely occurs; the rise in temperature is gradual; bronchial catarrh is often observed; nervous symptoms are prominent, and are manifested by wakefulness and delirium; diarrhea is often absent; the eruption is slight; the abdominal symptoms are mild; and perforation rarely occurs.

Typhoid Fever in the Aged.—After the age of 40 the disease is very rare.

Typhoid fever is rare in **pregnant women.** Abortion or premature delivery usually occurs in the second week of the disease. The mortality is high (17 percent).

A condition known as the **Typhoid State** frequently occurs in the latter half of the second week. It is characterized by delirium, carphologia, coma or drowsiness, a tendency to slip to the foot of the bed, muscular weakness, subsultus tendinum, soft and rapid pulse, dry and furred tongue, and sordes in the teeth and lips. This condition is not peculiar to typhoid fever, but is found in all malignant types of fever such as small-pox, pneumonia, and typhus.

Relapse is prone to occur. The true relapse sets in after complete defervescence of the fever and follows a somewhat milder course than the original type, and lasts from 2 to 3 weeks. Two, 3, or even 4 relapses may occur. The condition depends upon a reinfection, probably due to errors in diet, to constipation, or to overexertion of any kind.

Complications.—Hemorrhage from the bowels, a serious complication, occurs in from 3 to 5 percent of all cases, most commonly between the end of the second and the beginning of the fourth week—at the time the sloughs separate. The onset is often marked by a rapid fall in the temperature and by symptoms of collapse, both of which may occur some time before the blood makes its appearance in the stool. The mortality is from 30 to 50 percent of the cases.

Perforation occurs in from 5 to 6 percent of all cases, and is more frequent in men than in women. The peritonitis that it causes is marked by a sudden acute pain in the abdomen and by symptoms of collapse, followed by marked tenderness and rigidity of the abdominal walls, vomiting, a pinched expression of the face, dyspnea, and a small, rapid pulse. Great abdominal distention is usually present.

Peritonitis without perforation may occur by extension of the inflammation to the peritoneum surrounding the intestine.

Pneumonia.—Pneumonia and hypostatic congestion occur in about 8 percent of the cases.

Bed-sores are less frequently encountered than formerly, owing to the proper nursing now general.

Thrombi in the veins occur in about 1 percent of the cases, and the left femoral vein is usually affected. Thrombosis is indicated by enlargement and edema of the limb affected.

Among **other complications** are excessive diarrhea, meteorism, gangrene, parotitis, pharyngitis, endocarditis, bronchitis, nephritis, and pyuria.

The Widal reaction is as follows:

Macroscopic.—The blood or serum to be tested is added either "to a young bouillon culture of the typhoid bacillus or to sterile bouillon, which is then at once inoculated with the bacillus. In the former case the reaction with typhoid serum appears usually within 2 or 3 hours, and consists in clarification of the previously turbid fluid and the formation of a clumpy sediment composed of accumulated bacilli. In the latter case the tube is placed in the incubator, and within 15 hours the

reaction is manifested by growth of the bacilli in the form of a sediment at the bottom of the tube, the fluid remaining nearly or quite clear."

Microscopic Test.—The blood or serum is mixed with "a young bouillon culture or with a suspension in bouillon or salt solution of a fresh growth of the typhoid bacillus, and a drop or two of the mixture is examined at once under the microscope. With a dilution of 1 : 10 this microscopic typhoid reaction appears, as a rule, immediately or within a few minutes, and is evidenced by loss of motility and by clumping of the bacilli into masses of various sizes and shapes." When this reaction occurs, it is spoken of as a "positive reaction;" and when not present, it is said to be "negative."

Typhoid Agglutination Test.
Upper segment shows the freely moving germs. The lower the typical "clumping."—(*Greene.*)

The reaction is present in about 95 percent of cases.

Prognosis.—The mortality in private practice is from 5 to 12 percent, and in hospitals it is from 7 to 20 percent. Unfavorable symptoms are hemorrhage, delirium, meteorism, excessive diarrhea, and suppression of urine.

Prophylactic Treatment. Antityphoid Inoculation.—A. E. Wright has prepared a *vaccine*, a dead sterile culture of the typhoid bacillus, that has been used extensively in the British and United States armies; and that gives immunity for 2 to 3 years, while at the same time it is absolutely innocuous.

Two or three injections should be made at intervals of 10 days, the first of 500 millions, the second and third of 1000 millions each.

For the prevention of the resulting lessened coagulability of the blood Wright advises 30 to 40 grains of calcium chlorid, and alcohol should be forbidden. It has been found to diminish both the incidence and the mortality of typhoid fever. Leishman reports: "In 5473 soldiers vaccinated against the disease, 21 took it and 2 died; in 6610 soldiers practically under the same conditions, who were not vaccinated, there were 187 cases and 26 deaths; that is, among the vaccinated soldiers there were 3.8 cases per thousand, and among the unvaccinated 28.3 per thousand." It is recommended for troops, especially when concentrated in camps, for nurses and physicians, and all persons exposed in time of epidemic. Castellani advises for prophylaxis an inoculation of dead culture to be followed a week later by the inoculation of an attenuated live culture, maintaining that the degree of immunization obtained by the latter is greater, while at the same time the reaction is not severe and the person does not become a "carrier."

In the United States army over 8500 persons had been inoculated up to June, 1910, and none of them contracted typhoid, although among the unprotected in the same period of time there occurred more than 200 cases.

Under conditions of careful asepsis the injection is made subcutaneously into the arm at the insertion of the deltoid muscle, preferably at about 4 P. M., so that the greater part of the reaction may take place before morning- The reaction is in most cases very slight; severe general reactions occurring with headache, backache, vomiting, nausea, and is in every case entirely over in 48 hours. During this period it is best to abstain from active exercise.

The following procedures, suggested by Gilman Thompson, should be carried out in hospital practice, and, with modifications, in private houses:

1. The best disinfectants of typhoid urine and stools for practical use are: (*a*) 1:500 acidulated solution of corrosive sublimate; (*b*) a 1:10 crude carbolic acid solution; (*c*) chlorinated lime.

2. Owing to the possibility of injury to plumbing, the carbolic acid solution is preferable wherever plumbing is concerned. The lime is best for country use, in privies and trenches.

3. The disinfectant should be thoroughly mixed with the stool, and left in contact with it for fully 2 hours. Enough of the disinfectant must be added completely to cover the stool with the solution.

4. The bed-pan should be kept filled at all times with at least a pint of the disinfectant, into which the stool is at once discharged, and should be cleaned with scalding water and one of the disinfecting solutions.

5. Rectal thermometers, syringes, tubes, and all utensils coming in contact with any of the fecal matter must be disinfected with the corrosive sublimate or carbolic acid solution.

6. After each stool the patient's perineum and the adjacent parts should be washed and sponged with a 1:2000 corrosive sublimate solution.

7. Nurses and attendants should be cautioned to wash their hands thoroughly, and to immerse them in a 1:1000 corrosive sublimate solution after handling the bed-pan, thermometer, syringe, or patient, or after giving sponge or tub-baths.

8. All linen or bedclothing used by the patient should be soaked in 1:20 phenol solution, and subsequently boiled for fully 2 hours.

9. Disinfection of the stools should be begun as soon as the diagnosis of enteric fever is established, and should be continued for 10 days after the temperature has remained normal.

10. In localities where a proper drainage system is lacking, the stools should either be mixed with sawdust and cremated or buried in a trench 4 feet deep after being covered with chlorid of lime.

When epidemics are prevalent, the drinking-water and milk should be boiled.

Important for the patient and for the public is the removal of typhoid bacilli from the urine by the administration of urotropin in doses of 7 1/2 grains three times a day beginning the third week at least, and continued for several weeks during convalescence.

General Treatment.—The physician and attend-

ants should ever keep in mind the fact that each individual case of typhoid fever is a focus for the spread of the disease. To carry out effective measures of prophylaxis is quite as much a part of the physician's duty as is the care of the patient.

General Management.—Careful nursing and a regulated diet are the essentials in a vast majority of cases. The patient should be kept in a well-ventilated room, *strictly confined to bed* from the onset, and remain there until the evening temperature has been normal for a period of at least 8 days. The constant use of the bed-pan should be strictly enjoined.

Diet.—A liquid diet should be begun at the onset, and should be continued throughout the course of the disease. Milk is the best food. If not well digested, a tablespoonful of lime-water may be added to each glass of milk, or it may be peptonized. The stools should be frequently examined, to see if they contain much fat. Other varieties of liquid foods may be given, such as strained soups, mutton or chicken broth, consomme, barley gruel, albumen water, and beef-juice. A pleasant fresh beef-extract may be made in the following manner: A thick piece of steak is seasoned with a small amount of butter, pepper, and salt, and subsequently placed on the top of a hot stove for a minute or two; it is then turned quickly to the opposite side, and allowed to remain until slightly browned; it is then cut into small pieces, to be masticated by the patient, only permitting the liquid portion to be swallowed. This diet may be allowed to patients in private practice when the persons are well known. In hospital practice it may prove dangerous, from the fact that solid particles might be swallowed surreptitiously. If diarrhea is present, soups, beef-juice, and beef-extracts may aggravate the condition, and milk, strained gruel, and barley-water should be substituted.

Plenty of cold water should be given to the patient. Fruits should not be given, but the juice of an orange or of a lemon may be taken at intervals.

Typhoid patients should be fed every 3 hours throughout the day. If there is great exhaustion, milk or liquid foods may also be given once or twice during the night, but in mild cases this is not necessary.

The Coleman-Shaffer High Calory Diet.—This has been tried, with success, in several cases of typhoid fever, and has been suggested in other fevers as well. We append herewith the conclusions of Dr. Coleman, with an account of the administration of the diet.

"Conclusions.—(1) None of the older diets for typhoid fever furnishes the patient with sufficient energy for his metabolic exchanges. Therefore a patient taking any of these diets is compelled to live in part upon his own tissues.

"(2) The amount of food which a patient requires can be determined only by his individual needs. The clinical guides to these needs are the weight of the patient and the state of his appetite. A patient who is losing weight should be given more food if he can digest and absorb it. A patient who is hungry should be given sufficient food to appease his appetite. In the early stage of severe cases it is always difficult to give more than 3000 calories a day; in the steep-curve period and in convalescence, patients take readily from 4000 to 6000 calories a day.

"(3) If any article of food causes persistent disturbances of digestion, the quantity given should be diminished, or the food should be stopped; otherwise the object of the high calory diet, the maintenance of the patient's nutrition, is defeated. If a patient cannot take all the food he requires, he should be given all he can digest and absorb.

"(4) Carbohydrates should furnish the greater part of the energy of the diet. The daily protein ration should not be below 62 grams, nor greatly exceed 94 grams. Clinical evidence indicates that a diet rich in fat may be taken by typhoid fever patients with benefit. Fat has furnished in some cases from one-third to one-half of the total energy of the food.

"(5) In the cases studied, the high calory diet has apparently modified the course of the disease, shortened convalescence, and reduced the mortality.

"Details of Administration.—The successful administration of the high calory diet depends upon unremitting attention to detail. It is a good plan to make a frank statement to the patient regarding the object of the diet whenever, in the opinion of the physician, this can be done. However, it is not always wise to enter too fully into particulars. Very often I tell patients that the more they eat, the sooner they will get well, and the effect of the suggestion upon the quantity of food which they will take is sometimes surprising. I tell every patient who is capable of appreciating the advice, to ask the nurse for more food if he wants it, and I tell the nurse to give the patient all the food he can digest and absorb.

"Typhoid fever patients cannot all be fed alike. Their preferences for and idiosyncrasies to foods are not removed by the fever. Yet often the judicious substitution of one article of food or dish for another will increase the fuel value of the diet by several hundred calories. Sometimes patients who complain that the milk is too sweet when it contains one-half to one ounce of milk sugar will take eagerly from two to four ounces of milk sugar in custard, ice cream, or lemonade. As in every other illness, the physician should permit as great variety of foods as is consistent with the patient's wellbeing.

"Ordinarily, when a patient first comes under observation he is put upon plain milk for a day or two. The subsequent procedure depends upon the patient's condition; that is, whether he is suffering from a mild or severe attack of the disease. In the former case he may be allowed foods which require mastication; in the latter, the diet should be liquid.

"Foods and Their Calory Values.—All of the foods and recipes which follow have been given thorough trial, and are recommended with confidence for appropriate cases.

Name.	Amount.	Calories.
Apple sauce	1 ounce	30
Bread	Average slice (33 grams)	80
Butter	1 pat (1/3 ounce)	80
Cereal (cooked)	1 heaping tablespoonful (1 1/2 ounces)	50
Crackers	1 ounce	114
Cream (20%)	1 ounce	60
Egg	1 (2 ounces)	80
Egg, white	1	30
Egg, yolk	1	50
Lactose	1 tablespoonful (9 grams)	36
Milk (whole)	(1 pint 350) 1 ounce	20
Potato (whole)	1 medium	90
Potato (mashed)	1 tablespoonful	70
Rice (boiled)	1 tablespoonful	60
Sugar, cane	1 lump	16
Sugar, milk	1 tablespoonful (9 grams)	36
Toast	Average slice	80

"Rubner's figures for calculating the calory values of the different foodstuffs will be found useful: 1 gram pure protein furnishes 4.1 calories; 1 gram pure carbohydrate furnishes 4.1 calories; 1 gram pure fat furnishes 9.3 calories. Nitrogen multiplied by 6.25 equals protein.

"Food Combinations and Recipes.—For the convenience of those desiring to use the high calory diet, the following combinations of foods are given. They are most useful in the early stages of the disease, or in the case of patients who are unable to take solid food.

	Calories.
For 1000 calories a day:	
Milk, 1 quart (1000 c.c.)	700
Cream, 1 2/3 ounces (50 c.c.)	100
Lactose, 1 2/3 ounces (50 grams)	200
This furnishes 8 feedings, each containing:	
Milk, 4 ounces	80
Cream, 2 drams	15
Lactose, 6 grams	24
For 1500 calories a day:	
Milk, 1 1/2 quarts (1500 c.c.)	1000
Cream, 1 2/3 ounces	100
Lactose, 3 1/3 ounces (100 grams)	400
This furnishes 6 feedings, each containing:	
Milk, 8 ounces	160
Cream, 2 drams	15
Lactose, 16 grams	64
For 2000 calories a day:	
Milk, 1 1/2 quarts	1000
Cream, 8 ounces (240 c.c.)	500
Lactose, 4 ounces (125 grams)	500
This furnishes 7 feedings, each containing:	
Milk, 7 ounces	140
Cream, 1 ounce	60
Lactose, 18 grams	72
For 2500 calories a day:	
Milk, 1 1/2 quarts	1000
Cream, 8 ounces	500
Lactose, 8 ounces (250 grams)	1000
This furnishes 7 feedings, each containing:	
Milk, 7 ounces	140
Cream, 1 ounce	60
Lactose, 36 grams*	144
For 3000 calories a day:	
Milk, 1 1/2 quarts	1000
Cream, 1 pint (480 c.c.)	1000
Lactose, 8 ounces	1000
This furnishes 8 feedings, each containing:	
Milk, 6 ounces	120
Cream, 2 ounces	120
Lactose, 1 ounce (30 grams)	120
For 3900 calories a day:	
Milk, 1 1/2 quarts	1000
Cream, 1 pint	1000
Lactose, 16 ounces (480 grams)	1900
This furnishes 8 feedings, each containing:	
Milk, 6 ounces	120
Cream, 2 ounces	120
Lactose, 2 ounces	240

*If this and the following combinations are too sweet, a portion of the milk-sugar may be given in some other form.

"When the above combinations are employed, it is generally desirable to add eggs to the diet in order to raise the nitrogen to the desired amount. The eggs may be soft-boiled or be shaken up in any of the above feedings unless distasteful to the patient, though the addition of an egg makes the stronger mixtures very rich. Milk toast with the addition of butter or cream, is relished by many patients." (From Coleman's article in the *American Journal of the Medical Sciences*, Jan., 1912.)

Hydrotherapy.—Since 1861 the value of bathing in fevers has been specially emphasized by the late Dr. Brand, of Stettin. Hydrotherapy may be carried out in several ways, of which, in typhoid fever, the most satisfactory are (1) by *sponging*, (2) the *wet pack*, and (3) the *full bath*.

Cold Sponging.—The water may be tepid, cold, or ice cold, according to the height of the fever. A thorough sponge bath should require a period of not less than 15 minutes. When from any cause a full bath cannot be given, sponging with ice-cold water may be used. It is specially valuable in the case of children and for delicate persons. At times it may be less objectionable to sponge one extremity at a time; then the abdomen and back, in regular order.

The cold pack is of special service in cases with pronounced nervous symptoms. The patient should be wrapped in a sheet wrung out of water at 60° or 65° F.; cold water is then sprinkled over the body with an ordinary watering-pot or a similar utensil.

The Bath (Brand Method).—The tub should be of such dimensions that the entire body except the head may be immersed. It seems best to give the bath every third hour when the temperature rises above 102.5° F. The temperature of the water at the beginning of the bath should be about 70° F., and it should be kept at this point by the addition of pieces of ice from time to time. The duration of the bath depends upon the height of the fever and upon individual susceptibility. In the majority of instances the duration varies from 15 to 20 minutes. When the colder (70° F.) bath is not borne well, it may be best to start with a higher temperature (80°-90° F.), and gradually to lower it by the addition of ice. After the first or second bath less objection is usually encountered.

The tub should be wheeled to the bedside, and after enveloping the body (in the case of women) in a sheet, two assistants gradually lower the patient into the water. As soon as the body (except the head) has been immersed, the head should be sponged, and afterward should be kept cool. From the moment the patient is placed in the water, and in order to prevent chilling, shivering, and cyanosis, and to stimulate the circulation,

the extremities and trunk should be constantly rubbed, paying especial attention to the feet and hands, which first feel the effects of cold. The abdomen may be rubbed only lightly or not at all. After removal from the bath the patient should be wrapped in blankets, and, if necessary, hot-water bottles or bags containing hot water may be applied to the extremities.

In private practice a substitute for the tub may be devised as follows: Place a quilt or blanket on a cot, cover with a piece of thick black oilcloth, and over this place a sheet; upon the latter the patient may be placed, and the bath may then be conducted as described. It will be of great advantage to elevate the end of the cot upon which the head rests, in order to assist drainage into a receptacle placed at the foot.

Contraindications to the bath are peritonitis and hemorrhage. Pregnancy, bronchitis, and pneumonia are not contraindications.

Advantages of the Bath.—(1) The fever is reduced; (2) the intellect becomes clearer, stupor is lessened, and the muscular twitchings disappear; (3) there is a general tonic action on the nervous system, and particularly on the heart; (4) insomnia is lessened, the patient usually falling asleep for several hours after the bath; and (5), most important of all, the mortality is much reduced. Under the expectant and general medicinal plans of treatment the mortality ranges from 12 to 17 percent; with the Brand method the mortality in many instances has been reduced to a fraction above 7 percent.

Medicinal Treatment.—It should be constantly remembered that in the treatment of typhoid fever overdrugging does harm. In many cases all that may be required is a mild purge at the onset, and subsequently a mild diuretic, continued for a day or two. The daily use of medicinal antipyretics is to be deprecated, from the fact that they are depressing, especially to the heart. In obstinate cases, when it seems impossible to control the temperature by baths, and when they are demanded too frequently, a single dose (5 grains) of phenacetin or antipyrin or pyramidon may be administered.

Antiseptic Medication.—Remedies that have been recommended are acetozone, beta-naphthol, naphthalin, salol, guaiacol, carbolic acid, corrosive sublimate, iodin, and calomel. Irrigation of the colon has been advised.

Antitoxin and Vaccine Treatment.—Pfeiffer (1894) was the first to prepare typhoid toxin and antitoxin; and he produced a serum which gave good results in some cases. As yet a generally satisfactory serum has not been produced although Chantemesse of Paris claims good results with one which he prepared. At present, interest centers around the typhoid vaccine which has acted so efficiently as a prophylactic. For this purpose three injections of a suspension of killed bacteria are given at intervals of 10 days. The first dose is 500,000,000 and the second and third doses 1,000,000,000 bacteria. The vaccine as usually prepared contains 1,000,000,000 to the mils and can readily be administered subcutaneously with a small, sterile syringe after the part has been sterilized with iodin. It was first utilized as a prophylactic on a large scale in the British Army in India. Its subsequent adoption by other countries and the United States marked the death knell of typhoid which so long had been among the scourges of armies encamped, particularly, in times of war. In the Spanish-American War 20,728 out of 107,973 men had typhoid fever and 1580 died. Vaccination in the United States army was begun in 1909 and made compulsory in 1911. The result has been the practical eradication of the disease from the service. The following table is from Russell's recent article:

TYPHOID FEVER, 1907 TO 1913, FOR THE WHOLE ARMY, OFFICERS AND ENLISTED MEN, AMERICAN AND NATIVE TROOPS.

	Cases.			Deaths.			Occurring Among Those Who Were Vaccinated.	
Year.	Mean Strength.	No.	Ratio per 1000 of Mean Strength.	No.	Ratio per 1000 of Mean Strength.	Percentage of Total Cases.	Cases.	Deaths.
1907	62,523	237	3.79	19	0.30	8.0		
1908	74,692	239	3.20	24	0.31	10.0		
1909	84,077	282	3.35	22	0.26	7.8	1	0
1910	81,434	198	2.43	14	0.17	7.1	7	0
1911	82,802	70	0.85	8	0.10	11.4	11	1
1912	88,478	27	0.31	4	0.044	14.8	8	0
1913	90,646	3	0.03	0	0.00	0.0	1	0

Antityphoid vaccination is safe and is destined to become more and more in use in private practice, particularly in localities where typhoid is endemic and among youths and young adults, the age of greatest susceptibility. It has been practised with success in a number of hospitals where nurses and others are exposed to infection. It is to be recommended to tourists and vacationists who while travelling are subjected to varying water and food supplies. Following the injection there is not infrequently a local reaction consisting of redness and tenderness and in some instances slight tenderness of the adjacent lymph glands. A systemic reaction, slight fever and malaise, oc-

curs in 5 to 10 percent of the cases. The injection is contraindicated in the presence of an acute illness such as tonsillitis, gonorrhea, etc. It is generally acknowledged that the preventive inoculation produces only a temporary immunity lasting about two to two and one-half years and that under its influence the disease, if it occurs at all, pursues a milder and less fatal course than is usual. Typhoid vaccination has not been found of value in the treatment of the disease except in those patients in whom the bacilli persist in the urine and feces after the attack has subsided. These patients are prone to become carriers of the infection and are sources of danger. The treatment of chronic carriers is often unsuccessful. The use of an autogenous vaccine offers the best chance for success (McCrae).

Treatment of Special Symptoms.—The abdominal pain and tympanites are best treated with fomentations or with turpentine stupes. A flannel roller is placed beneath the patient, and then a double layer of thin flannel, wrung out of very hot water, with a dram of turpentine mixed with the water, is applied to the abdomen and covered with the ends of the roller.

Meteorism.—Turpentine internally has been highly recommended by the late Dr. George B. Wood. It may be given in the form of an emulsion, as follows:

℞. Turpentine, Compound tincture of lavender, Sugar, each, ʒ jss
Acacia, ʒ ij
Water, enough to make ℥ iij.
Two teaspoonfuls every 3 or 4 hours.

℞. Beta-naphthol, ʒ ss
Bismuth subnitrate, ʒ j.
Divide into 6 powders. One powder every 3 or 4 hours.

The following may also be tried:

℞. Guaiacol, Salol, each, gr. v
Beechwood creosote, ♏ v.

In some cases soups, beef-extracts, and similar foods give rise to the disturbance, and peptonized milk should be substituted. The rectal tube may give relief; also injection of milk of asafetida (5 to 6 ounces).

Diarrhea.—In this condition no medicines should be given unless the stools number 3 or 4 daily. As in the case of meteorism, it sometimes ensues from animal foods, for which albumin water, barley-water, strained gruel, and the like, should be substituted. Boiling the milk is frequently all that may be necessary. In some cases lime-water added to milk will do good.

℞. Bismuth subnitrate, ʒ ijss
Paregoric, Compound tincture of lavender, each, ʒ j
Elixir of curacoa, ʒ iij
Water, enough to make ℥ iij.
Two teaspoonfuls every 3 or 4 hours.

℞. Codein sulphate, gr. iij
Bismuth subnitrate, ʒ j.
Divide into 6 capsules. One every 3 hours.

℞. Dover's powder, ʒ ss
Bismuth subcarbonate, ʒ j.
Divide into 6 powders. One every 3 hours.

Constipation should be relieved every 2 days by enemata of water containing a small amount of soapsuds.

Hemorrhage.—Elevate the foot of the bed; allow the stools to be passed into the draw-sheet; apply an ice-bag or ice-coil to the abdomen; and give a hypodermic injection of morphin (1/4 grain), though it has the disadvantage of masking the symptoms. Administer internally opium (1 grain) every 3 hours, or the lead and opium pill. The diet should be very bland, consisting of peptonized milk, or malted milk.

Peritonitis without perforation may have a favorable outcome if absolute rest be insisted upon. Morphin (1/4 grain hypodermically) should be given, and repeated if necessary.

Perforation and peritonitis, as a rule, end fatally. Laparotomy should be done as soon as the diagnosis is positive; of about 120 cases collected by Finney, 20 percent recovered. G. E. Armstrong well says: Local anesthesia has very materially altered our attitude towards early operations. It is no longer necessary to administer a general anesthetic. The abdomen can be quite well opened under local anesthesia without causing the patient any pain whatever. A 1 percent solution of novocain, with the addition of two drops of adrenalin, 2 min. to 1 dr., is thorougly satisfactory and may be used freely. First inject the skin and subcutaneous tissue, and then with a needle 1 in. long, penetrate the deeper muscular layers along the line of incision. Either a gridiron incision or one along the outer border of the right rectus answers admirably. . . . . But early operation is most essential if success is to be obtained."

Heart-failure.—When the pulse grows successively weaker, whisky (3 ounces) should be allowed every 3 hours, day and night, if necessary.

℞. Aromatic spirit of ammonia, ʒ iv
Tincture of digitalis, ʒ ij
Elixir curacoa, ʒ iij
Water, enough to make ℥ iij.
Two teaspoonfuls in water every 3 hours.

Strychnin (1/40 grain) or ether (30 minims) may be given hypodermically. From 1/2 to 1 liter of salt solution may be infused beneath the skin 3 or 4 times a day. Collapse may be treated by camphor (1 grain) in olive oil (15 minims) given hypodermically.

Nervous symptoms are best treated by hydrotherapy. In the cases that show meningeal symptoms the cold pack should be used. An ice-cap may be applied to the forehead and one to the back of the neck. Blisters are of doubtful benefit, and add to the distress. For insomnia sulphonal (15 grains), or chloralamid (30 grains) or trional (10 to 15 grains) may answer. As a last resort

give chloral or morphin (1/4 grain) hypodermically twice daily.

℞. Strontium bromid, Sodium bromid, } each, ʒ vj
Peppermint water, enough to make ℥ iij.

A tablespoonful every 3 hours.

℞. Extract of opium, gr. iij
Asafetida, ʒ ss
Extract of henbane, gr. iij.

Add enough cacoa-butter to make 6 suppositories. One to be used every 4 hours.

℞. Chloral, gr. xv
Strontium bromid, ʒ jss
Water, ℥ vj.

Use an enema with a long rectal tube, inserted about 18 inches.

Diuretic solutions:

℞. Sweet spirit of niter, ℥ ss
Solution of potassium citrate, ℥ ijss
Elixir curacoa, ʒ iij
Water, enough to make ℥ iv.

A tablespoonful every 3 hours. Large quantities of water may be given immediately after each dose of medicine.

Also—

℞. Potassium acetate, Tincture of digitalis, } each, ʒ jss
Elixir curacoa, ʒ ijss
Water, enough to make ℥ iv.

A tablespoonful every 3 or 4 hours.

Suppression and Retention of Urine.—Suppression of urine is a rare complication. Retention, however, frequently occurs, and may be relieved with a sterilized catheter 2 or 3 times daily.

Bed-sores.—Prevent bed-sores by hydrotherapy and by sponging the back frequently with diluted alcohol. Should they form, treat them antiseptically.

Sore Mouth.—Cleanliness of the mouth in the treatment of typhoid fever becomes of the greatest importance. One of the chiefest aims should be to keep the appetite and digestion in the best condition possible. Remedies given for other conditions arising during the course of the fever are seldom received with more gratefulness than those used for this purpose. If the teeth, tongue, and gums of the patient are sponged daily with a very weak (0.5 percent) carbolized glycerin solution, many cases of diarrhea and tympanites will be prevented. Sordes accumulate upon the teeth, the appetite is lost, the lips become parched, the thirst is unquenchable, and a condition of much discomfort supervenes when cleanliness is neglected. It should be remembered that in this disease mouth-breathing is common, causing the tongue to become dry and brownish; and, if it is neglected, it may become fissured.

℞. Phenol, gr. v
Glycerin, ʒ iij
Peppermint water, ℥ j
Water, enough to make ℥ iv.

To be used with tooth-brush at least once daily.

TYPHUS FEVER.—An acute, infectious, and epidemic fever, highly contagious, and characterized by sudden invasion, profound depression of the vital powers, sickening odor, and a peculiar maculated and petechial eruption, favorable cases terminating by crisis about the fourteenth day. There is no constant lesion.

Etiology.—It is due to a special organism, the *Bacillus typhi exanthematici*, recently (1915) isolated by Plotz. The organism is gram-positive, from 1 to 2 mikrons in length, the breadth being about one fourth of the length. It has no capsule, and is not acid fast. It is probably carried by bedbugs and body lice. It is rarely seen in the United States except in seaports. The period of incubation is about 12 days.

Symptoms.—It begins abruptly with a chill, followed by violent fever, the temperature within a few days reaching 104° to 105° F. There is a frequent, bounding pulse, soon becoming small, weak, and rapid. The cardiac impulse and first sound are almost effaced, there is severe headache, followed by violent delirium. From the fifth to the seventh day a coarse, red, diffused, measly eruption, with a mottling of the skin, develops all over the body except the face, not disappearing on pressure. The face is apathetic and has a uniform deep, dusky flush, the skin has a glazed appearance, the pupils are contracted, and the conjunctiva is red and congested. With the development of the disease there is cutaneous hyperesthesia, muscular soreness, and tenderness over the tibia. There are great prostration and muscular feebleness, vertigo, tremor, and subsultus. Constipation is the rule. At the end of the second week the temperature suddenly declines and the patient passes into a rapid convalescence.

Brill's disease is a mild atypical form of typhus.

Complications.—Pneumonia and swollen parotid glands are common.

Diagnosis.—It is differentiated from **typhoid fever** by the age, season of the year, onset of the disease, character of the eruption, intestinal symptoms, and the Widal reaction. The following is a comparative table, showing the main points in differential diagnosis.

Typhus Fever.	Typhoid Fever.
Attacks quickly; incubation 9 days.	Commences slowly; incubation about 13 days.
Occurs at any age.	Most common in youth and childhood; rarely occurs after 40.
Rare among the higher classes, except those exposed.	As common among the rich as among the poor.
Mulberry eruption on fourth or fifth day, on extremities, lasts until close.	Rose eruption on seventh to tenth day; isolated, flattened papules (few) on abdomen and back, in successive crops, which fade and disappear.

Typhus Fever.	Typhoid Fever.
Brain chiefly affected; bowels often but little so; abdomen natural; evacuations dark, but never bloody (these are occasionally reversed).	Bowels chiefly affected; evacuations ocher color and watery; sometimes hemorrhage or even ulceration; abdomen tumid.
Contracted pupils; dusky face.	Dilated pupils; cheeks flushed.
Pulse increases to 120, and temperature rises to 105° F., until third day; high for 6 days, then fall.	Pulse and temperature rise and fall independently, and without uniformity, but both are usually high to fifteenth day.
Lasts from 2 to 3 weeks.	Lasts from 4 to 6 weeks or longer.
Relapses rare.	Relapses frequent.
Death from coma or from congestion of the lungs in first or second week.	Death from asthenia, pneumonia, hemorrhage, or perforation of intestine, in or after third week.
Arises from destitution, overcrowding, bad ventilation; is highly contagious and generally epidemic; no microbe determined.	From poisoned drinking water, putrid animal matter, bad drainage; is not contagious, often sporadic; Eberth's bacillus present in the intestinal lesions, and in the spleen, liver, blood, etc.
Postmortem: changes not constant; the most frequent are dark blood, enlarged spleen, soft heart.	Postmortem: morbid Peyer's patches; enlarged mesenteric glands; ulcerated mucous coat of intestines; enlarged and soft spleen; ulcerated pharynx.
	Responds to the Widal reaction.

Measles begins milder, with coryza and cough, and never shows such pronounced nervous phenomena; but an early eruption occurs, appearing on the face.

Cerebrospinal fever has many symptoms in common, and but for the rarity of typhus in this country would be more confusing. The headache and rigidity of the muscles of the neck are much more pronounced in cerebrospinal fever and the prostration is less than in typhus fever. The eruption of typhus is characteristic, and should prevent error. Specific microorganisms are found in cerebrospinal fever.

In the early stages small-pox and bubonic plague have been mistaken for typhus fever.

Prognosis.—The unfavorable indications are high temperature, frequent pulse, early stupor, presentiment of death. The favorable indications are youth, moderate temperature and pulse, and mild nervous phenomena.

The duration is about two weeks. The mortality varies from 10 to 30 percent.

Treatment is symptomatic. As typhus fever is distinctly contagious, isolation is imperative, with immediate removal and disinfection of the patient's excreta. Body lice and bed-bugs (the carriers of the disease) are best destroyed by steam. All cases are benefited by small doses of the mineral acids, alternating with quinin sulphate. For high temperature, cold sponging, cold pack, or full doses of quinin, antipyrin, acetanilid, or acetphenetidin, or the systematic use of the cold bath, or "tubbing," as now used in typhoid fever.

For the headache and delirium, cold to the head is indicated. In the young and strong a few leeches to the temple, and chloral, with or without the bromids, may be used. For constipation mild laxatives are given. For the debility give alcohol early and in full doses, and spirit of chloroform in dram doses whenever there is danger of collapse. During convalescence such tonics as quinin and strychnin may be given. The patient may be nourished by nutritious liquids, such as milk, broths, egg-nog, etc.

TYROTOXICON.—A ptomain obtained by Vaughan from poisonous cheese, poisonous milk, poisonous ice-cream, etc. Chemically, it is very unstable; it may disappear altogether in 24 hours from milk rich with the poison. It induces vertigo, nausea, vomiting, chills, rigors, severe pains in the epigastric region, dilatation of the pupils, griping and purging, a sensation of numbness, or "pins and needles," especially in the limbs, and marked prostration or death. The symptoms may vary somewhat in different individuals. The poison is thought to be the cause of the summer diarrhea of infants.

Treatment of Poisoning.—It is best to give emetics if vomiting is not free, or to employ the stomach-pump or siphon to wash out the stomach, and to administer thymol in alcoholic solution, or salol, napthalin, or other antiseptics. The antagonists are opium and other sedatives. Stimulation is necessary when there is prostration. See Ptomain-poisoning.

U

ULCERS.—An ulcer is the term applied to an open sore produced by a loss of substance of the free surface of the skin or mucous membrane in the process of ulceration, or of ulceration and gangrene combined. The term, moreover, is sometimes extended to any open granulating wound the result of an injury or operation.

Varieties.—The various names given to ulcers are derived either from their local conditions and surroundings or from their specific cause. The characters of the specific ulcers, however, often become obscured by accidental local conditions; and these latter, again, are constantly changing from day to day, so that an ulcer which at one time would be called callous, may at another time be in a sloughing state. The following are examples of the chief types of ulcers, but in practice many minor shades of difference in the local appearances occur, so that it may be difficult or impossible to assign a given ulcer to a particular type.

The Simple, Healthy, or Healing Ulcer.—The edges are smooth and shelving, and extend in the form of a bluish-white film over the marginal granulations. The base is level, or nearly so, and is covered with healthy granulations. The discharge is inodorous pus, or if the ulcer is dressed antiseptically, and all irritation avoided, merely healthy serum. The surrounding skin is healthy. This is the type that all ulcers assume when healing.

Treatment.—Rest and protection by any light unirritating dressing are all that is usually required. When large, cicatrization may be promoted by skin-grafting. Two methods are employed. See PLASTIC SURGERY.

The exuberant or fungous ulcer is generally due to obstructed venous return from the granulations, the result of undue contraction of surrounding tissues, as seen for example, after a burn. The edges are healthy, but the granulations rise above the surface, and are turgid, dark red, redundant, and bleed readily. The discharge is purulent.

Treatment.—Solid nitrate of silver or sulphate of copper should be rubbed over the granulations until they are reduced to healthy proportions.

The edematous or weak ulcer generally occurs in connection with tubercular bones or joints, but any ulcer may become edematous if healing is delayed by the prolonged use of emollient applications. The edges and adjacent tissues are generally healthy; and the granulations are upraised, flabby, bulbous, semitranslucent, watery, and friable. The discharge is profuse and watery.

Treatment.—Removal of the cause, when possible, uniform pressure, and applications of lotions of nitrate of silver or similar astringents.

The Inflammatory and Inflamed Ulcers.—These terms are applied to ulcers in which the inflammatory phenomena are the most marked features. The inflammation may depend on some constitutional disturbance consequent upon alcoholism, improper food, and the like; or it may be the result of local irritation applied to any ulcer, whatever its previous character. For the purpose of distinction, the term "inflammatory" is applied to the former condition, while the term "inflamed" is generally restricted to ulcers of the latter class. Inflammatory ulcers are usually of irregular shape: the edges are ragged and shreddy, or abrupt or sharp-cut; the surrounding skin is red and edematous, and the base void of granulations, dry, livid red, or covered with a serous or sanious discharge mixed with tissue debris, and, if the inflammation is very acute, with yellow sloughs. When inflammation attacks a previously granulating ulcer, the granulations become florid and swollen, and generally slough, while the surrounding parts present the ordinary inflammatory phenomena.

The treatment should consist of rest, elevation of the part, removal of all local irritation, application of warm antiseptic lotions (as boric acid) on lint, attention to the constitutional state, and regulation of the secretions.

The Sloughing Ulcer.—This is merely a severer degree of the former, and it differs from it in that the inflammatory process is more intense and of a spreading character. It seldom occurs except in connection with venereal disease. The microorganisms at work in this and in the phagedenic form of ulcer are probably only the ordinary pyogenic micrococci found in all ulcers, but here acting with greater intensity in a vitiated constitution. The ulcer spreads with great rapidity, the edges are undermined, inverted, and dusky red, and the base is covered by an ash-gray or black slough. There are, commonly, much pain and severe constitutional fever.

The treatment is similar to that of the inflamed variety. Antiseptics should be freely used if the ulcer is foul, and opium should be given if there is much pain. When due to syphilis, the proper remedies for that affection should, of course, be given; but mercury should be used cautiously or should be altogether withheld until the sloughing has ceased.

The phagedenic ulcer, owing to improved sanitation and hygiene, and to the more scientific treatment of wounds, is seldom seen at the present day, except in connection with venereal disease in persons whose constitution is thoroughly broken down by intemperance, defective nutrition, and general neglect. The edges of the ulcer are irregular, swollen, and undermined, and the surrounding skin is of a dark, purplish, and dusky

red color. The surface is devoid of granulations, and is covered with a dark, blood-stained, ichorous discharge, often mixed with sloughs. When the sloughing proceeds to any extent, the ulceration is spoken of as **sloughing phagedena**. The ulcer spreads with fearful rapidity, and often destroys the whole organ, as the penis or vulva, and is attended with severe constitutional disturbance.

Treatment.—The patient should be placed under an anesthetic, the surface of the ulcer dried, and then thoroughly destroyed with fuming nitric acid. Some surgeons apply carbolic acid (1 : 20) or perchlorid of mercury (1 : 1000), and then dust with iodoform. Application of pure bromin is very effective. The continuous use of the hot bath is often of much service in phagedena of the penis and vulva. Internally, opium should be given in full doses, with tonics, nourishing diet, and, when indicated, stimulants. Thorough ventilation and good hygiene generally are imperative.

The Chronic, Callous, or Indolent Ulcer.—This condition of an ulcer is the result of continued irritation and neglect, in consequence of which the edges become infiltrated with inflammatory material, which impedes the circulation and prevents healing. It is very common in the lower third of the leg in the poorer classes. The edges are smooth, white, callous, rounded, steep, and quite insensitive when touched. The adjacent skin is generally congested or eczematous. The base is covered with a thin, sanious discharge, while there are either no granulations, or those present are small, flabby, pale, and ill formed. These ulcers often exist for years, and are usually attended with but little pain, and though they are at times small, at other times they extend nearly round the leg. They are often adherent to the fascia, periosteum, or bone. Old, callous ulcers, when subjected to continued irritation, are apt, as age advances, to become epitheliomatous.

Treatment.—The callous edges should first be softened by emollient dressings, and uniform pressure subsequently applied by a Martin's bandage or by strapping and a bandage. The strapping plaster, cut into strips 1 1/2 inches wide, should be evenly applied and should extend 2 inches below and the same distance above the ulcer. Holes should be cut in the strapping opposite the ulcer to allow of the escape of the discharge. Over the strapping a bandage from the foot to the knee should be applied. The bandage should be changed daily; the strapping once or twice a week. Iodoform or some other antiseptic powder should be sprinkled on the ulcer beneath the strapping. Other applications which have been found useful are Unna's paste, spirit of camphor, tincture of iodin and a weak solution of sulphate of copper, two or three grains to the ounce.

Cases intractable to other treatment have been much benefited and sometimes cured by baking in the hot air oven for thirty minutes daily.

When these ulcers are adherent to the fascia or periosteum their base should be liberated either by multiple radiating incisions or by a circular incision about a half an inch from their edge. When the ulcer is very large or extends quite round the leg or shows signs of becoming epitheliomatous, amputation is indicated.

The Varicose and Eczematous Ulcer.—These terms are applied to any ulcer, whatever its other characters, when associated respectively with a varicose state of the veins or an eczematous condition of the skin. Both conditions frequently occur together.

The Irritable or Painful Ulcer.—Though any ulcer may be irritable or painful, these terms are generally restricted to a small, painful ulcer around the anus, and to a small, superficial, generally congested ulcer, commonly situated near the ankle, and occurring chiefly in women beyond middle life. The pain is often intense, and is generally believed to depend upon the involvement of the nerve-endings.

Treatment.—The improvement of the general health, small doses of opium, and cauterization with nitrate of silver, will often suffice to cure the ulcer. In inveterate cases an attempt may be made to divide the nerves subcutaneously, after the manner of Hilton.

Tuberculous or strumous ulcers are generally due to the breaking down of enlarged tuberculous lymphatic glands, the bursting of subcutaneous tuberculous abscesses, or the ulceration of the so-called tuberculous or strumous nodules. They are generally multiple, and often confluent, forming an irregular indolent sore. The edges are pale, bluish-pink, thin, and undermined. The granulations are pale, edematous, protruding, and bleed readily on handling. The discharge is thin, yellowish-green, and scanty. Enlarged glands and cicatrices of former ulcers are frequently present in their vicinity. The cicatrices are generally raised, pale pink or white, while the skin is often puckered around them.

Treatment, constitutionally, is that for struma and tubercle. Locally, the sore should be destroyed by paring away the edges and scraping the base with a Volkmann's spoon. The cicatrices may sometimes be dispersed by repeated blisterings or by subcutaneous division.

Syphilitic Ulcers.—Primary ulcers or chancres are described under Syphilis (*q. v.*). Those occurring in the course of constitutional syphilis may be divided into the superficial and deep, and are treated locally as well as constitutionally.

ULNA.—See Forearm.

UMBILICAL CORD (Funis).—A vascular, cord-like structure connecting the fetus with the placenta.

Origin.—It is derived from the pedicle of the allantois, appearing about the third week of gestation. When fully formed, it is composed of two arteries, one vein, the omphalic duct, the remains of the umbilical vesicle, and the pedicle of the allantois, surrounded by a covering of mucous tissue (Wharton's jelly), and insheathed by a layer of amnion. At term the cord is from 50 to 60 cm. in length, and from 1 to 2 cm. in thickness.

Function.—It is the medium of communication between the mother and child. It supplies the fetus with rich arterial blood, and returns to the mother impure venous blood.

Abnormalities. Length.—The cord may be very much longer (250 cm.) or very much shorter (1 cm.) than normal. If too long, it is likely to be coiled about the fetus or is liable to prolapse; if too short, it may prevent descent of the fetus, causing great pain at the placental site and, finally, premature detachment of the placenta.

Thickness.—Sometimes there may be an excess of mucous tissue, causing great increase in the thickness of the cord. This does not usually involve its entire length.

Torsion.—From 8 to 12 twists in the cord are normal; they are caused by the twisting of the arteries around the vein. Extreme torsion may sometimes occur, rarely causing interference with the blood supply to the fetus.

Coils and Knots.—True knots have been found in the cord, although they are not usually tight enough to interfere with the circulation. The cord is frequently found coiled around the child's body. In about 25 percent of cases it is coiled around the neck.

Insertion.—The cord is usually inserted into the central part of the placenta, occasionally into the periphery (battledore placenta). When the vessels run between the amnion and chorion before entering the placenta, it is said to be a velamentous insertion.

Cysts, Tumors, and Calcareous Deposits.—These conditions are occasionally found in the cord, but they are, as a rule, of no significance.

Care after Labor.—After the pulsations in the cord cease it should be ligated, a piece of narrow iodoform tape or aseptic silk being used for this purpose. Only one ligature should be used, placed about 1 1/2 inches from the child's abdomen. It should first be secured by an ordinary surgeon's knot and then by a bow-knot, the ends being left long, so that it may be tightened after the child has had its bath. The cord should now be cut about 1/2 of an inch beyond the ligature, care being taken that no part of the child is injured by the scissors. The free end of the cord is allowed to drain into a vessel, thus decreasing the size of the placenta, facilitating its separation from the uterus, and hastening its expulsion. After the child has received its bath, the ligature around the cord should be tightened, and the cord dusted with a powder composed of salicylic acid and powdered starch, 1 part to 4 respectively. It should now be inclosed in a piece of salicylated cotton and the binder applied. The cord usually drops off about the fourth day; the granulating ulcer remaining gradually heals and retracts, forming the umbilicus.

Septic Infection.—This is a rare condition if proper asepsis is observed in ligating and dressing the cord. When present, the cord is inflamed and thickened, and a grayish, diphtheritic membrane may cover its distal end. High fever is a usual accompaniment.

The treatment consists of applications of a strong solution of mercuric chlorid (1:500) and in proper dressing, as described.

Umbilical Fungus.—An overgrowth of granulations may occur about the umbilical ulcer or the cord may remain as a projection of well-organized connective tissue. In the former case the granulations should be cauterized with nitrate of silver; in the latter the cord should be religated close to the abdominal wall and the excess removed with scissors.

Hemorrhage (Omphalorrhagia).—This may be primary, from imperfect ligation of the cord, or secondary, occurring after the cord has fallen. The mortality is very high, being probably 75 percent or more.

Treatment.—In primary hemorrhage the cord must be religated; occurring from the umbilical ulcer, after the cord has fallen, the bleeding point, if seen, should be ligated, or pressure and astringents may be tried. If these fail, a fold of the abdominal wall should be transfixed with a hare-lip pin passing below the umbilicus, the pin passing beneath the hypogastric arteries; over this a figure-of-eight ligature should be applied. Occasionally, it may be necessary to pass a second pin above the umbilicus, so as to occlude the umbilical vein.

Prolapse.—The descent of a loop of cord in advance of the presenting part of the fetus. This is not a very rare complication, occurring once in about 250 labors.

Causes.—The principal causes are: (1) Lack of conformity between the presenting part of the child and the maternal pelvis, as in deformed pelves, small head, and abnormal positions; (2) hydramonios; (3) excessive length of cord; (4) placenta prævia.

Prognosis.—The fetal mortality is high, over 50 percent of children losing their lives from asphyxia.

The treatment consists of prompt replacement of the cord, if possible. This may be accomplished by the fingers alone or by the aid of some instrument, such as a catheter and string. A piece of string about 4 inches long is passed through the eyelet of the catheter, and the ends are tied; the cord is placed in the angle made by the loop and catheter, and the free end of the loop is hooked over the top of the catheter. In this way the cord is held fast, and may be carried back into the uterus. When the catheter is withdrawn, the loop passes over the end and the cord is released. If the patient is placed in the knee-chest posture, reduction will be very much facilitated.

After reduction has been accomplished, the patient should be kept in the knee-chest posture, or, at least, should have the buttocks elevated, so that the prolapse may not recur. This precaution is unnecessary after the presenting part has descended to the pelvic floor.

If it is found impossible to reduce the cord, it should be placed in a position in which it will be least liable to suffer severe compression—usually over the left sacroiliac joint—and rapid delivery of the child should be effected, either with forceps or by version.

UNCINARIASIS.—See Ankylostoma, Hookworm Disease.

UNCONSCIOUSNESS.—See Coma.

UNGUENTUM.—See Ointment.

URANOPLASTY.—See CLEFT PALATE.

URATES.—Combinations of uric or lithic acid with a base. See URINE (Examination).

UREA.—$CO(NH_2)_2$. The chief solid constituent of urine and the principal nitrogenous end-product of tissue metamorphosis. See URINE (Examination).

UREA-QUININ.—See QUININ AND UREA HYDROCHLORID.

UREMIA.—The name given to a certain group of symptoms resulting from nephritis, and due to the circulation in the system of the effete products that should be eliminated by the kidneys.

Etiology.—The exciting agent is unknown. Certain facts, however, lead to the belief that there is an accumulation in the system of organic basic products—ptomains and leukomains—which may cause uremia.

Symptoms and Clinical Course.—These are mainly referable to the nervous system. In acute uremia the symptoms may appear without any previous warning. In the more chronic form there are such premonitory symptoms as headache, vertigo, morning nausea, indistinct vision, drowsiness, cool skin, obstinate constipation, various cutaneous eruptions, and a diminution in the amount of the urine, which usually contains albumin and casts. See PHENOLSULPHONEPHTHALEIN TEST.

The uremic attack may manifest itself in a variety of ways:

Gastrointestinal Variety.—The patient suddenly experiences attacks of vertigo, pallor of face, nausea and vomiting, with fever, the temperature varying between 100° and 103° F., pulse tense and rapid, respiration hurried, and the urine scanty, with low specific gravity; unless the symptoms are promptly relieved, convulsions may occur, followed by coma and death, or drowsiness may supervene, followed by coma, which is really nothing but a profound sleep. Rarely, an acute maniacal outbreak follows the gastrointestinal symptoms.

Convulsive Variety.—Without any appreciable prodromes there are epileptiform convulsions, with or without loss of consciousness. The convulsions may consist of a single paroxysm, or a succession of fits may follow one another at intervals of a few minutes or of several hours, the patient being in a condition of more or less profound insensibility during the intervals. The fits almost exactly simulate true epilepsy. In this variety the temperature is high—from 103° to 106° F., or more; the pulse is rapid, with or without tension; the respirations are quickened. Coma, followed by death, is a very common ending of this variety of uremia, or after a profound sleep of hours the patient gradually recovers his usual health. Alcoholic excesses are responsible for many of these attacks.

Cerebral Variety, or Uremic Coma.—This form develops either gradually, with an increasing drowsiness, associated with headache and irritability of temper (mild mania), nausea, vomiting, and rise of temperature, often reaching 105° F., rarely 107° F., with rapid, full pulse; or the patient may fall suddenly into a condition of profound coma, the symptoms closely resembling an apoplectic stroke, except the high temperature. Uremic coma is always accompanied by rise of temperature and stertor. This stertor is peculiar; it is not the "snoring" of apoplexy, but a sharp, hissing sound produced by the rush of expired air against the teeth or hard palate. The respirations are accelerated and the pulse is rapid, but of low tension. This variety may suddenly terminate fatally with a convulsion, or a deepening coma with prostration and cold, wet skin, with edema of the lungs. Rarely, there may be gradual recovery.

Pulmonary manifestations are nocturnal dyspnea, usually of a paroxysmal character. Cheyne-Stokes breathing may continue for several weeks, and is not a necessarily fatal symptom.

Abdominal manifestations are obstinate vomiting and profuse diarrhea.

General Manifestations.—The skin is dry and has a dusky hue; the breath has a urinous odor; the urine is scanty, albuminous. contains different varieties of casts, and is deficient in urea. The temperature is normal or slightly subnormal, and the pulse is slow and full, until late in its course, when it becomes rapid and feeble.

Differential Diagnosis.—The clinical history and examination of the urine will aid in determining the diagnosis. See COMA, CONVULSIONS.

Prognosis is unfavorable.

Treatment.—The first indication is to aid the disabled kidneys in eliminating the waste products of the body by stimulating the skin and bowels to activity. Croton oil (1 or 2 drops) with olive oil (1 dram) should be given at once, to produce rapid catharsis. Elaterium (1/8 grain) may be given every 3 or 4 hours until 2 or 3 doses have been taken. Calomel (2 grains) with compound jalap powder (20 grains) every hour until 4 doses have been taken.

A hot bath (110° F.) or a hot vapor bath should be given from the onset of the symptoms to produce free diaphoresis.

The patient may be wrapped in blankets wrung out in hot water and given hot drinks to increase perspiration. If the pulse is full and bounding, venesection may be performed. Chloral (1 dram) may be given by the rectum to control the convulsions. Inhalations of chloroform or nitrite of amyl may also be used.

If the pulse is feeble, the following may be used:

℞.	Tincture of digitalis,	ʒ ij
	Aromatic spirit of ammonia,	ʒ v
	Aromatic elixir,	ʒ iv
	Water, enough to make	℥ iij

Two tablespoonfuls every 3 or 4 hours.

If collapse threatens, give strychnin (1/30 grain), atropin (1/100 grain), or nitroglycerin (1/100 grain) hypodermically. The diet should be composed of liquids. See ECLAMPSIA.

URETERS, CATHETERIZATION.—This method constitutes a real advance in the accurate diagnosis of certain morbid renal conditions. By introducing a catheter directly into the ureter it can be learned whether blood or pus which is contained in the urine comes from the kidneys, and if so whether it is derived from one or both of these

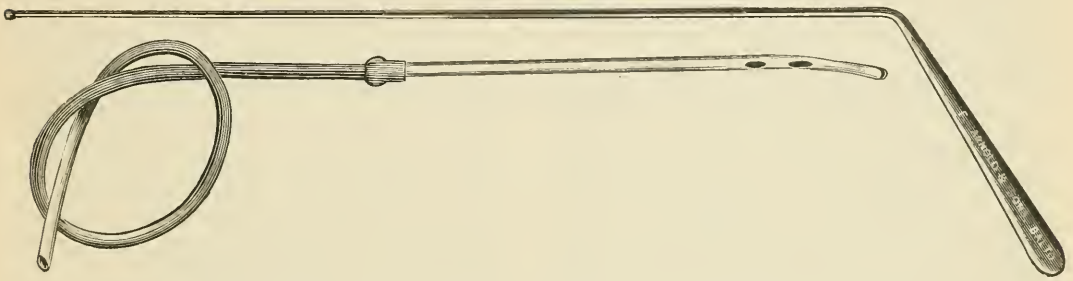
organs. The patency of the ureter can also be determined, and by injecting fluid through the catheter it can be learned whether the pelvis of the kidney is dilated. Suppurative conditions of the renal pelvis may be treated directly by the injection of medicated solutions. The secretory power of the two kidneys can also be determined when this method is employed in connection with certain functional tests. Casper and Richter found that in health the urine secreted simultaneously by the two kidneys contained about the same quantity of nitrogen, urea, and salts and that the freezing-point of both fluids was the same. In disease, however, these relations are altered, the diseased kidney excreting less than the healthy one. The same holds true of the excretion of phloridzin, which produces an artificial diabetes of short duration. Thus it is seen that the possibility of securing urine from each kidney separately by means of the ureteral catheter enables the clinician to obtain valuable diagnostic data concerning the functional capacity of each organ. At present it may be considered an invariable rule in renal surgery to have an examination of the urine obtained separately from each kidney made upon one or more occasions before resorting to operation. If the functional capacity of both kidneys is low, the removal of one might be followed by uremia and death.

mucosa. When they are located the ureteral catheter is made to enter one orifice and passed upward by a slow rotary movement for a distance of about 5 centimeters. The same procedure is then repeated on the other side.

The cystoscope may be left *in situ* while the urine is being collected, or it may be withdrawn, leaving only the catheters in place. With the improved modern cystoscopes the latter procedure is easy and is less disturbing to the patient.

The urine is collected in sterile glass tubes, every precaution being taken to prevent contamination.

URETHANE.—Ethyl carbamate, $C_3H_7NO_2$, is an ester of carbamic acid, obtained by the reaction of ethyl alcohol upon carbamid (urea) or one of its salts. It occurs in colorless crystals, readily soluble in water, alcohol, ether, or glycerin. Dose, 10 to 30 grains; but is best given in doses of 5 grains frequently repeated, up to 20 grains or more, as a full dose may cause vomiting. It is incompatible with many substances, and is best administered by itself. Urethane is a mild hypnôtic for adults, but a safe and efficient one for children. It stimulates the respiration, and in medicinal doses does not affect the circulation; but in very large quantities it slows the heart, depresses the body temperature, and induces muscular relaxation and some degree of general anesthesia.



KELLY'S SEARCHER, ABOVE, FOR INVESTIGATING A DOUBTFUL URETERAL ORIFICE.
SHORT URETERAL CATHETER, BELOW, WITH RUBBER TUBING ATTACHED.

Catheterizing cystoscopes are made both in the direct and indirect varieties. The instruments of Nitze, Casper, Albarran, Bransford Lewis, Brown, and Buerger are most commonly used. They all carry two catheters, which permit simultaneous catheterization of both ureters.

In the female the ureters may be catheterized by the aid of a speculum passed through a dilated urethra, the patient being in the lithotomy position with the pelvis well raised, or in the genu-pectoral position. The modern perfected cystoscopes, however, render such a procedure unnecessary, and moreover, afford an easier method for the average operator.

The technic of ureteral catheterization is the same as that of cystoscopy. The bladder is washed out with sterile water or a weak antiseptic solution, then distended with the same fluid and the cystoscope introduced. The ureteral orifices are situated at the base of the trigone, one at either angle and appear as small slits in the vesical

URETHRA (FEMALE), DISEASES. Inflammation.—Inflammation of the female urethra is almost invariably due to gonorrhea. It may occasionally be due to traumatism, chemic irritants, drugs, and the exanthematous diseases.

Symptoms.—In acute urethritis there is frequent and painful urination. In severe cases blood may appear in the urine. The external meatus is inflamed and swollen, and pressure over the course of the urethra is accompanied by intense pain and by the discharge of a few drops of pus. As the disease becomes chronic the severe symptoms subside; there is little or no pain. Pressure over the urethra reveals some tenderness, and, if the patient has not urinated recently, will probably cause the discharge of a drop of pus. Endoscopic examination will show localized areas of inflammation.

The treatment in the acute stage should consist of rest in bed, a nonstimulating diet, diluent drinks, and rather free purgation. A very good plan is to

put the patient on an exclusive milk diet. The external genitals should be cleansed several times daily with hot boric acid solution (1 dram to 1 pint). After the first two or three days of the attack salol, oil of sandalwood, cubebs, or copaiba, in 5-grain doses, may be given 3 or 4 times daily. If this treatment is ineffectual, irrigation of the urethra with sterile water should be tried, followed by the injection of a solution of nitrate of silver, 2 grains to 1 ounce. In injecting solutions of any kind into the urethra it should be remembered that its capacity is not more than 10 or 15 drops. Occasionally, the condition will persist in spite of this treatment. Such cases require applications of a stronger solution of nitrate of silver (10 grains to 1 ounce) directly to the affected areas through the endoscope.

Caruncle.—See CARUNCLE (Urethral).

Polypus.—Polypi of the urethra are mucous in character. They cause no symptoms except that of obstruction to the flow of urine. They should be excised.

URETHRA (MALE), HEMORRHAGE.—Hemorrhage from the urethra may be caused by the introduction of a bougie, by the opening of a false passage, by the separation of a slough formed by the caustic bougie, or by the rupture of a blood-vessel during acute chordee, or it may result from internal injuries. It may occur from general arterial excitement or may be associated with HEMATURIA (*q. v.*).

Treatment.—The recumbent posture, with application of cold and pressure, should be tried. A flat piece of cork should be pressed by the patient against the perineum, far back, and gradually moved forward until it reaches the right spot, when the dripping of blood will cease. A solution of tannic acid in water may be used as an injection. Gallic acid may be of service. Adrenalin solution has proved efficient. A steel bougie, first put in very hot water and then introduced into the urethra, is often used to arrest this variety of hemorrhage. If the hemorrhage is from the anterior portion of the urethra, a catheter should be inserted and a bandage firmly applied around the penis.

URETHRA (MALE), INJURIES.—Rupture of the urethra is a serious injury, as it exposes the patient not only to the immediate danger of extravasation of urine, but also to the lifelong trouble of a traumatic stricture. It is generally caused by a kick on the perineum, by a fall astride a joist or rail, or by the displacement of a fragment of the pubic arch in fracture of the pelvis. The urethra may also give way behind an old stricture while the patient is straining to empty his bladder.

State of the Parts.—The rupture usually occurs where the urethra passes under the pubic arch: *i. e.*, either just in front of or just behind the triangular ligament. In the former situation urine and blood will be extravasated in the perineum; in the latter, about the neck of the bladder. As the triangular ligament, however, is generally torn, some urine will, as a rule, in the latter case also pass forward into the perineum. The urethra may be completely torn across, or the rupture may only be partial, the upper wall escaping.

The symptoms are usually quite obvious. Together with the history of an accident there will be pain, swelling, and the ecchymosis of the perineum, and escape of blood, often in considerable quantities, from the urethra. The patient is unable to pass water, and any attempt to do so merely forces more urine into the tissues of the perineum, and gives pain. On trying to pass a catheter, some obstruction is generally met with, and will often prove insurmountable; but if the catheter is finally passed, clear urine will escape. These signs distinguish it from ruptured bladder, in which injury the catheter passes easily, but, generally (although the bladder is said to have been full at the time of the injury), only a little urine flows. In mere bruising and ecchymosis of the perineum the catheter will pass easily, and there is, as a rule, no escape of blood from the urethra. See HEMATURIA, URINE (Examination).

Treatment.—A soft catheter should be passed, if possible; if not, a gum-elastic or a silver one; and, in any case, the catheter should be tied in. Failing to pass a catheter, an extravasation of urine in any quantity having already occurred, a silver catheter should be passed down to the obstruction and a free incision through the middle line of the perineum made on its point. If the proximal end of the torn urethra can now be found, the catheter should be passed through it into the bladder and tied in. If not readily discovered, a prolonged search for it need not be made, as with a free incision through the perineum there is no danger of further extravasation of urine. If the urethra is found only partially torn across, an attempt should be made to bring the edges together by suture over a catheter, the external wound in the perineum being then united by deep sutures. The catheter should be kept in place for a week. Should a fragment of the pubic arch be found compressing the urethra, steps must be taken to remove it, the bladder in the mean time being aspirated above the pubes to prevent further extravasation occurring. When the wound in the perineum is left to granulate in the ordinary way, a silver catheter—as the point of this is more under control than that of a soft one—should be passed daily during the healing of the wound, and the patient should be enjoined subsequently to pass one for himself at frequent intervals, and warned that if he neglects to do so, a stricture will gradually form (Walsham).

Foreign bodies introduced into the urethra require extraction. Urethral forceps should be avoided as far as possible; sometimes, by placing the patient in a hot bath, giving him plenty of liquid to drink, and directing him to retain his water, sufficient can be withheld to drive out such an obstruction, for example, as the end of a catheter broken off in a stricture; but this should not be tried too long. Hair-pins, on the other hand, and such structures, nearly always require incision. The cases in which the obstruction is slight and a stone lies out of the way are much more rare, and, as a rule, occur only in elderly men. In a few instances huge cylindric calculi have been found, 3 or 4 inches in length and 1 1/2 inches in circumference. These generally lie in the tissue

by the side of the urethra, occupying a cavity which they have worn out for themselves, and sometimes they are so invested by the mucous membrane that a sound may be passed down by them without any characteristic grating.

URETHRA (MALE), STRICTURE.—In the male, stricture may be either congenital or acquired. Congenital stricture occurs but rarely, and is usually confined to the meatus. Acquired stricture may be defined as an abnormal lessening of the caliber of the urethra, or of the dilatability of the urethral canal, associated with changes in the mucous, submucous, or muscular structures constituting its walls. This definition embraces the varieties of strictures known as inflammatory, spasmodic, and organic.

Inflammatory stricture is a narrowing of the caliber of the urethra, due to inflammation; it is usually of short duration, is seldom attended with retention of urine, and is frequently the starting-point of organic stricture.

Spasmodic Stricture.—This condition is due to contraction of the muscular fibers of the urethra; it is frequently reflex in character, as is shown by the retention of urine that sometimes follows surgical operations on the anus, rectum, penis or scrotum. It may be caused by shame, fear, or anger, or by a hyperesthetic condition of the canal.

Organic stricture may exist in either sex. In the male it occurs early in life; it is most common between the ages of 25 and 45. It is caused by long-standing urethritis, by traumatism, and, according to some authorities, by masturbation.

Symptoms.—As a rule, it will be found that the individual has suffered one or more attacks of urethritis within a year or two previous to presenting himself for treatment. A frequent desire to urinate, more urgent during the day, is usually one of the early symptoms; the stream is much reduced in size, and may be forked, twisted, or spray-like. After the stricture has existed for some time and atony of the bladder has developed, there will be marked diminution of the expulsive force. Dribbling from the urethra is frequently an early symptom, depending on the condition of the circular muscular fibers of the urethra. Late in the disease incontinence of urine sets in, which is the so-called "incontinence of retention;" it is more persistent during the day.

When inflammation of the prostate or bladder exists, ardor urinæ will prevail. The same causes may give rise to vesical tenesmus. Urethral discharge is present in about 50 percent of the cases, and is usually of a mucoid character; retention is, as a rule, a late symptom, and is caused by exposure to cold, unusual exertion, alcoholic excess, or immoderate coition.

Strictures of very small caliber may markedly interfere with the act of coition: the stricture becoming congested during the sexual embrace, prevents the semen from passing forward, and it slowly dribbles away after the erotic act has terminated.

In cases of long standing in which a diseased condition of the bladder and kidneys exists, associated with alternation in the character of the urine, there will frequently be found well-marked constitutional symptoms, such as uremia and septicemia.

Treatment.—The patient must be carefully examined, so as to ascertain the number, position, caliber, resiliency, and relative irritability of the strictures. The condition of the bladder and kidneys must be determined, and a microscopic and chemic examination of the urine must be made, to decide whether any pus, mucus, or blood is present, or whether any casts are to be found. If possible, a bacteriologic study of the urine should be made, as the presence of pathogenic organisms has often a great bearing on the treatment of the case. The quantity of urine passed during 24 hours should be fixed upon and the amount of urea clearly ascertained, together with the aggregate of albumin and sugar. Having obtained these data, the surgeon will be enabled to decide upon the proper operation to be performed.

The numerous methods resorted to for the extirpation of urethral stricture are: (1) Gradual dilatation; (2) continuous dilatation; (3) modified rapid dilatation; (4) internal urethrotomy; (5) dilating internal urethrotomy; (6) dilating internal and external perineal urethrotomy; (7) external perineal urethrotomy with guide; (8) external perineal urethrotomy without guide; (9) electrolysis; (10) urethrectomy; (11) divulsion.

1. Gradual Dilatation.—This is the treatment usually pursued for the relief of stricture, and is by far the safest method, death never having followed its employment. In soft recent strictures the number of permanent cures resulting from gradual dilatation compares favorably with those treated by internal urethrotomy, without incurring the risk attendant upon the latter operation.

To perform gradual dilatation properly the character, position, and caliber of the stricture should be closely ascertained by means of the bougie à boule. If possible, the operator should commence dilatation while the caliber of the stricture is not dense. The instrument to be used should be a conic steel bougie one or two sizes smaller than the contraction, as more or less hyperesthesia of the urethra usually exists, and the onward progress of an instrument large enough to fill or distend the stricture gives rise to great pain, causing more or less spasm and interfering with the passage of the bougie. The canal in the neighborhood of the obstruction is likely to be congested, chronically inflamed, and softened. If there is much distention, the mucous membrane is easily lacerated. Laceration is followed by pain after micturition, with the discharge of more or less blood. In rare cases urine is absorbed into the system by reason of abrasion or laceration, giving rise to urinary fever. By commencing with a bougie of a smaller diameter than the caliber of the stricture, this complication is frequently avoided. The confidence of the patient is gained if the instrument produces but little pain, and thereby more progress is made than if force were used.

The best rule is to increase the size of the instrument as the pain of insertion diminishes and as the amount of blood following the introduction becomes less. The instrument should not be intro-

duced more frequently than every third day, and should be immediately withdrawn after insertion.

Before using an instrument, both it and the urethra itself should be made thoroughly aseptic. Palmer has shown the value of boric acid in sterilizing the urine, administered when the patient is placed under treatment. It should be given for 2 weeks in doses of 10 grains 3 times daily.

Urinary fever is most likely to occur at the beginning of the treatment, when the mucous membrane of the canal is in a condition of subacute inflammation and is somewhat softened. This may be avoided by the use of boric acid.

Examination of the urethra by means of the endoscope will show how rapidly the inflammatory symptoms disappear in the neighborhood of the stricture when partial dilatation has been accomplished. This change possibly accounts for the rapid amelioration of the local symptoms—indeed, it commences after the instrument has been passed but a few times, and before the normal caliber of the urethra has been restored.

The length of time the treatment should be continued will vary with the condition of the obstruction to be overcome. If the stricture is extensive, about 3 months will be required to restore the urethra to its normal size. During this time the patient is to be instructed in the use of the instrument, which he should be directed to pass twice a week for a period of 2 months; after which he must use it once a week for a similar period, then once in two weeks, and finally once a month. The treatment may then be discontinued, the patient being directed to return to the use of the instrument whenever there is an indication of a tendency to recurrence to an abnormal condition.

By faithfully employing the instrument when necessary, the patient can always keep the urethra patulous, and need suffer no further urinary difficulty. In cases of stricture of very small caliber a much longer time will be required to bring about permanent good results. Gradually dilatation may be employed for years, with every advantage to the patient, no symptom of contraction making its appearance nor any indication of trouble from the prolonged use of the bougie.

Recent strictures frequently disappear altogether when the method here prescribed is pursued, when the further use of the instrument may be dispensed with.

Gradual dilatation is indicated in all cases of recent dilatable stricture in any portion of the urethra, or when the stricture is not irritable, resilient, or nodular. Firm, well-organized bands situated within from 3 1/2 to 4 inches from the meatus may require other measures for their obliteration.

When diabetes or advanced disease of the kidneys exists, gradual dilatation is far more safe than any other method of procedure. This, too, is the proper treatment for those suffering from debility, or from disease of the heart, and for individuals broken down in health, and for the very old, especially if chronic urinary fever coexists.

In many cases one of the cutting operations may be advised instead of dilatation, but experience teaches that when a well-organized stricture exists, urethrotomy is as frequently followed by recontraction as is dilatation, the patient at the same time running the greater hazard that always follows a cutting operation, with very little, if any, better chance of permanent benefit in his favor.

It cannot be denied that every urethrotomy is attended with more or less risk to the patient, while dilatation is perfectly safe; moreover, the further the division of the stricture is made from the meatus, the greater will be the danger from the operation.

Death has followed shock after simple division of the meatus. Even in the hands of the most experienced operators the death-rate from internal urethrotomy is 2 in every 100 cases.

Taking the dangers of the cutting methods into consideration, and the fact that they are rarely followed by permanent results, it would seem to be obligatory on the part of the surgeon to give the uninformed the option of the safest course. If the cure from the cutting operations were radical, and if the strictures did not recontract in a large percentage of cases, it would doubtless be the duty of the practitioner to allow the patient to run the risk of urethrotomy; but as the result is by no means certain by any method now employed, there should be no hesitancy in recommending a course that, while it has its disadvantages, yet relieves the symptoms due to obstruction and is absolutely safe.

2. **Continuous Dilatation.**—In resorting to continuous dilatation, the surgeon should begin with a very small instrument, a filiform bougie being usually employed. This must be allowed to remain *in situ* for 3 days, when, as a result of the continuous pressure, the stricture relaxes sufficiently to allow of the introduction of a larger instrument. As a rule, the tunneled catheter is the instrument to be used; this is passed over the whalebone and through the obstruction into the bladder. After this the surgeon is free to deal with the stricture in any manner that he may prefer.

There are two conditions under which this method of treatment is applicable: First, when there is a stricture of small caliber, usually situated in the membranous portion of the canal, and generally accompanied by retention of urine; second, when, although the stricture is tight, the patient is enabled to pass urine with sufficient ease to allow him to be prepared for a radical operation.

In the first instance, when a filiform bougie has been inserted, a Gouley tunneled cathether should, if possible, be threaded over the whalebone and passed through the obstruction, and the urine should then be withdrawn. Should the effort to pass the catheter be unsuccessful, the filiform bougie should be retained in place by means of appropriate dressings, so that it cannot be expelled from the urethra. If the symptoms are urgent, the bladder must be aspirated. If the viscus is not overdistended, the patient should be given 1/2 grain of morphin and should be immersed in a hot bath, when he will have but little further trouble in passing his urine. The stricture should then

be treated as the surgeon may deem most expedient.

Under the second condition, continuous dilatation is employed simply to enable the operator to overcome the contraction by the use of either gradual or modified rapid dilatation, or to enable him to enlarge the stricture sufficiently to pass a Syme's staff, and thus facilitate the performance of external perineal urethrotomy, should this operation be indicated.

The failure of many practitioners to use filiform bougies successfully arises from various causes: the instruments usually sold are often worthless: they are too stiff, not well rounded, do not terminate in a proper neck, and are generally too large to be threaded over the smaller sized catheters. The surgeon should make his own filiform bougies; a dozen, properly constructed, will, with ordinary care, last through several years of active practice. An important rule to follow is to employ the filiform before any bougie, catheter, or other instrument has been introduced into the urethra. If an instrument has been previously used, it is of very little avail to attempt to pass a filiform, as failure will generally result. Great patience is a necessary element to success.

It is well first to inject two drams of adrenalin solution 1 to 4000, let the patient hold it in the urethra for two or three minutes, and then distend the canal by gently injecting a syringeful of warm carbolized oil before inserting the filiform, which has been rendered aseptic, and which is to be introduced into the meatus and passed slowly down to the obstruction, while at the same time the patient's face is carefully watched for the slightest expression of pain, which is an indication that the onward passage of the filiform must cease. The slightest impediment to the passage of the bougie should warn the operator that he has proceeded far enough with the instrument, when a second should be introduced in the same manner, and the process thus repeated until 6 or 8 whalebones have been inserted, when the operator very gently tries each in turn; to see if he can find the opening in the obstruction; beginning on the left and passing to the right side of the patient, the surgeon naturally tending to work toward himself.

If the stricture is excentric, the opening will probably be found by this manipulation; the instrument will glide through the contraction with little or no pain, when, without force being required, it will pass into the bladder, and will be freely movable in the urethra.

These instruments are frequently made with a spiral twist at the end, on the supposition that the physician can more readily pass such a one should the stricture be excentric. However, perfect success with the straight instrument is always possible.

In order to successfully insert a tunneled catheter over the filiform through the stricture, the instrument should be gently passed down to the obstruction, then transferred from the right to the left hand; and while the right hand keeps the penis on the stretch, the filiform is to be withdrawn about 1/4 of an inch, and then both the filiform and the tunneled catheter are to be carried together through the contraction. This procedure prevents the catheter from cutting the filiform into two fragments, and assists in guiding it through the obstruction.

This method of treatment is of great value as an adjunct to the employment of more radical measures. It is of service in relieving retention of urine due to strictures of small caliber, in preparing the canal for gradual or modified rapid dilatation, and in permitting the passage of a staff for external perineal urethrotomy.

If a stricture exists in the neighborhood of the bulbous or membranous portion of the canal, and is not irritable, resilient, or nodular, the employment of continuous dilatation should be followed by the gradual method; and if this is not practicable, modified rapid dilatation is strongly recommended.

3. **Modified Rapid Dilatation.**—The operation to which this name is given is not in favor with many genitourinary surgeons, but undoubtedly gives good results in strictures of small caliber situated in the membranous portion of the urethra.

The patients thus operated on are confined to the house but 4 days, at the end of which time they are allowed to go about, with directions to report to the surgeon at intervals of 3 days in order to have a full-sized bougie inserted, which they soon learn to use themselves. The treatment is to be continued as advised when speaking of gradual dilatation.

It is not observed that strictures thus treated show any greater tendency to recontract than those on which either internal or external urethrotomy has been performed, especially if dilatation is continued afterward.

To carry out this method of treatment properly the patient is to be put to bed, the urethra washed out with a 4 percent solution of boric acid, and an aseptic filiform bougie passed and tied in place. The patient is then given 10 grains of boric acid 3 times daily, and the urethra is to be irrigated daily with boric acid solution; at the end of the third day he is etherized and the urethra is washed with a 1:20,000 mercuric chlorid solution. The Thompson dilator is then passed over the filiform and through the obstruction, when, by means of the thumb-screw attached to the handle, the blades of the instrument are slowly and very gradually separated to a very slight degree; after remaining in this position for 1 minute they are again approximated.

This procedure of alternate separation and approximation is to be repeated, taking care each time to separate the blades of the instrument to a somewhat greater extent, until the stricture is enlarged sufficiently to allow of the insertion of a Gross dilator, which requires that the caliber of the urethra should not be less than 18 F.

The Thompson instrument is then removed, and the Gross instrument inserted. In the same gradual manner the caliber of the urethra is brought to the full size of the canal, which has previously been ascertained by means of a bougie à boule.

Strictures so treated are stretched rather than lacerated or torn; this is shown by the small

amount of hemorrhage that follows. On examination with the endoscope two weeks later the walls of the urethra will be found to be smooth, and not ragged, as would be the case if laceration had taken place.

After the Gross instrument is withdrawn, a full-sized bougie is passed, to ascertain whether all obstruction has been dislodged; if this is found to be the condition, the urethra should be irrigated with a 1 :20,000 mercuric chlorid solution, and a sterilized catheter passed and tied in place; then a small quantity of warm boric acid solution is to be injected into the bladder. The patient is put to bed; the urethra and bladder are to be irrigated daily with a warm boric acid solution, and on the fourth day the instrument is to be removed and a full-sized bougie passed. The patient is allowed to sit up, and may resume his vocation on the following day.

This method is applicable to the treatment of filiform strictures in the neighborhood of the bulbous and membranous portions of the urethra, which are not irritable, resilient, or nodular, and which cannot be treated by gradual dilatation. It likewise is not convenient when time is an object, as, for instance, when the individual is about to undertake a journey or is about to be married. It should not be performed on the aged, or on those suffering from disease of the kidney, urinary fistula, or abscess of the perineum. In many cases in which the stricture is resilient, the caliber very small, and a perineal section is indicated, this operation may be employed primarily to facilitate the passage of the grooved staff, immediately afterward performing the cutting operation.

It would seem that an operation that is so free from complications, attended with so little danger to life, and that at the same time produces such favorable results, with no greater tendency to relapse than is to be encountered after other methods, is entitled to a prominent place among the resources that the surgeon possesses wherewith to overcome obstructions in the bulbous and membranous portions of the urethra.

When it is observed that in performing this operation the stricture is dilated gradually, and that an effort is simply made to restore the contracted portion of the canal to its normal caliber, that it is not overdilated, and that in conjunction with the operation the strictest aseptic and antiseptic precautions are employed, it will be seen that it differs very materially from the method of divulsion, which should become obsolete.

4. **Internal urethrotomy** should be limited to well-organized strictures situated within 3 1/2 or 4 inches from the meatus. If they are of such small caliber that a urethrotome cannot be passed, they should be first cut on the roof of the urethra, from before backward, and the constriction should be divided on the floor of the canal by the cross urethrotome, which, being of the shape of a bulbous bougie, locates the constricting band with great exactness. Stricture of the meatus and of the neighborhood of the fossa navicularis should be divided on the floor of the urethra, especially if they give rise to reflex symptoms.

5. **Dilating internal urethrotomy,** though very thorough, is not indicated in many instances the operation being frequently followed by reformation of the stricture. Its sphere of usefulness is confined to those conditions in which the stricture is well organized, of long standing, situated within 3 1/2 inches of the meatus, and is either nodular or resilient. In the latter condition it is the only operation that offers permanent relief; but unless the patient employs the bougie in the manner recommended when treating of gradual dilatation, the contraction will be likely to return.

Dilating internal urethrotomy should not be employed in a case of ordinary stricture of the penile portion of the canal, unless it is complicated in the manner already described, as the operation will probably be followed by a curvature of the penis, which may last for a period ranging from 6 weeks to a year, and is, of course, a source of great mental anxiety to the individual. What is far worse is that the knife of the instrument cuts so deeply that an extensive division of the muscular fibers of the urethra follows, and, as a result, dribbling after the act of micturition takes place; as the canal is unable to expel the last drops of urine, it slowly oozes from the meatus. This condition is permanent.

If it can be avoided, dilating internal urethrotomy should not be performed on persons suffering from impotence, neurasthenia, abnormal nocturnal losses, or sexual hypochondriasis. Very naturally, the incurvation of the penis and the dribbling of the urine produce very depressing mental effects on the patient, which are difficult to overcome. When these complications exist, it is preferable to rely upon internal urethrotomy by means of the Gross instrument.

6. **Dilating internal and external perineal urethrotomy** is relied upon for the relief of nodular strictures of the penile portion of the urethra, and of strictures of the bulbous portion of the canal. The object in opening the membranous portion of the canal, in cases of nodular strictures situated in the anterior portion of the urethra, which have been divided, is that the parts may be put at complete rest, and that the indurated tissue of which they are formed may be allowed to undergo fatty degeneration, atrophy, and absorption.

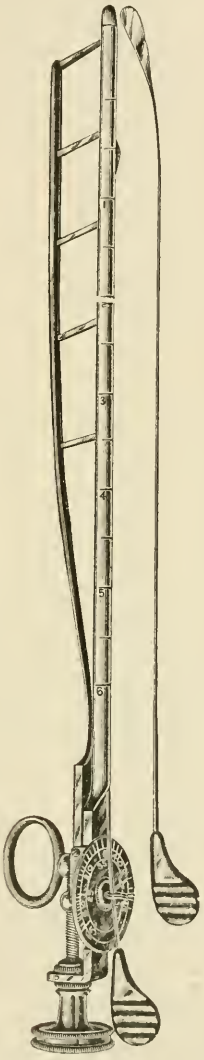
Dilating internal and external perineal urethrotomy has frequently been modified, with good results. The strictures upon which this method was resorted to were situated about 2 1/2 inches from the meatus, were nodular, resilient, and of very small caliber. By means of the Maisonneuve instrument they were divided on the roof of the canal, and the insertion of the Otis dilating urethrotome thus permitted; the constricting bands on the floor were freely divided, and the caliber of the urethra brought to its full size. A Jacques' catheter was then passed, fastened in place, and allowed to remain *in situ* for 2 weeks, temporarily removing it every third day for the purpose of sterilization. The urethra and bladder were daily irrigated with a boric acid solution. The induration around the seat of the stricture disappeared,

and the patients recovered without complicating the cases by the addition of perineal puncture.

7. **External Perineal Urethrotomy by Means of a Guide.**—The membranous urethra is opened, the surgeon being guided in reaching that portion of the canal by either the filiform bougie, a Gouley tunnel catheter, Thompson's dilator, or a Syme's staff. This operation is indicated in nondilatable, resilient, nodular strictures of small caliber, in associated with fistulæ and abscesses, and when false passages exist, with retention of urine. It may be performed by carefully dissecting down upon the urethra until the obstruction is found, and then cutting through the stricture, a procedure known as the "Wheelhouse operation." Another method is sometimes employed, known as "Cock's operation."

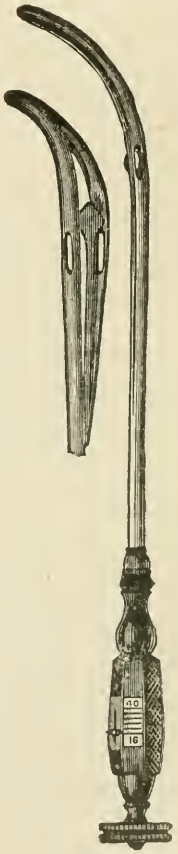
With the aid of a modification of the Wheelhouse

SYME'S STAFF.



OTIS' DILATING URETHROTOME.

OTIS' URETHROMETER.



GROSS' DILAT R.

obstructions of the canal associated with fistulæ and abscesses of the perineum, and in conjunction with internal urethrotomy performed upon some part of the penile portion of the urethra.

8. **External perineal urethrotomy without a guide,** generally known as "**perineal section,**" is performed when no guide of any kind is passed into the canal. It is generally employed in the cases of stricture of traumatic origin, of obstructions

staff designed by Horwitz, the operation known by the name of that surgeon is very materially altered and simplified. Horwitz's staff consists of two blades in close approximation, which together form a smooth rod with a thumb-screw at one end, by means of which the blades may readily be separated, working upon the same principle as the Otis dilating urethrotome. The distal end of the instrument terminates in a rounded nut, which can

be removed or replaced by a whip filiform; the nut on the end is tunneled, so that an ordinary whalebone filiform can be passed. The filiform is employed when it is not possible to insert the whip bougie, as it frequently happens that the former instrument can be introduced when the passage of the latter cannot be achieved; so that the staff can be employed with either an ordinary filiform or a whip bougie, or without any guide.

When it is possible to introduce the whip bougie through the stricture, it is to be fastened to the perineal staff. The blades of the instrument are closed and then passed into the urethra until arrested by coming in contact with the shoulder of the stricture. The whip bougie being pushed in front of the staff, reaches the bladder and curls up, and when the urethra is opened, serves as a guide to the operator, as it passes directly through the stricture.

In case the whip bougie cannot be passed through the stricture, a whalebone filiform should be inserted; the tunnel at the end of the staff is threaded over with a filiform and is introduced into the urethra until arrested at the contracted portion of the canal.

By means of the thumb-screw the blades are separated, and thus the urethra in front of the stricture is not only fixed, but is made prominent, and the operator, after making the incision through the skin, can readily open the urethra with absolute precision and ease.

If the stricture is impassable and the operation must be performed without a guide, the staff is to be passed down to the seat of contraction; when this point is reached, the blades are to be separated and the urethra fixed and made prominent, when the urethra can be opened in front of the stricture by a few touches of the knife. The modification in the technic of perineal section will now be considered.

When the patient is placed on the operating table, an effort is to be made to introduce the whip bougie; should this fail, a filiform is inserted, over which is threaded the perineal staff, which is passed down to the strictured portion of the urethra; the blades are then separated and the instrument given to an assistant to hold, who at the same time lifts the scrotum well out of the way. The individual is then placed in the lithotomy position, the buttocks projecting slightly beyond the edge of the table. A free insicion is made along the perineal raphe, and the structures overlying the urethra are divided until the canal is exposed at the bottom of the wound. A tenaculum is then passed into the urethra on each side of the staff, and placed in the hands of the assistant who has charge of the leg, with directions to make gentle traction; this brings the urethra prominently into the wound, where it can be readily incised in front of the stricture, when the staff is exposed *in situ*. The Wheelhouse probe is then utilized to search for the mouth of the stricture; as soon as it is disclosed, the probe is to be inserted by the side of the filiform and passed backward until it enters the bladder; it is then handed to an assistant to hold.

With the index-finger of the left hand in the rectum as a guide, and in order to prevent injury to the bowel, a probe-pointed bistoury is passed along the groove on the under sufrace of the staff, so as to divide the stricture throughout its entire length; after which a Teale gorget is to be inserted beside the probe until the instrument enters the bladder. The probe is then to be removed and a soft-rubber catheter passed through the penile urethra until the point of the instrument appears in the perineal opening, when it is to be seized by the surgeon between his finger and thumb, pulled well into the incision, and made to pass along the gorget until it reaches the bladder; the urethra, perineal wound, and bladder are then to be irrigated with a solution of 1:20,000 bichlorid of mercury, and the perineal wound dressed in the usual manner.

In cases in which neither a whip bougie nor a filiform can be made to pass the stricture, a method precisely similar to that just described should be pursued. It sometimes happens that, owing to infiltration against the compact tissue, it is impossible, after the most careful search, to find the proximal end of the urethra. Should the operator be unable to discover the opening to the strictured portion of the canal, the bladder should be opened after the method suggested by Cock. If the patient is in poor physical condition, or if suffering from chronic disease of the kidney, or if he has sustained a rupture of the urethra, with infiltration of urine, valuable time should not be wasted in attempting to reach the bladder through the perineum; the proper method is to proceed at once to perform retrograde catheterization.

Cock's Operation.—The surgeon having failed to pass any instrument through the strictured portion of the urethra to serve as a guide, the patient is to be placed in the lithotomy position; the index-finger of the left hand is introduced into the rectum, and its tip kept in contact with the apex of the prostate gland. A double-edged knife is then thrust directly into the median line of the perineum about one inch above the sphincter ani, and carried toward the tip of the finger in the rectum, opening the urethra at the junction of the membranous and prostatic portions of the canal.

9. **Electrolysis.**—Of 15 cases treated by this means, all did badly: either urethritis, prostatitis, cystitis, or epididymitis followed; and this mode of treatment was necessarily abandoned. In one case slight improvement followed; this was due to the gradual dilatation produced by the electrode. Fort, of Paris, has devised special instruments for this operation, from the use of which he claims to have obtained most excellent results. The experience of genitourinary surgeons throughout the United States is against its general adoption or its value in ordinary cases. It is therefore not recommended.

10. **Urethrectomy.**—This treatment is reserved for traumatic strictures, attended by great resiliency, which promptly recontract, in spite of every effort, after a most thorough and complete operation. It consists in either partial or complete excision of all the nodular and strictured tissue, which is dissected away by means of an incision in

the perineum, a new urethra being formed around a retained catheter.

11. **By divulsion** is understood the passing of a dilator so as to rupture the contracting band. Divulsion of a stricture by Holt's instrument is generally condemned as dangerous to life, as has been abundantly proved by a large mass of clinical testimony. Safer methods offer better results.

URETHRAL CALCULUS.—Calculi are occasionally formed in the urethra, in the dilated and fasciculated pouch that develops behind a stricture; but the nucleus is nearly always carried down from the bladder. The symptoms depend upon the degree of obstruction: if the calculus is large enough to occlude the urethra itself, or is so sharp and angular as to bring about the same result by the spasm that it excites, retention occurs; and if speedy relief is not given, ulceration and extravasation follow. If, on the other hand, it is small and is lodged in a diverticulum, it may continue to increase from the deposit of phosphates on its surface, and to wear its way into the tissues, until at length it forms an enormous mass, lying in the substance of the penis, alongside the urethra, almost buried under the mucous membrane.

Impacted calculus is more common in children than in adults, owing to the greater frequency of stone in childhood and to the small size of the urinary passages. The calculus is washed down from the bladder during the act of micturition and is suddenly arrested, generally in the membranous part or at the meatus.

Symptoms.—The stream stops suddenly, there is a sharp, cutting pain at the end of the penis, with violent straining, and perhaps a few drops of blood exude from the urethra, especially if the calculus is sharp and angular. For a time the straining continues, the bladder becomes more and more distended, and then either sudden extravasation occurs, or, if a small quantity of urine can escape by the side, so that there is not such immediate tension, inflammation sets in, ending in urinary abscess and fistula.

Diagnosis.—There is seldom difficulty in the diagnosis. The history of the case, the way in which the child screams and pulls at the end of its penis, the retention of urine, which is so rare in children from any other cause, and the few drops of blood are distinctive. Very often the calculus can be felt from the outside. If it cannot be felt, a small catheter may be passed down the urethra; sometimes it comes to an abrupt stop against the stone; sometimes it slips by the side of it with a rough, grating sensation, and, entering the bladder, gives relief for the moment. If any time has elapsed since the accident, the bladder may be distended up to the pubes; or there may already be a swelling in the perineum, due to inflammation and commencing extravasation.

Treatment.—A calculus in the penile part can generally be worked forward with the fingers until it reaches the orifice, when a small incision may be necessary to extract it. If this is not successful, a scoop or pair of urethral ("alligator") forceps may be passed down the urethra, and an attempt made to draw the calculus forward; but this may inflict serious injury upon the mucous membrane. If it is fixed or is too far back for this, the patient should be placed in the lithotomy position, the skin over the projection stretched with the finger and thumb of the left hand, and a small median incision made down upon it. Generally the calculus springs out at once, and the wound may be left to granulate. The bulb should, if possible, not be incised. If the calculus is near the neck of the bladder, it should either be removed by the median operation or pushed further back and crushed with a lithotrite.

URETHRITIS.—See GONORRHEA.

URETHROSCOPE.—See ENDOSCOPE.

URETHROTOMY.—See URETHRA (Male) (Stricture).

URIC ACID.—See URICACIDEMIA, URINE (Examination).

URICACIDEMIA.—A constitutional disease arising from disturbed metabolism and an accumulation of uric acid in the blood, and characterized by an excess of uric acid in the urine, by disturbed digestion, and by various nervous symptoms. It differs from gout chiefly in the absence of deposits of urates in the small joints and in the absence of localized manifestations.

Synonyms.—Lithemia; lithic acid diathesis; uric acid diathesis; latent gout; lithuria.

Etiology.—Hereditary influences, overeating, alcoholic excess, impaired digestion, sedentary habits, insufficient exercise, and mental anxiety, with loss of sleep are the principal causes.

Symptoms.—It may be said that, as a rule, in lithemia the nervous symptoms are vague, such as insomnia, pains in the lumbar region, headache, neuralgia, and mental hebetude. The circulation is sluggish, and the patient complains of cold feet. Tonsillitis is common.

Gastrointestinal Symptoms.—In these cases constipation exists, and the tongue is furred. The appetite may be poor or sometimes may be abnormally large. The digestion is always bad and gastralgia and acid dyspepsia may coexist.

Urinary Symptoms.—In nearly every case the urine is loaded with uric acid and the urates. The urine is usually high colored, scanty, acid in reaction, and may cause pain on micturition. See URINE (Examination).

Sequels.—Arteriosclerosis, interstitial nephritis, cirrhosis of liver, gastralgia, dyspepsia, and probably nerve lesions not yet understood.

Diagnosis.—There are but few diseases in which the importance of the examination of the urine is greater. A disease with such vague nervous and gastrointestinal symptoms may simulate any number of other affections, including malaria (very common), rheumatism, and diseases of the brain and of the spinal cord.

If uric acid is present in a sample of urine, it is not absolutely diagnostic of lithemia; but with the history and other symptoms it is not likely that the diagnosis will be mistaken. Next in importance to the examination of the urine is a correct and complete history. It is very often a disease

of neglect, and the patient, as a rule, does not consult the physician until its progress has far advanced, and until the accumulation of the uric acid in the system produces the manifold symptoms which each patient can so accurately portray.

Treatment.—Few diseases yield so rapidly to proper treatment, and a system of hot baths, salines, cathartics, and diuretics may yield truly brilliant results. Meats, coffee, tea, alcohol, malt liquors, and especially tobacco are to be restricted to the greatest degree, and foods easily digested are indicated. All kinds of fruit and vegetables may be eaten, and the diet should be composed principally of these articles. Fats and desserts should be shunned. The bowels, kidneys, and the skin must be kept active by medicines, massage, and the proper amount of outdoor exercise.

For the constipation:

℞.	Tincture of nux vomica,	℥ ij
	Fluidextract of cascara,	℥ jss
	Glycerin, enough to make	℥ iij.

One teaspoonful at bedtime.

Constipation may often be relieved by a pill containing:

℞.	Strychnin,	gr. ss
	Extract of belladonna,	gr. iij
	Aloin,	℥ ss.

Divide into 30 pills. One pill 3 times daily.

Purgative salines may be used, such as Carlsbad salts (1/2 ounce), Rochelle salts, or any of the purgative or laxative mineral waters, such as the Hunyadi and Apenta. Sodium phosphate may be given morning and night. For the kidneys almost any diuretic may be given. Free use of drinking-water is advisable.

To keep the skin active, hot baths should be taken in the middle of the day, 3 times a week. Thorough massage following the baths greatly enhances the value of this treatment. See Acidity, Autointoxication.

URIDROSIS.—See Sweat Glands.

URINARY CALCULI.—Urinary calculi are found in the kidney, ureter, bladder, and urethra. They may be formed from any of the sediments that occur in urine, but the tendency is much greater in the case of some—uric acid, for example—than in the case of others, such as phosphate of lime. The animal matter that holds the particles together is derived from the mucous of the urinary tract, which undergoes a process of fermentation, and either collects layer after layer of uric acid or leads to the formation of sparingly soluble oxalate of lime.

Origin.—The nucleus of a calculus may be hollow or may consist of dried blood; in most calculi, however, it is formed of uric acid or oxalate of lime, held together by a colloid material. These are of renal origin, though they subsequently increase by the deposit of laminæ as they lie in the pelvis of the kidney or in the bladder. Those formed of triple phosphates are only thrown down when the urine becomes ammoniacal, and usually, therefore, originate in the bladder, though they are not confined to it. Nuclei of uric acid are most common in early childhood and in late adult life, especially if there is a tendency to gout. The starting-point is the deposit of crystals in the secreting tubules, and most likely in the actual cells; infarcts of uric acid are often present in the renal tubules of infants shortly after birth; and in gout all stages can be traced, from crystals to the cells and irregular masses in the tubules of the medullary part, to minute calculi projecting from the orifices on the pyramids or lying loose in the cavity of the pelvis. The cause of the precipitation is probably some impairment in power of the cells, whether this arises from weakness, from exhausting illness, or from long-continued overwork, as in gout; and it is assisted by everything that tends to check the flow of urine, whether it is the small size of the secreting passages, as in children, or an actual obstruction, such as an enlarged prostate. When once the pelvis of the kidney or the bladder is reached, the nucleus increases by acting as a focus around which are deposited layers that differ according to the reaction and composition of the urine.

Very little is known with regard to the formation of renal calculi, with the exception of those composed of triple phosphate, which may be formed around anything that causes decomposition of urea. In children of the poorer classes calculi are more common than among the well-to-do, and are nearly always composed of uric acid; possibly this arises from a deficient supply of milk and from improper diet. Gravel, too, is chiefly found among those who have a tendency to gout, or those who consume large quantities of animal food, or those who are addicted to the use of alcohol; but though this points in a general way to increase in the tissue waste, and to the effects of indigestion, acidity, and malassimilation, in causing the precipitation of sediments in the urine, something more is needed to explain the formation of calculi. There must be some condition of the urinary organs leading to the production of the colloid material necessary to cement the particles together.

Calculus is more common in the male than in the female; and this cannot be altogether explained by anatomy, as the same holds good with regard to the kidneys, although to a less extent. Hereditary influence probably does exist, even after full allowance has been made for the effects of locality and for similarity of habit.

Physical Characteristics.—Calculi vary in size from minute bodies, somewhat larger than gravel, to masses of more than a pound in weight. The smaller calculi are frequently numerous; the larger masses are single.

The following is a table of the characteristics of calculi (Moullin):

—	Shape and Size	Surface.	Fracture.	Color.	—
1. Uric acid..	Ovoid or round, varying in size from gravel to that of a hen's egg, or even larger.	Smooth or slightly granular. Susceptible of a fairly high polish.	Crystalline in proportion to purity. Brittle, but hard.	Yellow to red or reddish-brown.	Uric acid calculi are the most common of all, and are always deposited in acid urine. Usually they occur at the extremes of life.
2. Urates.....	Ovoid, rarely as large as the former; often multiple.	Smooth and earthy.	Earthy and inclined to crumble. If it forms the whole, homogeneous; but in general much laminated.	Fawn colored or whitish-gray.	Most common in children, mixed with lime oxalate. Generally acid urate of soda, but sometimes of lime and ammonia.
3. Oxalates...	Irregular, sometimes in the form of hempseed calculi.	Tuberculated...	Crystalline and very hard.	Dark brown, and even black, from repeated hemorrhages.	Usually layers of oxalate with others of uric or urates. Very often coated with phosphates.
4. Mixed phosphates.	Depend on that of nucleus.	Smooth and friable.	Chalky, soft, and breaking easily. Occasionally small crystals on the surface.	White or gray...	Only deposited after decomposition of the urea.
5. Phosphate of lime, or bone earth.	Rarely of any size...	Smooth and soft.	Breaking easily, with crumbling fracture.	White.	
6. Cystin.....	Ovoid and generally of medium size.	Finely granular, with small yellow crystals over it.	Soft and crystalline.	Yellow, turning pale green after exposure, with a somewhat radiated appearance. Waxy.	Usually pure, but sometimes on a uric acid nucleus.

Analysis.

Incineration.	Murexid Test.	Final Test.	Nature of Calculus.
Melts and leaves a fixed residue.	Purple color...	Yellow flame when burned	Sodium urate.
Melts and leaves a fixed residue.	Purple color...	Violet flame when burned	Potassium urate.
Melts and leaves a fixed residue.	No purple color.	Dissolve residue in acetic acid; add ammonia in excess—white, crystalline precipitate.	Ammonio - magnesium phosphate.
Melts and leaves a fixed residue.	No purple color.	Residue insoluble in acetic acid. Dissolves in HCl; add ammonia—white precipitate.	Calcium phosphate.
Does not melt, but leaves a fixed residue.	Purple color...	Dissolve residue in dilute HCl; add ammonia until alkaline, then ammonium-carbonate solution. (*a*) White precipitate (*b*) No precipitate	Calcium urate. Magnesium urate.
Does not melt, but leaves a fixed residue.	No purple color.	Residue dissolved in water is not alkaline. Dissolves in HCl without effervescence. Ammonia in excess causes a white precipitate.	Calcium phosphate.
Does not melt, but leaves a fixed residue.	No purple color.	The calculus is insoluble in acetic acid, but the residue dissolves with effervescence. The calculus dissolves with effervescence in acetic acid...	Calcium oxalate. Calcium carbonate.
No fixed residue.....	Purple color...	Mix powder with lime and moisten. (1) Ammonia is evolved and red litmus paper becomes blue in the vapor. (2) No ammonia	Ammonium urate. Uric acid.
No fixed residue.....	No purple color.	Nitric acid solution grows yellow with evaporation. Residue insoluble in potassium carbonate.	Xanthin.
No fixed residue.....	No purple color.	Nitric acid solution turns dark brown. Residue soluble in ammonia.	Cystin.
No fixed residue.....	No purple color.	The soft calculus grows brown when dry and soft again with heat. Soluble in ether and residue grows violet on heating. Soluble in nitric acid, with slight bubbling; no change of color.	Urostealith.

See Bladder (Stone), Kidney (Stone).

URINARY STREAM, ALTERATIONS. Projective Force of the Stream.—A strikingly strong stream is characteristic of a pathologically developed detrusor, due to hindrances to micturition in the urethra canal, such as follow moderate strictures, a narrow external orifice, or from spasm of the detrusor. A weakening of the projective force

of the current is, at a certain age, pathognomonic of prostatic hypertrophy, and is seen in weakening of the detrusor from chronic inflammation of the mucous membrane and muscular tissue, from neglected gonorrhea, in atony from fatty degeneration of the muscular tissue, as in the course of acute infectious diseases, as typhoid fever or dysentery, and from voluntary retention of the urine when micturition is painful, as in stone in the bladder and fissures of the neck of the bladder. A decrease of force is observed in neurasthenics and in spinal diseases and tabes.

Decreased Caliber of the Stream.—Hypertrophy of the prostate; or stricture, will diminish the caliber. In prostatics the current falls vertically, and in stricture as well; but in the former the force is not increased by pressing, while in the latter it is. Spasmodic contractions of the urethra, from general diseases, may also cause a diminution of the caliber.

Altered Form of the Stream.—A deviation from the round form is observed as the earliest sign of stricture. In decreased force of expulsion the form is changed. Change of form is not a certain sign of stricture.

Continuity of the Stream.—Sudden stopping of the stream is supposed to be pathognomonic of stone, but it is rarely observed except in children. If in adults, the stone must be very small and light. It is sometimes noticed in spasm of the sphincter in neurasthenics.

Starting the Stream, etc.—A drop-by-drop passage of the urine is characteristic of great stricture and great pressure. In some cases there follows a round and strong stream when it started drop by drop (spasm of sphincter).

Dripping of Urine.—Dripping of the urine after passage of the stream is a frequent occurrence, and is of varying importance according as it appears after voluntary urination—a short time after or in the intervals. It is due to a relaxation of the muscular tissue of the urethra, and the urethra lying in a half-opened condition does not press the urine out of the bulbous portions, so that it accumulates and is suddenly ejected after urination, or it drips away slowly during walking. Narrow strictures also cause it, when the portion posterior to the stricture fills like a sack, and unless emptied by milking movements by the patient, it drains away afterward. Abnormal narrowness of the orifice or very great phimosis are other causes. Involuntary urination may occur at any time, while dripping only follows urination.

URINE, EXAMINATION.—The principal duty of the kidney is to eliminate the waste products of the body arising from normal katabolism. To this end excrementitious material is constantly being absorbed from the fluids and tissues of the body, and the same is constantly thrown off through the medium of the kidneys, which have been accurately denominated the "sewers of the human system." By an examination of the urine, therefore, some idea of cellular activity may be formed, as well as of the character of such action as it occurs in the living organism.

Average Composition of Normal Human Urine (Wormley).

	(Parts in 1000.)		Voided Daily.	
			Grains.	*Grams.*
Water	950.00			
Urea	28.00	Organic matter 37.60	520.80	35.00
Uric acid	0.60		11.16	0.75
Hippuric acid	0.35		6.51	0.44
Creatinin	0.65		12.09	0.81
Extractives	8.00		148.80	10.00
Sodium chlorid	8.00		148.80	10.00
Phosphoric acid	2.00	Inorganic matter, 12.40	37.20	2.50
Sulphuric acid	1.25		23.45	1.56
Lime, CaO	0.25		4.65	0.31
Magnesia, MgO	0.30		5.58	0.37
Potash, K_2O, and soda, Na_2O	0.60		11.16	0.75
	1000.00		930.20	62.49

	(Parts in 1000.)	Voided Daily.	
		Grains.	*Grams.*
Water	950.00		
Organic matter	37.60	699.36	47.00
Inorganic matter	12.40	230.64	15.49
	1000.00		

To find the proportion of solids in the urine use **Bird's formula:** The last two figures of the specific gravity of urine nearly represent the number of grains of solids to the ounce contained in the urine. The same two figures multiplied by 2 (**Trapp's factor**) give the parts in 1000. **Haeser's factor** is 2.33.

Chemic Examination of Urine

By the chemic examination of urine is ascertained the (1) quantity; (2) color; (3) odor; (4) reaction; (5) specific gravity; (6) freezing point. Also the presence or absence of (7) albumin; (8) glucose; (9) indican; (10) peptone; (11) propeptone; (12) acetone; (13) diacetic acid; (14) various coloring-matters, as bile; (15) the amount of urea; (16) various ingredients, as mucin, fibrin, inosite, sugar of milk, etc.; (17) urinary calculi.

Quantity.—The whole amount of urine passed within 24 hours must be collected. The normal quantity of urine passed within this time ranges from 40 to 50 ounces, or 1200 to 1500 c.c. The quantity is increased in winter and is less in summer, when there is more evaporation from the skin. The quantity is lessened in fevers and in exhaustive diseases.

CLINICAL SIGNIFICANCE OF VARIATIONS IN THE VOLUME OF THE TWENTY-FOUR HOURS URINE.—(*Bartley.*)

Increased Volume.	Polyuria (*V*+)	Renal affections.	Interstitial nephritis.
			Amyloid degeneration.
		Nutritive disorders.	Diabetes mellitus.
			Diabetes insipidus (phosphaturia).
		Nervous.	Hysteria.
		Essential.	Epilepsy.
			Dementia.

Decreased Volume.	Oliguria ($V-$)	In febrile diseases.	Dermatitis. Gout. Toxic conditions.
		In chronic affections.	Of the heart. Of respiratory organs. Of the kidneys. Of the liver and uterus.
	Suppression, or anuria.		Calculus or tumor. Certain forms of nephritis. Nervous anuria. Traumatic anuria.

Before beginning to collect the specimen of urine, the patient should first empty the bladder. Should any urine be lost at stool, it must be approximately estimated and included in the total quantity.

Color.—Normal urine is pale yellow. Dark amber urine frequently contains large quantities of uric acid.

The color may be changed to black by the administration of carbolic acid or naphthalin, or to yellow after the administration of santonin. In malarial fevers of a pernicious type it is frequently bright red from dissolved hemoglobin.

The following is a table of colors of the urine:

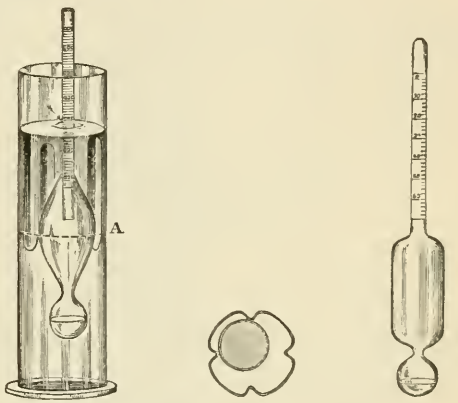
Color.	Cause of the Color.	Pathologic Condition or Cause.
Nearly colorless.	Dilution or diminished pigments.	Various nervous conditions, hydruria, diabetes mellitus, diabetes insipidus, contracted kidney.
Normal color becoming black on standing.	Unknown; glycosuric acid.	Sometimes in pulmonary tuberculosis. Pathology unknown.
Milky.....	Fat globules; pus corpuscles.	Chyluria; fatty kidney; purulent disease in the urinary tract.
Dark amber to reddish-brown.	Increase of normal or occurrence of pathologic pigments; concentration of the urine.	Fever; pernicious anemia; excessive sweating.
Yellow.	Excreted drugs: *e. g.*, picric acid.	
Orange.	Excreted drugs: *e. g.*, santonin, chrysophanic acid.	
Brown to black..	Hematin, methemoglobin, melanin, hydrochinon, and catechol.	Small hemorrhages; methemoglobinuria; antipyrin; chlorate of potassium; melanotic sarcoma: carbolic acid; creosote.
Brownish-yellow to red, becoming blood-red on adding alkalies.	Substances introduced with senna, rhubarb, and chelidonium.	
Red or reddish..	Hemoglobin or free blood. Pigments in food: *e. g.*, logwood, madder, bilberries, fuchsin.	Hemoglobinuria or hematuria.
Greenish to brown or black.	Bile pigments.	Jaundice.
Dirty green or blue.	Dark serum on surface and blue deposit due to indigo-forming substances.	Cholera; typhus; hepatic and intestinal affections. Especially marked in stale urine.

Odor.—Faintly aromatic; rendered strong after eating certain vegetables, as asparagus.

Reaction.—Normally, the urine has an acid reaction, due chiefly to acid sodium phosphate. Uric, hippuric, and lactic acids also aid in rendering the urine of an acid reaction. In herbivora the urine is alkaline in reaction, and in carnivora very acid. A vegetable diet causes an alkaline urine. On standing, urine undergoes ammoniacal decomposition, rendering the reaction alkaline.

To determine its reaction, red and blue litmus papers are used; if the urine is acid, it turns blue litmus red; and if alkaline, it turns red litmus blue.

Specific Gravity.—The specific gravity of normal urine varies from 1015 to 1025. When the specific gravity is above 1030, glucose should be suspected; or when below 1010, albumin. However, the solids dissolved in the urine determine to a great extent its specific gravity, and a sample of urine may vary from 1015 to 1025 and contain albumin or glucose. For the determination of the specific gravity of urine the urinometer is generally used. In order to determine the accuracy of the instrument, it should be placed in distilled water at 60° F., when it should sink to the mark 0 or 1000.



a, Squibb's Urinometer and Jar. *b*. Section of Same

Freezing-point.—See Cryoscopy.

The following table from Bartley is of service:—

THE URINE OF THE TWENTY-FOUR HOURS—NORMAL AND PATHOLOGICAL

Physical Character.	Normal.	Alterations in Abnormal Conditions.
Color.....	Pale straw to reddish yellow. The average color is amber.	Colorless: neuroses, chronic nephritis, diabetes. High-colored: acute fevers, icterus. Blood-red: blood or foreign color. Dark brown: hematuria, poisoning by carbolic acid, potassium chlorate, or iodoform. Smoky brown: presence of decomposed blood, acute nephritis. Yellow or green: presence of bile. White: chyle or pus.

Physical Character.	Normal.	Alterations in Abnormal Conditions.
Transparency.	Clear, with only a slight flocculent cloud of mucus.	Urine turbid when passed, is abnormal. Whitish sediment may be pus, phosphates, or ammonium urate.
Consistence...	When normal, urine is mobile, like water.	When viscid, it indicates albumin, bile, mucus, or pus.
Odor.....	Peculiar to itself.	Urine putrid when passed, indicates cystitis.
Reaction.....	Slightly acid; becomes more acid on standing, then becomes alkaline.	Urine strongly acid in fevers and inflammations of the liver, heart, and lungs; in acid dyspepsia. Urine is alkaline in cystitis, and occasionally in debility, chlorosis, certain organic nervous diseases, typhus, etc.

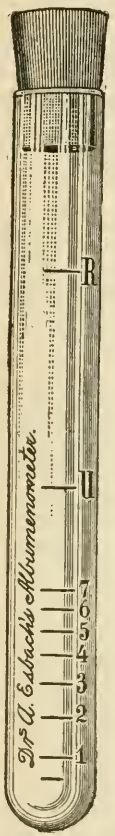
Inorganic. Constituents.	Amount in Grains.	Alterations in Pathological Conditions.
Sulphuric acid.	23 to 38	Having more or less the same source as urea, it will increase or diminish therewith. Occurs as sulphuric esters, and preformed.
Phosphoric acid.	46 to 54	**Increased** in fevers, in nerve-exhaustion, disease of spinal cord, and in tubercle of the lung. In phosphatic diabetes the alkaline phosphates are greatly increased. **Diminished** in many mental diseases, especially mania, in nephritis, and in chlorosis.
Oxalic acid....	0.3	**Increased** in catarrhal jaundice, and in oxalic acid diathesis, mental depression, and certain forms of dyspepsia.
Phosphate of lime.	4 to 5	**Increased** in osteomalacia, rickets, scrofula, carcinoma, long-continued suppuration, organic disease of the spinal cord. **Diminished** in fevers.
Phosphate of magnesium.	7 to 11	
Chloride of sodium.	150 to 250 (Cl = 90 to 150, Na = 60 to 90)	**Increased** in fevers at the onset, and with the reabsorption of dropsical fluids. **Diminished** during apyrexia, dropsies, cholera, typhus, inflammations generally, and especially in the forming stage of pneumonia.
Free acid (calculated as oxalic acid).	30 to 60	**Increased** during the acme of acute febrile affections (on account, probably, of the diminished proportion of water present). **Diminished** in most diseases affecting the nutrition and leading to a deficiency thereof.
Total inorganic salts.	200 to 380	
Potassium.	38 to 48	
Sodium.	140 to 180	
Calcium.	4 to 5	
Magnesium.	2 to 3	

Organic Constituents.	Amount in Grains.	Alterations in Pathological Conditions.
Urea.....	450 to 500 or 30 to 34 gm.	**Increased** after much meat, in fevers, diabetes mellitus, copious drinking of water or alcohol, congestion of liver. **Diminished** in abstinence from meat, rest, hepatic abscess, nephritis, chronic wasting diseases.
Uric acid.....	4 to 15 (ratio to urea, 1 : 40)	**Increased** in leukocythemia, pernicious anemia, gont, rheumatism, deficient oxidation; organic diseases of heart, lungs, liver, or skin; after acute fevers and excessive meat diet. **Diminished** in vegetable diet, gout, before attack, chronic renal disease, outdoor exercise.
Hippuric acid.	5 to 15	**Increased** with vegetable diet, after taking benzoates. **Decreased** in animal diet.
Creatinin.....	8 to 15	**Increased** in meat diet, and increased nitrogenous metabolism. **Decreased** in vegetable diet, and milk diet.
Xanthin bases.	0.5 to 2	**Increased** in splenic disease, meat diet, deficient oxidation. **Decreased** in vegetable diet.
Carbolic acid, Cresol, etc.	0.015	**Increased** in certain diseases of the intestines, causing constipation (ileus, etc.), but has been observed to be increased also in certain cases of diarrhea.
Indoxyl.....	0.07 to 0.05	**Increased** with diseases attended by constipation and intestinal fermentation, and occasionally, also, in cases of diarrhea. After cholera, cancer of the liver and stomach, purulent peritonitis. Valuable diagnostic sign in typhoid fever and cancer of the liver.
Acetone.....	Traces.....	**Increased** in diabetes mellitus; conditions of increased proteid metabolism, with deficient oxidation.
Diacetic acid,	Traces.	
Hydroxybutyric acid.	Traces.	
Albumin.....	None.....	Nephritis, pregnancy, poisoning by certain substances, cold baths, violent exercise, rheumatism, infection, fevers, etc.
Albumose.....	None.....	Presence not clearly diagnostic.
Peptone.....	None.....	Presence not clearly diagnostic.
Dextrose.....	None or trace.	Glycosuria and diabetes mellitus.
Lactose.....	None.....	During lactation, after weaning.
Bile.....	None.....	Obstruction in bile-duct, structural hepatic diseases, malaria, pernicious anemia, yellow atrophy of liver, typhoid fever, and AsH_3 poisoning.
Blood.....	None.....	Hemorrhages, giving hematuria; hemoglobin in malaria, acute nephritis (sometimes).

Organic Constituents.	Amount in Grains.	Alterations in Pathological Conditions.
Pus.....	None.....	Suppuration.
Mucus.....	Present.....	Increased in any irritation along the urinary tract, by uric acid, calcium oxalate, etc., catarrh of bladder, urethra, vagina. Usually increased in acute fevers.

Albumin.—The urine should always be filtered before being tested.

Heller's Nitric Acid Test.—Place in a test-tube about 3 or 4 c.c. (45 to 60 minims) of pure nitric acid, and gently overlay with an equal amount of urine. If albumin is present, a cloudy ring of coagulated albumin will appear at the junction of the two liquids.



Esbach's Albuminometer.

Frequently there will appear an opaque zone immediately above the point of contact of the fluids, which is often due to urea nitrate or to urates. If the urine is heated, this zone will disappear if due to these latter substances; whereas if due to albumin, the precipitate remains permanent.

The Heat-and-acid Test.—In a test-tube place from 6 to 8 c.c. (90 to 120 minims) of urine, and boil. If albumin is present, a precipitate appears, insoluble in a few drops of nitric or acetic acid. Earthy phosphates are also precipitated from the urine by boiling, but these dissolve on the addition of nitric or acetic acid.

Picric Acid.—In a test-tube place from 4 to 5 c.c. of urine, and overlay with a saturated watery solution of picric acid; if albumin is present, a deposit, which is insoluble on boiling, forms at the line of junction.

Quantitative Determination of Albumin.—The albuminometer (a standard graduated glass tube) is filled with acidified urine to U, and the Esbach reagent added to R. This reagent consists of a solution of 10 grams of picric acid and 20 grams of citric acid in 1 liter of distilled water. After closing the tube with a rubber stopper it is inverted several times to mix the contents thoroughly and then placed for 24 hours in a test-tube rack. Then the amount of albumin is noted. The number of grams of albumin in a liter of urine is represented by the graduations on the tube.

Purdy's Centrifugal Method.—To 10 c.c. of the urine in a centrifuge tube 3 c.c. of a 10 percent solution of potassium ferrocyanid and 2 c.c. of 50 percent acetic acid are added. After inverting the tube to mix the contents thoroughly, the thumb being used as a stopper, it is allowed to stand for 10 minutes and then placed in a centrifuge the radius of which with tubes extended must be 6 3/4 inches. The revolutions of the tubes should be at the rate of 1500 per minute and should last 3 minutes. The amount of albumin is then read off in bulk percentage, 1 percent by bulk representing 0.021 percent by weight of albumin. Each division of the tube corresponds to 1 percent, 10 c.c. of urine being used and the divisions representing tenths of a cubic centimeter.

Clinical Significance.—It is stated by von Jaksch that the normal urine occasionally holds a variable quantity of albumin (serum-albumin globulin) as a temporary constituent, while at the same time the kidneys exhibit no alteration of structure; such is "cyclic albuminuria," which occurs during the day and disappears during the night. Many theories exist as to its exciting cause.

When albumin persists in the urine, it must be considered pathologic, and its presence in the urine is looked upon as being indicative of inflammation or degenerative changes in the structure of the kidneys; in other words, of nephritis. However, albuminuria is too often taken as an evidence of nephritis. Careful microscopic study of the urine, together with skilful clinical examination, are necessary to insure a correct diagnosis. Certain associated minor signs of nephritis often neglected are:

1. Auditory difficulties—ringing in the ears and deafness. Mounier has sought to bring the vertigo of Ménière's disease into this category.
2. Numbness of the fingers or hand.
3. Chilliness of legs and feet.
4. Pruritus, likened to the sensation produced by a hair on the skin.
5. Epistaxis, especially in the morning and beginning during sleep.
6. The sign of the temporal artery. The arterial system is tense, the vessels are bent and hard, without there being arteriosclerosis: and this is shown especially well by the temporal artery.

Each of these signs separately has little value; but collectively they are sometimes enough to form the diagnosis.

The following is a table of differential diagnosis between functional and organic kidney-disease (Lane):

Functional.	Organic.
Albumin may be present at infrequent intervals, and may vary in amount from a plain trace to 10 to 20 grains in 24 hours.	Albumin is usually persistent, though not always abundant.
Albumin not found when patient is kept absolutely quiet, and rarely found in urine passed immediately on rising in the morning.	It may be intermittent and still be organic.

Functional.	Organic.
If dropsy is present, it is dependent on insufficient activity of the circulation, rather than on a tardy elimination of the fluids by the kidneys. A very careful examination of the heart and larger vessels is imperative.	Dropsy may or may not be present.
The quantity of urine passed in 24 hours (unless the use of mineral water, beer, etc., is frequently indulged in) will not vary greatly from 3 pints.	The quantity of urine for 24 hours is usually decreased, though in many cases it is greatly increased.
The day urine should exceed the night by double or more its bulk.	The night urine frequently equals and sometimes exceeds that of the day in bulk.
The specific gravity should be between 1015 and 1025, when taken from a sample of 24 hours' mixed urine.	The specific gravity (from a sample of 24 hours' mixed urine) is usually above 1020, though it rarely gets above 1030. In those cases where the quantity of urine is greatly increased, the specific gravity is correspondingly decreased, occasionally falling as low as 1005.
The urea is not diminished for 24 hours.	The urea is diminished for 24 hours.
There is no complication of acute diseases: viz., scarlatina, diphtheria, true gout, or retinal change.	There may be complicating diseases, as scarlatina, diphtheria, etc.
No pus or blood appears in the urine.	There may be both pus and blood in the urine.
No tube-casts are found.	Usually casts of urinary tubules are found.
Patient is under 40 years of age.	If patient is over 40 years of age, the prognosis must be particularly guarded.

Sugar (Glucose, Dextrose).—When the specific gravity of the urine is above 1030, it should be examined for glucose.

Moore's test with sodium or potassium hydroxid, Boettger's bismuth test, and Johnson's picric acid test are all subject to fallacious results.

Those tests which are recommended are Fehling's and Trommer's, which depend upon the reduction of cupric oxid, CuO_2, in alkaline solution by glucose to red cuprous oxid, Cu_2O (Fehling's and Trommer's) or to yellow cuprous hydroxid, $Cu_2(OH)_2$ (Trommer's). In these two tests albumin must first be removed.

Fehling's Qualitative Test.—Fehling's solution deteriorates with age, and it is therefore desirable to keep the copper solution and the alkaline solution separate.

The two solutions may be prepared and the test made in the following manner (Greene): **Solution A.**—Dissolve 34.64 grams of pure, dry, powdered copper sulphate in 200 c.c. of warm distilled water and add distilled water to make 500 c.c. of the *light blue solution*. **Solution B.**—Dissolve in 300 c.c. of hot water 180 grams of Rochelle salt. Filter. Add of pure caustic soda, 70 grams. Cool, and add distilled water enough to make 500 c.c. of a *colorless solution*. Keep in a dark place.

Pour into a test tube one finger's breadth of each of the stock solutions which when mixed should form a deep blue solution.

Heat test solution to boiling-point, add at once 20 to 30 drops of the suspected urine and *boil no longer*, but in the absence of a reaction set aside for from 5 to 30 minutes, and try the polariscopic and fermentation tests, a positive reaction *proves* nothing but the presence of a reducing agent unless the ultimate precipitate is *red*, not yellow or green.

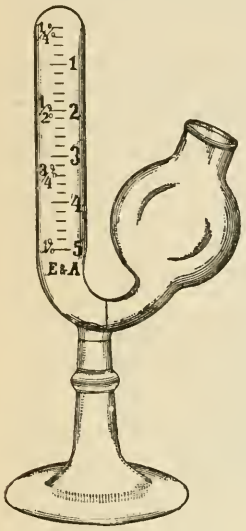
Objections to Fehling's Solution.—Fehling's solution as ordinarily prepared is open to serious objections: (a) It is unstable. (b) An excess of glucose obscures the terminal reaction by becoming caramelized if boiling is prolonged. (c) It cannot be directly applied to ammoniacal urine unless such be especially prepared. (d) A large number of substances may reduce its cupric oxid. Such are glycuronic and glycosuric acid, alkapton creatinin, uric acid, and various drugs, such as benzoic acid, chloroform, chloral, glycerin, the salicylates, turpentine, etc. Hence, if one uses Fehling's solution for qualitative work, he must bear in mind that it is more valuable as a negative than as a positive test. *A urine that does not reduce Fehling's solution is free from glucose, but reduction does not conclusively establish its presence.*

Trommer's Qualitative Test.—To about 6 c.c. (1 1/2 drams) of the urine add about one-fourth its volume of sodium or potassium hydroxid solution. Then add, drop by drop, a solution of cupric sulphate (about 10 percent solution) and agitate the liquid until the bluish-white precipitate of cupric hydroxid, $Cu(OH)_2$, ceases to be dissolved and the liquid presents a slightly turbid or opaque appearance. Heat the liquid, and if glucose is present, the cupric oxid, CuO_2, will be reduced to red or brownish-red cuprous oxid, Cu_2O, or to yellow cuprous hydroxid, $Cu_2(OH)_2$.

Haine's Test.—A much simpler test is Haines' modification of Trommer's test. This test has the advantage of making use of a solution that remains stable almost indefinitely. This solution consists of pure copper sulphate, 30 grains, distilled water, 1 ounce; when a perfect solution is made pure glycerin, 1/2 ounce, is added; then after thorough mixing, 5 ounces of liquor potassæ are added. Of this solution 1 to 2 c.c. are gently

boiled in a test-tube. Then 6 to 8 drops of the urine are added and the upper part of the solution is boiled gently for a second or two only. Presence of sugar is indicated by the formation of a yellow or yellowish-red precipitate.

Fermentation Test.—This test, which depends upon the production of carbon dioxid from glucose by the action of yeast, is best applied by means of an Einhorn fermentation tube so graduated that the amount of carbon dioxid is read off in terms of percent of glucose. The urine must therefore be diluted so as to contain less than 1 percent of glucose, the result being multiplied by the dilution. To the acidified urine is added a piece of compressed yeast the size of a pea and the mixture shaken and poured in the tube without introduction of air bubbles. Controls are also made. The tubes are placed over night in the incubator at 37° C. The percentage of sugar is then read off from the small figures, the larger representing the cubic centimeters of gas.



Einhorn's Saccharometer.

The polariscope is also used to estimate the percentage of glucose in the urine.

Benedict's Test.—The solution is made of:

Copper sulfate (pure crystallized),	17.3 gm.
Sodium or potassium citrate,	173.0 gm.
Sodium carbonate (crystallized),	200.0 gm.
Distilled water, to make,	1000.0 c.c.

The citrate and carbonate are dissolved together (with the aid of heat) in about 700 c.c. of water. The mixture is then poured (through a filter) if necessary, into a larger beaker or casserole. The copper sulphate (which should be dissolved separately in about 100 c.c. of water) is then poured slowly into the first solution, with constant stirring. The mixture is then cooled and diluted to one liter. This solution keeps indefinitely.

For the detection of glucose in the urine about 5 c.c. of the reagent are placed in a test-tube and 8 to 10 drops (not more) of the urine to be examined are added. The mixture is then heated to vigorous boiling, kept at this temperature for one or two minutes, and allowed to cool spontaneously. In the presence of glucose the entire body of the solution will be filled with a precipitate, which may be red, yellow or greenish in tinge. If the quantity of glucose is low (under 0.3 percent) the precipitate forms only on cooling. If no sugar is present, the solution either remains perfectly clear, or shows a faint turbidity that is blue in color, and consists of precipitated urates. The chief points to be remembered in the use of the reagent are (1) the addition of a small quantity of urine (8 to 10 drops) to 5 c.c. of the reagent, this being desired not because larger amounts of normal urine would cause reduction of the reagent, but because more delicate results are obtained by this procedure, (2) vigorous boiling of the solution after addition of the urine, and then allowing the mixture to cool spontaneously, and (3) if sugar is present the solution (either before or after cooling) will be filled from top to bottom with a precipitate, so that the mixture becomes opaque.

It is often convenient to perform the test by placing the tube containing the mixture of the solution and urine in bubbling, boiling water, where it must remain with the water actually boiling for five minutes.

Clinical Significance.—When found in the urine, glucose gives rise to what is called glycosuria, or diabetic urine. While it may be true that at times normal urine may contain a trace of glucose, yet from a clinical standpoint its occurrence and detection by the ordinary tests when accompanied by polyuria, should be looked upon as pathologic, and as indicative of diabetes. Glycosuria is also found in such conditions as cholera, intermittent fever, cerebrospinal meningitis, and in certain diseases of the heart, lungs, and liver, and especially in those diseases that have their seat in the fourth ventricle of the brain.

Indican.—Indoxyl potassium sulphate is an oxidation product of indol in the feces. Its method of formation is thought to be as follows: Indol in the intestines upon oxidation yields indoxyl, after which it combines in the liver with sulphuric acid and is eliminated as indoxyl potassium sulphate, or indican.

Test (Jaffe's).—To a small quantity of urine (4 c.c.) in a test-tube add an equal quantity of pure hydrochloric acid, and subsequently one drop of a saturated aqueous solution of sodium or calcium hypochlorite; agitate thoroughly; now add about one-fourth the volume of chloroform and shake; within a few moments the indican is decomposed into indigo-blue, which is dissolved out by the chloroform.

The hypochlorite solution may be easily prepared by adding 2 or 3 ounces of the commercial chlorid to lime to 8 ounces of water. It should be allowed to stand over a day or two, being shaken frequently, and, finally, filtered under a well-fitting cover. It should be freshly prepared every four weeks. The hypochlorite solution may also be composed of a saturated aqueous solution of sodium hypochlorite. Like the solution prepared from lime, it quickly deteriorates.

Clinical Significance.—At one time indican was thought to represent the amount of putrefaction occurring within the intestines, but this is not the case. In typhoid fever it is often absent. Some have thought that it is increased in wasting diseases and conditions in which the hydrochloric acid in the stomach is decreased, as in gastrointestinal catarrh. It is said to be increased after a meat diet and in obstruction of the bowels, but this does not invariably hold true.

Peptone. Ralfe's Test.—Gently overlay 4 c.c.

(1 dram) of Fehling's solution with a small bulk of urine. If peptone is present, a rose-colored halo will develop immediately *above* the zone of phosphates that frequently occurs at the point of contact of the two liquids.

Clinical Significance.—Peptone frequently occurs in typhoid fever, scarlet fever, miliary tuberculosis, scrofulous pneumonia, jaundice, and cancer of the liver.

Propeptone.—To a small quantity of urine in a test-tube add a few drops of nitric acid, which precipitates propeptones. Now heat, and the solution assumes a yellow color, which precipitates on cooling. It has the same clinical significance as peptone.

Acetone.—In normal urine traces of acetone are found that may be called physiologic.

Legal's Test.—To 3 or 4 c.c. (1 dram) of urine in a test-tube add enough solution of soda or potash to render it alkaline. To this solution then add a few drops of a freshly prepared saturated aqueous solution of sodium nitroprussid, and if acetone is present, a purple or violet-red color will be formed on the addition of chemically pure acetic acid. This test, however, is not distinctive for acetone as it is given by diacetic acid, alcohol and acetic aldehyd.

Trommer's Test.—To 10 c.c. urine strongly alkalinized with potassium hydrate 10 to 12 drops of a 10 percent solution of salicylaldehyd in absolute alcohol are added and the mixture is heated to about 70° C. If acetone is present the fluid changes color and becomes red upon standing. If absent, the color is unchanged. This last is very delicate and distinctive for acetone.

Clinical Significance.—In certain instances acetone precedes the occurrence of diacetic acid in cases of diabetes, and its presence is always considered an unfavorable symptom. It is also said to occur in the urine as the result of cancer and of cerebral disease. See Acetonuria.

Diacetic Acid.—To urine freshly voided add a few drops of a strong aqueous solution of chlorid of iron. If a precipitate occurs, the mixture should be filtered. Heat the filtrate to boiling, and to a small quantity again add the solution of ferric chlorid. If a red color is produced, add sulphuric acid and extract with ether by distillation.

Arnold's Test modified by Lipliawsky is more satisfactory than the above. Two reagents are used: (1) 1 gram of paraamidoacetophenon, 100 c.c. of distilled water, 2 c.c. concentrated hydrochloric acid; (2) 1 percent sodium nitrite solution. To 6 c.c. of solution 1 and 3 c.c. of solution 2 are added an equal volume of urine and 1 drop of ammonia. When shaken, the mixture becomes brick-red in color. Ten drops of 2 c.c. of this mixture, depending on the probable percentage of diacetic acid in the urine, are treated with 15 to 20 c.c. of concentrated hydrochloric acid, 3 c.c. chloroform and 2 to 3 drops of ferric chlorid solution. In the presence of diacetic acid the color of the chloroform changes to violet; if no trace is present the color is yellow or pale red. This test is very delicate and is not given by acetone in oxybutyric acid.

Clinical Significance.—Diacetic acid is never found in normal urine, and when it occurs in diabetes, the disease usually terminates fatally. In this condition it is spoken of as *diabetic diaceturia.* It may occur in certain febrile diseases, as typhoid fever, pneumonia, phthisis, pleurisy, and pericarditis, and in acute exanthematous diseases. See Acidosis.

Coloring-matters (Bile). Gmelin's Test.—To a few drops of urine placed on a marble or porcelain slab add a few drops of impure nitric acid (or of nitric acid containing a few drops of nitrous acid), when a play of colors will be produced, such as green, violet, red, and yellow. The colors are best developed by placing the urine and acid a short distance apart and gradually bringing them together. This test may also be demonstrated in a test-tube by overlaying the acid with the urine.

Clinical Significance.—Biliary pigment is nearly always present in the urine in cases of cholelithiasis and in the acute stage of catarrhal jaundice.

Urea.—Different forms of ureameters are preferred by authors. However, the principle upon which the more reliable appliances are constructed depends upon the decomposition of the urea in the urine when brought into contact with a solution of sodium hypobromite or hypochlorite with the evolution of nitrogen.

Many forms of ureameters are too complicated, and cannot be used by the general practitioner. Simpler forms, while not so delicate, are more frequently employed, and only vary within a few grains of the correct amount of urea. Albumin should always be removed before estimating for urea.

Estimation of Urea by Doremus' Apparatus.—The sample of urine must be selected from the amount passed within 24 hours.

To employ this method the following solutions are required, and must be freshly prepared.

Alkaline Hypobromite Solution

Dissolve 100 gm. of sodium hydrate in 250 c.c. of water and allow to cool.

Bromin Solution

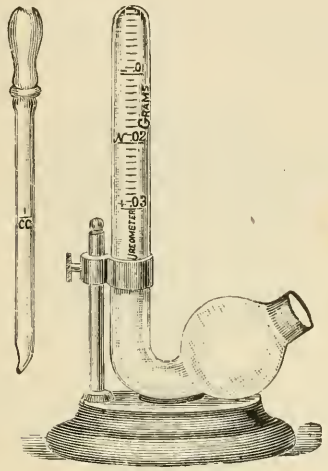
Bromin,	1 c.c.
Sodium hydrate solution (as above),	25 c.c.

Fill the upright graduated tube of the apparatus with the hypobromite solution as thus prepared to the mark .03, and add enough water to about half fill the bulb; mix thoroughly. Tilt the instrument forward, and by means of the pipet, pushed well into the head of the upright tube, slowly add 1 c.c. of urine. After about 15 or 20 minutes read off the volume of gas, which gives the percentage of urea to 1 c.c. of urine. To determine the total amount of urea, multiply this percentage by the

number of cubic centimeters of urine passed within the 24 hours.

Frequently the percentage of urea is so great that the volume of nitrogen presses the hypobromite solution below the .03 mark. When this is the case, dilute the urine with an equal amount of water and proceed as before. Multiply the percentage obtained by 2, which gives the percentage of urea in the specimen of urine.

Clinical Significance.—The normal quantity of urea within the 24 hours fluctuates greatly. From 308 to 617 grains, or 1.5 to 2.5 percent, is the normal amount as stated by Tyson. In midwinter the urea may fall to 130 or 140 grains in those who lead sedentary lives. Urea is the chief organic



Ureameter of Doremus.

constituent of the urine, and through its determination furnishes an index to the rapidity of metabolic changes taking place within the body. However, this change is not the only governing factor, since the quantity of urea depends also upon the amount of nitrogenous food ingested. The urea is *increased* (1) in diabetes mellitus; (2) by the use of nitrogeneous foods; (3) after copious ingestion of water; (4) in acute febrile diseases; (5) in dyspepsia; (6) in nervousness. The urea is *decreased* (1) after prolonged rest; (2) by the use of vegetable foods; (3) by starvation; (4) by the excessive use of tea or coffee; (5) in nephritis. Muscular exercise has but little effect upon the excretion of urea.

Uric acid exists in the urine for the most part in the form of soluble urates of sodium, potassium, and ammonium.

Amount.—The amount of uric acid excreted daily by a healthy man ranges from 7 to 10 grains.

Uric acid is soluble with difficulty in water (in 18,000 parts of cold and 15,000 parts of hot water), and is insoluble in alcohol and ether.

In the urine it exists for the most part in the form of acid urates of sodium, and potassium.

It is frequently found as a sediment in urine, having the color of cayenne pepper granules.

Estimation of Uric Acid.—Probably the best and most accurate method for the estimation of uric acid by the general practitioner is that known as the Hopkins' method, which has been modified by Maisch as follows: To 100 c.c. (3 1/3 ounces) of urine add 30 gm. (1 ounce) of ammonium chlorid (or until saturated), and then add 5 c.c. (75 minims) of water of ammonia; allow the mixture to stand for from 15 minutes to half an hour and then filter. The flask in which the precipitation is to be carried out is thoroughly washed with a saturated aqueous solution of ammonium chlorid and poured upon the filter, and is subsequently washed several times with the saturated aqueous ammonium chlorid solution. The filter is then pushed through and the precipitate is transferred to a beaker (of 6 to 8 ounces capacity) with hot water by means of a Spritz bottle; to this fluid is then added 1 to 2 c.c. (15 to 30 minims) of pure hydrochloric acid, and the liquid is evaporated to 20 or 15 c.c. (1/2 of an ounce), when it is allowed to stand for 1 hour, or until cool.

The precipitated uric acid is then collected upon a filter-paper, washed several times with water, and finally the filter is punched through and the uric acid is transferred to a porcelain capsule or a watch-glass with alcohol by means of a Spritz bottle, dried, and after removal of the small particles of filter-paper that appear on the top of the precipitate, it is weighed. The product obtained is a reddish-brown amorphous powder which under the microscope is crystalline and light yellow or reddish-yellow in color.

Clinical Significance.—When uric acid is not eliminated by the kidneys, it becomes stored up in the body and gives rise to what is known as the uric or "lithic" acid diathesis. Owing to the fact of its insolubility, uric acid is supposed by some to be deposited in the tissues, such as the serous membranes, giving rise to joint pains. By others its failure of elimination is supposed to give rise to headache, hemicrania, neuralgia, despondency, lumbago, and rheumatism.

It is stated that uric acid and urea are eliminated in the urine in the relative proportion of 1 part of the former to 33 parts of the latter. This relation must, however, be accepted as subject to wide variations, depending upon such factors as the amount of exercise, the variety of food and drink, and the season of the year.

While it was formerly held that uric acid has its origin for the most part in nitrogenous elements taken as food, the more recent opinion is that it arises in the system from the disintegration of the leukocytes and nuclein.

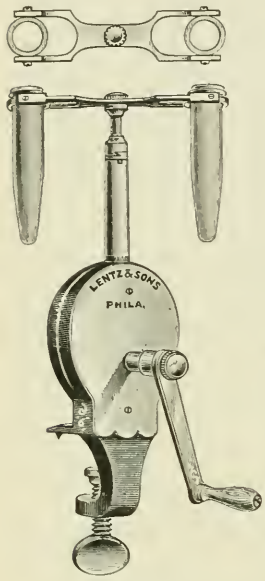
Uric acid is *diminished* in diseases interfering with the process of elimination, such as nephritis, and in diabetes, in chronic rheumatism, before paroxysms of gout, and in chlorosis. It is *increased* in leukemia, in indigestion, after attacks of gout, in acute fevers, in functional diseases, and in heart- and lung-diseases in which there is much dyspnea. Physiologically, it may be said to be increased or diminished *pari passu* with urea.

Various Ingredients (Mucin, Fibrin), etc.—The importance of these ingredients in the urine has not been finally settled.

Ehrlich's Diazo Reaction.—See Typhoid Fever.

Microscopic Examination

The microscopic examination of urine determines the presence or absence of (1) casts, (2) spermatozoa, (3) blood, (4) mucus or pus, (5) epithelium, (6) fungi, (7) uric acid, (8) urates of sodium and ammonium, (9) calcium oxalate, (10) calcium carbonate and sulphate, (11) triple phosphates, (12) leucin and tyrosin, (13) cystin.



Centrifuge.

To examine the urine microscopically the sediment is first obtained, either by means of the centrifuge or after the urine has stood for a period of from 12 to 24 hours. The urine may be preserved for a considerable length of time by the addition of a small quantity (from 5 grains to 1 dram) of chloral hydrate, or by adding 1 part of carbolic acid to 100 parts of urine or 1 part of mercuric chlorid to 3000 parts of urine.

Casts.—These bodies are molds of the uriniferous tubules, and are composed of the coagulable constituents of the blood that are pressed out of the blood-vessels into the tubules, and are afterwards excreted in the urine. This process forms the hyaline or granular cast. In some instances the cast also involves the epithelial cells of the tubule, which become detached, giving rise to an epithelial cast. Blood may also be entangled in the coagulable particles. Usually, this process is accompanied by the occurrence of albumin in the urine, but casts may be present in urine without albuminuria.

a. Blood cast and hyaline cast carrying blood-cells. *b*. Leukocyte or pus-cast. *c*. Hyaline cast carrying renal cells. Epithelial casts.—(*Greene.*)


Granular casts light and dark, coarse and finely granular. (*Greene.*)


a. Waxy casts. *b*. Fatty or fat-bearing casts.—(*Greene.*)

a, *a*, *a*. Round epithelium from bladder. *b*, *b*, *b*, *b*. Columnar epithelium from ureters and urethra. c^1, c^1, c^1. Columnar and squamous epithelium from deeper layers of epithelium of bladder. c^2. Squamous epithelium from superficial layers of epithelium of vagina.—(*Tyson.*)

Tube casts vary in size, shape, and appearance. Their length ranges up to 200μ or more; their diameter from 4μ to 40μ. They are usually straight, but may be curved, twisted, convoluted, or branched.

Varieties.—*Blood casts* are those composed of coagulated blood with corpuscles embedded. They show that the hematuria originates in the secreting structure of the kidney.

Epithelial casts are those composed of plastic matter with cells embedded and denoting desquamative inflammation.

Fatty casts are those containing free fat globules in the coagulated matter, indicating fatty degeneration in a chronic nephritis.

Granular casts are those containing finely divided, granular débris, either in scattered masses or completely filling the casts. They are usually found in cases of contracted kidney.

Hyaline casts are transparent, soft, delicate casts, also called *mucous casts*.

Pus casts are those that contain degenerated leukocytes; indicative of involvement of the interstitial kidney substance.

Seminal casts are molds of the seminal tubules found in the urine, and are recognized by the presence of spermatozoids.

Waxy casts are those that give the amyloid reaction; they are large and yellowish in appearance, and are indicative of serious nephritis.

Clinical Significance of the Different Varieties of Casts.

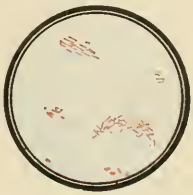
Acute Parenchymatous Nephritis.	Chronic Parenchymatous Nephritis.	Chronic Interstitial Nephritis.
Only a few casts present.	Many casts seen.	Few casts present.
Blood casts, epithelial casts, leukocytes.	In *early* stages large hyaline and dark granular casts. In *later* stages epithelial, large and small granular casts, hyaline casts, and compound granular cells.	Large and small hyaline casts, waxy casts, fatty casts, oil droplets.
During convalescence fatty casts may be present.	In acute exacerbations, on account of the inflammatory processes, there may be present epithelial casts and many leukocytes.	In acute exacerbations on account of the inflammatory process, there may be present all varieties of casts, especially large and small granular casts.

During most acute fevers hyaline casts are found. **Cylindroids** have no clinical significance.

Epithelium.—When the renal epithelium is found in the urine, it generally denotes a grave form of kidney-disease. It may be recognized by the large, oval nuclei. An excessive amount of epithelial cells from the bladder, in combination with pus, denotes cystitis. See also Hematuria.

Bacteria are frequently found in the urine.

Tuberculosis of the urinary tract is often diagnosticated by discovery of the tubercle bacilli in the urine. To examine the urine for *tubercle bacilli*, the sediment must be thoroughly centrifuged, and then examined in the same way that sputum is (see Tuberculosis); but a small amount of egg albumin is added to the specimen before it is placed on the slide or coverslip.



Tubercle Bacilli in Urine.—(*Greene.*) Observe tendency to form groups.

Yeast fungi are found in nearly all specimens of urine after they have been exposed to the air.

Spermatozoa and Associated Substances in Urinary Deposits.

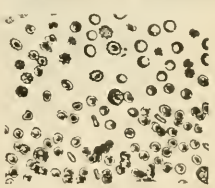
a, a, a, a. Spermatozoa. *c,c.* Spermatozoa, tail out of focus. *d,d,d.* Amyloid corpuscles. *e.* Prostatic cast. *g.* Crystals. *h.* Lecithin-granule cells. *k,k,k.* Epithelium.—(*Greene.*)

Spermatozoa may be found in the urine. See Semen.

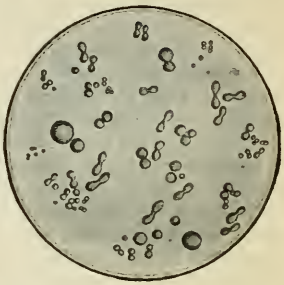
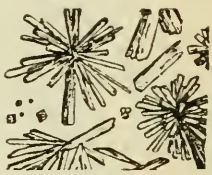
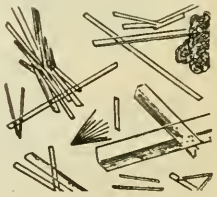
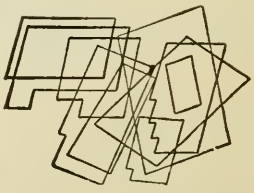
Calculi.—See Urinary Calculi.

Urinary Sediments.—See the following table.

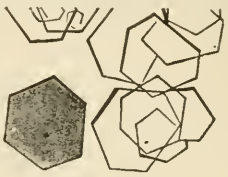
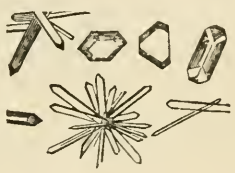
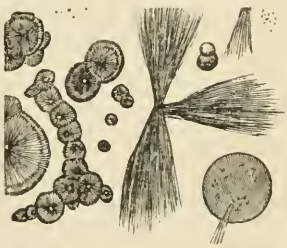
URINARY SEDIMENTS, TABLE OF

Variety.	Gross Appearances and Characters.	Microscopic Features.	Tests.	Significance.	Illustrations. (*After Tyson, Greene, Casselman Landois, Beale, Jakob and von Jaksch.*)
Blood.....	A flocculent, red deposit.	Blood-corpuscles.	Equal parts of tincture guaiac and mature oil turpentine or ozonicether cause green line at junction with urine.	Disease of kidney, bladder, or urethra.	

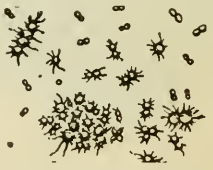
URINARY SEDIMENTS, TABLE OF

Variety.	Gross Appearances and Characters.	Microscopic Features.	Tests.	Significance.	Illustrations. (*After Tyson, Greene, Casselman, Landois, Beale, and von Jaksch.*)
Calcium carbonate.	Whitish sediment (rare); urine alkaline.	Amorphous granules; small spheric or dumbbell crystals.	Soluble in acids with effervescence.	No special significance.	
Calcium oxalate.	Cloudy, whitish, often highly refracting sediment.	Transparent, refracting octahedra. Sometimes "dumbbell" shaped.	Soluble in mineral acids, not in acetic.	Vegetable diet, especially rhubarb; oxaluria; often with uric acid in lithemia.	
Calcium phosphate.	Whitish or yellowish sediment; urine feebly acid or alkaline.	Amorphous granules, or wedge-shaped crystals, separate or in roset-like clusters.	Insoluble by heat; soluble in acetic or mineral acids.	Phosphaturia; dyspepsia; alkaline fermentation.	
Calcium sulphate.	Not distinctive: rare; urine acid.	Elongated, transparent needles or tablets.	Insoluble in ammonia or acids.	No special significance.	
Cholesterin.....	Not distinctive; very rare; urine alkaline.	Large, transparent plates, often superimposed; one corner frequently defective.	The microscopic appearances.	Pyelitis, cystitis, etc.	

URINARY SEDIMENTS, TABLE OF

Variety.	Gross Appearances and Characters.	Microscopic Features.	Tests.	Significance.	Illustrations. (*After Tyson, Greene, Casselman, Landois, Hawk, Beale, and von Jaksch.*)
Cystin.....	White or yellowish-gray deposit; rare; acid, neutral, or alkaline urine.	Six-sided plates, often superimposed.	Crystals burn on platinum with a bluish-green flame without melting; if heated with caustic potash on silver plate leave a permanent, dark stain.	Cystinuria may be an hereditary and insignificant condition; or it may indicate the presence of a cystin stone in the kidney.	
Hippuric acid...	Not distinctive; whitish deposit; urine acid.	Four-sided prisms with two or four beveled edges at the ends.	Dissolved in ammonia, but not in hydrochloric acid.	Diet of cranberries and other vegetables; administration of benzoic acid; in diabetes.	
Indigo.....	Amorphous fragments or concretions of blue color; urine alkaline or acid.	Amorphous granules, fine needles and crystals of a blue color.	The color is distinctive.	In decomposing urine.	
Leucin and tyrosin.	Usually a bile-stained deposit; often scanty; rare; urine acid.	*Leucin:* Yellowish highly refracting spheres, containing radiating lines. *Tyrosin:* "Needles" arranged in "sheafs."	*Leucin:* Heating with protonitrate of mercury in solution deposits metallic mercury. *Tyrosin:* Crystals dissolved in hot water, and treated with mercuric nitrate and nitrate of potassium, giving a red solution and red precipitate.	Destruction of liver; especially acute yellow atrophy, and phosphorus-poisoning.	
Magnesium phosphate.	Not distinctive; rare; urine concentrated, but feebly acid or alkaline.	Large, strongly refracting plates, in the shape of elongated rhombic tablets.	Soluble in acetic acid, re-precipitated by carbonate of sodium.	No special significance.	
Mucin.....	Cloudy turbidity or a viscid, gelatinous sediment.	Epithelium and leukocytes, held in a stringy, transparent mass.	Acetic acid causes cloudiness or precipitate.	Genito-urinary catarrh, especially cystitis.	

URINARY SEDIMENTS, TABLE OF

VARIETY.	GROSS APPEARANCES AND CHARACTERS.	MICROSCOPIC FEATURES.	TESTS.	SIGNIFICANCE.	ILLUSTRATIONS. (*After Tyson, Greene, Casselman, Landois, Hawk, Beale, and von Jaksch.*)
Phosphates, Triple—Ammonio-magnesium phosphate.	Heavy, white deposit; urine feebly acid or alkaline.	Triangular prisms with beveled edges— "coffin lids." Also feathery, star shapes, and other forms.	Insoluble by heat. Soluble in acetic or mineral acids.	Dyspepsia; alkaline fermentation of urine; cystitis.	
Pus.....	Compact, thick, viscid sediment; urine acid or alkaline.	Degenerated leukocytes.	The dark-red color of pus corpuscles on adding iodo-potassic-iodid solution.	In acid urine, with uric acid and no mucus; pyelitis; or alkaline urine with triple phosphates; cystitis.	
Tyrosin.....	See *Leucin*.				
Urates of sodium, ammonium, and potassium. (*The illustration is of ammonium urate.*)	"Brick-dust" deposit, the color due to the color of the urine. Dissolved and cleared by heating. Urine acid; sometimes alkaline.	Amorphous granules. Ammonium urate appears as spheric crystals surrounded by spicules—"hedge-hog crystals."	Dissolved by heat or on adding acids.	Lithemic and rheumatic diathesis. Fever. Ammonium urate occurs when an acid urine is undergoing alkaline fermentation.	
Uric acid.....	Small grains, resembling red pepper; urine acid.	Crystals of various shapes colored brownish-red by the urinary pigments. The commonest form resembles a whetstone.	The crystals dissolve in caustic potash. The murexid-test produces a purple color.	Lithemic or rheumatic diathesis.	
Xanthin.....	Not distinctive; urine acid; very rare.	"Whetstone" crystals.	Insoluble in acetic acid; soluble in ammonia.	Xanthin-stone in the kidney.	

URINE, EXTRAVASATION.—Extravasation of urine is commonly, though not always, the result of stricture, and is then due either to the dilated urethra behind a stricture ulcerating and giving way, or to a lacunar abscess bursting into the urethra. In either case the urine is forced by the contraction of the bladder into the surrounding cellular tissue.

The urethra may give way (1) in front of the anterior layer, (2) between the two layers, or (3) behind the posterior layer of the triangular ligament. In the first and by far the most common situation it is the bulbous portion of the urethra that gives way. Here the urine is prevented from passing (1) backward into the pelvis by the anterior layer of the triangular ligament which is attached to the rami of the pubes and ischium and to the subpubic ligament; (2) downward into the ischiorectal fossa by the anterior layer of the triangular ligament continuous around the transverse perineal muscle with the deep layer of the superficial fascia of the perineum; (3) laterally, on to the thighs, by the deep layer of the superficial fascia of the perineum attached to the rami of the pubes and ischium. Hence it passes in the middle line into the cellular tissue of the scrotum and penis, and laterally on to the abdomen, where it is prevented from passing down the thigh by the deep layer of the superficial fascia of the groin (which is continuous with the deep layer of the superficial fascia of the perineum) which is attached along the line of Poupart's ligament.

When the membranous portion of the urethra is ruptured, the urine is confined at first between the two layers of the triangular ligament, and if not released, will make its way (1) forward, through the anterior layer, and take the course given; or, rarely, (2) backward, through the posterior layer, and then, as when the urethra gives way behind the posterior layer, will make its way around the neck of the bladder, and finally induce a fatal result. Wherever the urine spreads it causes inflammation and sloughing.

Symptoms.—The history of a case of extravasation is not uncommonly as follows: A patient with a tight stricture is straining to pass water; he feels something give way, experiences a sensation of relief, and perhaps owing to the tension being removed by urine being forced into the cellular tissue, the superadded spasm for a time ceases, and a few ounces of urine are passed through the urethra. In half an hour or so a pricking or burning sensation is felt in the perineum, soon followed by pain, and by rapidly increasing swelling of the perineum, scrotum, and penis. If the urine is not let out by timely incisions, the swelling extends to the groin, and in some cases has been known to reach as high as the axilla. The skin now appears dusky or purplish-red and edematous, and gangrene and sloughing of the infiltrated tissues rapidly ensue. The absorption of the septic products gives rise to constitutional disturbance and to fever, which, though it may at first run high, soon assumes a low typhoid character, and the patient, especially if the subject of chronic kidney-disease, frequently sinks into a comatose state and dies. When the extravasation occurs between the two layers of the triangular ligament, it may remain localized, giving rise to a hard, circumscribed swelling in the perineum, which may slowly make its way toward the scrotum; and, lastly, when the extravasation occurs behind the posterior layer of the triangular ligament, and the urine is extravasated into the pelvic cellular tissue, the symptoms resemble those of extraperitoneal rupture of the bladder (Walsham).

Treatment.—A catheter should be passed into the bladder, or, when this is impossible, down to the stricture, and in either case a free incision, extending into the urethra, should be made on the catheter, in the middle line of the perineum. Free incisions through the skin of the scrotum, penis, and groins—in fact, wherever the urine has penetrated—should likewise be made, to allow of its draining away, and the wounds should be rendered as far as possible aseptic by the free application of iodoform or other antiseptics. At the same time the patient's strength must be supported by fluid nourishment and stimulants; opium should be given, unless contraindicated on account of kidney-disease.

URINE, INCONTINENCE (Enuresis).—Nocturnal enuresis may occur in adults or in children. It is more common in boys than in girls. It rarely persists beyond puberty; if so, it is usually incurable; such cases are most often met with in girls. Urination may occur once or several times during the night—most often during the first sound sleep—and again in the early morning.

During the first months of life the urine is retained in the bladder for only a short time, but after the first year constant or very frequent micturition indicates some abnormality or disease, although it may be due to mere habit. Paralysis; malformation; the secretion of a large amount of urine, as in diabetes insipidus; hyperacid urine; calculus; cystitis; irritation of the penis, from adhesions to the glans penis, etc.; a tight prepuce or contracted meatus; worms or other rectal irritation; unduly profound sleep, from the semi-asphyxiated condition caused by enlarged tonsils or postnasal adenoids; dreams or gastric disturbance, from late or unwholesome meals, and masturbation—these are all causes. Ill health, conjoined with an unstable and easily excited mind, may give rise to enuresis. The condition has been known to subside in delicate children on the correction of eye-strain. Renal calculus or pyelitis of tubercular origin may be possible causes.

In adults enuresis may arise from an overdistended bladder, from which urine continually dribbles. This is nearly always the result of impacted urethral calculus, phimosis, hypertrophied prostate, paralysis, or stricture. The use of a filiform bougie or a very finely calibered catheter on the first attempt to withdraw the urine will differentiate from incontinence, while the associated paralysis, if any, will confirm the diagnosis.

Incontinence of urine in women may occur from injury to the neck of the bladder or to

the urethra, from the prolonged pressure of the child's head during labor, or from instruments, or the removal of stone. It may be nocturnal or daily.

Treatment.—In the treatment of nocturnal incontinence of urine, apart from paralysis and irremediable malformations, the cause is to be looked for and all sources of irritation are to be removed. If due to phimosis, circumcision should be done; if to adhesions, these must be broken down; if the meatus is too small, dilatation or meatotomy should be performed. The urine should be examined for overacidity and for evidence of cystitis, and these conditions should be corrected by the use of potassium citrate or of liquor potassæ. If the diet is at fault, it should be corrected and irritating food should be forbidden. Worms must be removed by appropriate treatment. Late or undigestible meals are to be forbidden, and the habit of sleeping on the back is to be avoided. Too great weight of bedclothes is often provocative, and is to be remedied.

The most serviceable drug, after alkaline diuretics, is belladonna, or its alkaloid, atropin. Belladonna should be given in full and increasing doses (from 5 to 10 drops of the tincture 3 times daily; increase to from 10 to 20 drops in 12 hours) until physiologic results are obtained. Atropin is sometimes effective when belladonna fails. Potassium bromid may be given alone or with belladonna, while ergot, cantharides, potassium nitrate, camphor, and other drugs have been employed. In the incontinence of adults resulting from sudden movement or from excessive laughter, drop doses of the tincture of cantharides, 3 times daily, will do much to effect a cure, alkaline diuretics being employed at the same time. Punishment, by severe scoldings or whippings, is useless, and makes the sufferer sullen, and probably augments the trouble. If enuresis results from habit, it may be necessary to administer diuretic waters for a long time. The habit of passing urine just before retiring, and of arising for the same purpose several times during the night, should be encouraged.

The following prescriptions are useful:

℞. Potassium citrate, ʒ ss
Spirit of nitrous ether, ʒ vj
Water, enough to make ʒ j.
Give a dessertspoonful every 4 hours in an equal quantity of water.

℞. Arsenic trioxid, gr. 1/3
Extract of nux vomica, gr. ij.
Make into 20 pills. Give 1 pill 3 times daily after meals to a child of 8 or 10 years.

When enuresis results from paralysis or from retention and distention of the bladder, the catheter is to be used. Asepsis must be strictly maintained, and the bladder washed out with a weak antiseptic fluid, such as boric acid solution or a solution of 1:10,000 of bichlorid of mercury, or of 1:100 of phenol, when paralysis is responsible for the condition. In some incurable cases a urinal must be worn.

URINE, RETENTION.—Retention of urine is either partial or complete. In the former condition a certain amount of urine is never expelled, and the capacity of the bladder is proportionately diminished; in the latter it is distended until it can hold no more.

Etiology.—Either the expulsive power of the bladder is defective or there is some obstruction to the exit of the urine; or both may happen.

1. The former may arise from failure of the muscular power or of the nervous stimuli, or of both. Atony and peritonitis, spreading to the muscular coat, are instances of the first named cause; paralysis from disease or injury of the spinal cord or of the sacral nerves, hysteria, exhaustion (as in fevers), alcoholic excesses, shock, and, perhaps, belladonna poisoning, of the second. Railway accidents, operations around the rectum, such as ligation of piles, and injuries in the region of the pelvis are especially likely to cause it; but in old people, and in those in whom the wall of the bladder is already in a condition of partial atony, retention may follow the slightest accident, even a fall on the trochanter or the passage of a catheter.

2. Obstruction to the flow of urine may be situated:

(*a*) In the interior of the canal: impacted calculus, for example.

(*b*) Outside the urethra: such as a string tied around the penis by a child to check nocturnal incontinence or the pressure of a gravid or displaced uterus.

(*c*) In the wall itself. This is by far the most common. The affection may be permanent, as stricture or enlarged prostate; or temporary, as congestion and spasm. In most cases temporary and permanent causes act together. An impacted calculus, for instance, may occupy only a small part of the interior, but the spasmodic contraction that it causes prevents the passage of a drop of urine; a stricture which admits a No. 7 or No. 9 French catheter may suddenly become closed in the same way, owing to alcoholic excesses or to exposure to cold; an enlarged prostate may have existed for years without serious inconvenience, until suddenly congestion sets in, and the mucous membrane becomes so swollen that the weakened muscular fiber gives way.

Symptoms.—When retention has come on slowly, as from the gradual contraction of an organic stricture, there may be but little local pain and no constitutional disturbance, even though the bladder may be distended by many ounces of urine. When, however, it is produced suddenly, there is usually great pain, followed by severe constitutional symptoms—a small and frequent pulse, a dry and brown tongue, and perhaps delirium, symptoms probably due to the sudden check to secretion by the kidneys and to the stretching of the bladder. The bladder itself, unless greatly hypertrophied and contracted, rises out of the pelvis, and may be felt as a distinct tumor, dull to percussion, and at times extending as high as the umbilicus, or, in extreme

cases, even to the ensiform cartilage. The patient, unless drunk, usually complains of inability to pass urine. When, however, the bladder has become gradually distended and urine is passively flowing away, he may complain of inability to hold his urine, and be quite unaware that the bladder is full, and may object to having a catheter passed until the condition has been explained. The presence of a swelling in the abdomen, and the flowing of urine through the catheter immediately after the patient has passed urine and believes that he has emptied his bladder, should serve for the diagnosis. In suppression of urine the bladder is found empty on passing a catheter.

Results of Retention.—If the bladder is soon relieved, no apparent harm may ensue. If neglected, however, the overdistention may lead to (1) atony of the muscular coat; (2) cystitis; (3) nephritis; (4) rupture of the urethra behind the obstruction; (5) rupture of the bladder itself (rarely); and (6) passive overflow of urine, the bladder remaining full.

Treatment.—The distended bladder must be relieved, and if the distention is extreme and the symptoms urgent, at once.

As a rule, the patient is to be kept warm and should lie on his back. The administration of a hot bath and an opiate, or of a few drops of chloroform, may suffice, but usually resort must be had to instrumental aid. If success at passing an instrument into the bladder is not shortly obtained, it may be necessary to administer an anesthetic. In hysteric retention in women judicious indifference is best. After a safe interval the bladder should be relieved by the passage of a soft-rubber or gum catheter and withdrawing the urine. A hot hip-bath or cold water thrown suddenly over the back will often produce the desired effect.

In cases of retention of urine in young children an enema thrown into the rectum will often so stimulate both the center for defecation and the genitospinal center for urination as to bring about micturition without catheterism—a proceeding always dangerous in young children, unless they have been anesthetized. When retention is due to cyst of the sinus pocularis the passage of an instrument will rupture the cyst and the infant will be relieved.

When the cause of the retention is a stricture, it is well to try to pass first a soft catheter, then a hard catheter, employing large sizes at first, although some surgeons advise the immediate use of the filiform bougie. It is advantageous to withdraw but half of the retained urine, withdrawing the remainder after waiting half an hour, and then washing out the bladder with hot boric acid solution. After withdrawal of the urine hot blankets should be wrapped around the patient, and a hot sand-bag may be placed against the perineum and a hot water-bag over the hypogastrium. A suppository of opium and belladonna and tablets of salol and boric acid may be employed for several days subsequently.

If failure ensues from the use of rubber or silk or hard catheters, filiform bougies are to be employed. This form of bougie acts as a capillary drain, and will empty the bladder in a few hours. It is, of course, to be allowed to remain in the bladder until this is accomplished. Successively larger bougies are to be inserted alongside of the filiform for several days. No attempt is to be made to dilate the stricture forcibly until retention has ceased and inflammation has subsided.

Aspiration and suprapubic or perineal cystotomy must be resorted to when other means have failed. See URETHRA (Stricture).

In simple inflammation of the urethra the hot hip-bath, the use of suppositories of opium and belladonna, and the application of the hot sand-bag to the perineum and of the hot water-bag over the hypogastrium are means usually employed with success. A soft catheter is to be used if these measures fail, or if the symptoms are very urgent.

In spasmodic stricture a metal catheter of good size should be held firmly against the spasmodic area a sufficient length of time to cause the stricture to relax.

The occluded meatus of a new-born child may be incised with a tenotome or may be dilated. In complete phimosis the prepuce is to be slit up. A urethral stone may be removed by the urethral forceps or may be pushed in or out. When fecal impaction causes retention, the feces must be removed by enema, by the hand, or with a scoop. When prostatic hypertrophy is causative, a filiform bougie is first passed, and over a catheter. A silver instrument with a large curve is sometimes employed. A soft catheter is to be employed when expulsive defect exists. See PROSTATE (Diseases).

The administration of laxatives, maintenance of the free action of the skin, warmth, and confinement to bed are general means of treatment commonly employed, while the use of such drugs as salol, boric acid, and quinin is advised to render the urine antiseptic. It is, of course, understood that asepsis and antisepsis are important in the use of instruments.

Aspiration is to be employed, under antiseptic precautions, when other means fail. The trocar or aspirator needle should be passed in the median line just over the pubes, its course being downward and backward. The puncture must be antiseptically dressed: *e. g.*, with iodoform and collodion. See BLADDER (Paracentesis).

When rupture of the urethra has taken place and retention of urine ensues, perineal incision is advised, but otherwise it is not now resorted to. It must always be borne in mind that the horizontal position is to be maintained when passing the catheter, as this position lessens shock. See URETHRA (Injuries) URINE (Extravasation), URINE (Suppression).

URINE, SUPPRESSION.—Suppression of urine is the term applied to the nonsecretion of urine by the kidneys, and it must not be confounded with retention of urine, in which the urine is secreted as usual, but its passage from the bladder is obstructed. In the former condition the bladder is empty; in the latter, distended. Suppression of urine may

be due to obstruction of the ureter by a calculus, acute nephritis, or sudden shock. The usual causes of such shock are genitourinary operations. Suppression of urine is also caused by acute poisoning by phosphorus, lead, turpentine, cantharides, etc. It is seen in the collapse stages of cholera and yellow fever and in hysteria. If suppression of urine is not relieved, coma, convulsions, and death from uremia quickly ensue.

Treatment.—Dry or wet cupping of the loins, hot vapor baths, free purging, as by elaterium or croton oil, the administration of diuretics, injections of pilocarpin, and hot enemata by the rectum are, at times, successful in relieving the congested kidney. Large, hot irrigations of normal salt solution, with the double current rectal tubes, or infusion of saline fluids in the tissues or veins, may be tried. See NEPHRITIS, URINE (Retention).

UROTROPIN (Hexamethylenamin). $C_6H_{12}N_4$. —A compound produced by the action of formaldehyd on ammonia. The drug has other trade names—cystogen, aminoform, formin, uritone. Urotropin increases the excretion of the urine and of uric acid, the solution of the urates beginning within 24 hours. Urotropin is decomposed in the organism, formaldehyd being set free and being eliminated in the urine. Ordinary medicinal doses cause no general effects as a rule, but in susceptible persons it may cause gastric and renal irritation, with hematuria, hemoglobinuria, and albuminuria, also diarrhea, abdominal pain, a measley rash, headache, tinnitus aurium, and strangury. It is an excellent urinary and intestinal antiseptic, and possesses considerable power as a solvent of uric acid, the excretion of which it promotes. It is particularly efficient as an alterative and diuretic in the treatment of cystitis, pyelitis, and phosphaturia. It is advocated as a prophylactic against scarlatinal nephritis and threatened meningitis. The dose for adults is 7 1/2 grains, 2 or 3 times daily, best administered in 1/2 pint of plain or carbonated water. No more than 30 grains should be given in a day.

URTICARIA (Hives; Nettle-rash).—An inflammatory affection of the skin, characterized by the formation of evanescent whitish and pinkish elevations, attended by intense itching.

Symptoms.—The eruption appears suddenly, manifesting itself as firm, circumscribed, whitish or pinkish elevations (wheals, pomphi) with a reddish areola. The wheals last from a few minutes to several hours, disappear, and are succeeded by others. They are asymmetric, though usually bilateral, pea-sized or bean-sized, and irregular in shape, often, however, being linear. They may involve any portion of the cutaneous surface, or even the mucous membranes. When the pharynx or larynx is involved, alarming suffocative attacks may occur.

The itching in urticaria is intense, the relief produced by scratching being purchased at the cost of the excitation of new lesions. The skin is markedly sensitive to all sorts of irritation, and responds by the production of wheals. The artificial production of wheals gives rise to the form termed *urticaria factitia.* In some urticarial subjects a word may be inscribed upon the skin with a pointed instrument, and in a few minutes the letters will stand out in wheals as if embossed.

In children urticaria is apt to take the papular form—*urticaria papulosa* (*lichen urticatus*). In such cases there are actual inflammatory papules present, with or without the presence of wheals. The summits of the papules are apt to be excoriated on account of the scratching prompted by the intolerable itching. In some individuals wheals attain the size of an egg or even larger. This form is called *urticaria tuberosa* or *urticaria gigans* (giant urticaria). Hemorrhage into the wheal occurs occasionally, giving rise to the form known as *urticaria hæmorrhagica.* At times the upper layers of the wheal are raised into a bleb by the subjacent serum; this type is designated *urticaria bullosa.*

Urticaria, as a rule, runs an acute course, subsiding in a few days. In exceptional instances, however, it may become chronic, wheals appearing, disappearing, and reappearing, the process extending over a period of months or even years.

Etiology.—The great majority of cases of acute urticaria are produced through the alimentary tract. Substances taken into the stomach may cause urticaria, either by a mechanic irritation of the stomach or bowel or by producing a toxemia. Intestinal parasites and undigested aliment act by mechanic irritation. The substances capable of producing toxemia are almost numberless. They may be primarily toxic, or may only develop their toxicity through putrefactive changes while in the bowel. Again, a large number of substances, both foods and drugs, perfectly innocuous to the ordinary individual, act, on account of idiosyncrasy, as poisons to others. The following articles of food are particularly apt to produce hives: lobsters, crabs, mussels, cheese, sausage, pork, nuts, strawberries, etc.

The following drugs are prone to produce urticarial eruptions: quinin, copaiba, cubebs, salicylic acid, morphin, turpentine, chloral, etc. Urticaria may be produced reflexly also by irritation of viscera other than the alimentary tract. It is sometimes associated with rheumatism and tonsillitis. Thus, irritation of the uterus and adnexa may act as an etiologic factor. Rupture or puncture of hydatid cysts or puncture of pleural effusions may be followed by hives. Again, the disease may be produced by direct local irritation, such as the sting of the nettle, the bite of jelly-fish, mosquito, wasp, etc.

Pathology.—The wheal is produced as a result of direct reflex disturbance of the vasomotor apparatus. The lesion consists of a circumscribed edema of the cutis. A momentary spasm of the cutaneous vessels is followed by a dilatation, with exudation of serum and some leukocytes. At the summit of the lesion the effusion is so great as to produce a pressure anemia, hence the whitish coloration. The peripheral vessels are engorged, which gives rise to the reddish areola.

Diagnosis.—The characteristic features of urticaria are the presence of wheals, their rapid evolution and great evanescence, and the intense itching.

Prognosis.—Acute cases recover in a few days. Chronic cases may persist for a long time, and may exhaust the entire therapeutic armamentarium of the physician.

Treatment.—In severe acute cases seen early an emetic should be administered to get rid of the offending substance. Later, magnesium sulphate is to be employed until free catharsis is produced. In subacute cases salol or phenacetin, in 5- to 10-grain doses after meals, may be used with good results. In chronic cases most earnest efforts should be directed toward the discovery of the cause. The patient's dietary must be the subject of the most careful study. Every detail of occupation, of mode of living, and of habits must be scrutinized. The most careful examination, however, will sometimes fail to disclose any discoverable cause. Most cases will be found to be due to gastrointestinal disturbances. In such the most simple diet should be prescribed. In obstinate cases one will do well to restrict the patient for a few weeks to a milk diet.

In obscure cases some of the following remedies may be tried: atropin by mouth or hypodermically, antipyrin or phenacetin, quinin in full doses, sulphurous acid in dram doses, long-continued course of arsenic in small doses, bromid of potassium, pilocarpin, etc.

Local treatment is necessary to give relief from the harassing itching. The best antipruritic lotions are: Phenol, 1 to 3 drams to the pint; menthol, 5 to 15 grains to the ounce; liquor carbonis detergens, 2 to 3 drams to 8 ounces of water; saturated solution of benzoic acid; alkaline baths (1/4 of a pound of washing soda to 20 gallons of water), etc.

URTICARIA PIGMENTOSA.—An inflammatory affection of the skin, beginning in the first 6 months of infancy, and characterized by buff-colored, wheal-like nodules, with or without itching.

Symptoms.—The eruption is most abundant upon the neck and trunk. It consists of yellowish-red, split-pea-sized nodules or wheals with pinkish areolas. The nodules later become yellow, and may remain stationary for months. Some undergo involution, leaving brownish stains. Itching is often severe, but may be moderate or entirely absent. The disease is very rare.

Prognosis.—The affection usually disappears at or before puberty.

Treatment.—Locally, antipruritic applications. Internal treatment is to be based upon general indications.

UTERUS, ANTEFLEXION.—A bending forward of the fundus of the uterus upon the cervix. This is the normal position of the uterus, but it may be exaggerated sufficiently to cause obstruction of the cervical canal—producing dysmenorrhea and sterility—when it is regarded as pathologic. The point of flexion is usually at the site of the internal os.

Causes.—It is usually congenital in origin, and is due to imperfect development of the body of the uterus. It is frequently associated with imperfect development of the rest of the genital organs—tubes, ovaries, and vagina. It is possible that it may be caused by improper hygienic conditions about the age of puberty, such as improper clothing, insufficient exercise, etc. It is extremely rare to find pathologic anteflexion in a woman who has borne children.

Symptoms.—The most important symptom is dysmenorrhea. The pain is quite characteristic. It is expulsive in character, and is situated in the center of the hypogastric region. It begins several hours before the appearance of the menstrual discharge, and is gradually relieved as the bleeding becomes free. The blood is usually dark colored and clotted. Sterility is commonly present in anteflexion of the uterus, since the obstruction in the cervical canal prevents the entrance of spermatozoa. The imperfect development of the genital organs is a further cause of sterility. The interference with the menstrual flow will finally cause endometritis, which, in its turn, may cause inflammation of the tubes and ovaries.

Diagnosis.—Bimanual examination will reveal the anterior position of the fundus, with the sharp angle of flexion between it and the cervix. These physical signs and the symptoms just described will make an absolute diagnosis of pathologic anteflexion.

Treatment.—Pathologic anteflexion of the uterus should be treated by rapid and forcible dilatation of the cervix. This is performed in the following manner: The patient is etherized and placed in the lithotomy position; the vulva, vagina, hands, and instruments are thoroughly sterilized. The anterior lip of the cervix is seized with a double tenaculum and drawn well down toward the vulva. The small uterine dilator (Wathen's) is introduced, and the cervix is gently dilated 1/2 of an inch or more. This is followed by the introduction of the larger dilator. With this instrument the cervix is gradually dilated up to 1 inch or 1 1/4 inches. To secure a more permanent result, the instrument should be allowed to remain in place 10 or 15 minutes after full dilatation has been accomplished. The instrument is withdrawn and the cervical canal and the vagina are douched with sterile water. A tampon of iodoform gauze is inserted into the vagina; this is removed at the end of 24 hours, and a douche of sterile water is given. The patient should remain in bed a week or 10 days after the operation. The first menstrual period following the operation may be attended by some pain, but usually the subsequent periods are painless. In exceptional cases it may be necessary to repeat the operation.

UTERUS, CARCINOMA.—For description of carcinoma of the cervix see CERVIX UTERI.

Cancer of the body of the uterus is a somewhat rare condition when compared to cancer of the cervix. It occurs in only about 2 percent of all cases of cancer of the uterus. It originates in the epithelium of the endometrium.

The causes of cancer of the body of the uterus are not known. Chronic inflammation of the mucous membrane may be a predisposing cause. It occurs later in life than cancer of the cervix—usually between the fiftieth and sixtieth years—and it may attack the nulliparous as well as the parous woman.

The symptoms of cancer of the body of the uterus are about the same as those of cancer of the cervix. There are pain, hemorrhage, and leukorrheal discharge. Vaginal examination shows an enlarged uterus and a patulous cervical canal. When any doubt exists as to the nature of the condition, the uterus should be curetted and the scrapings examined under the microscope.

The treatment should be complete Hysterectomy (*q. v.*). Either the vaginal or the abdominal route may be selected for this operation. Early hysterectomy in these cases offers a very favorable prognosis.

In inoperable cases recently acetone applications or douches have been advocated to stop the bleeding and discharge and improve the general condition. The chief palliative measure is curettage followed by the use of Paquelin's thermocautery. Hemorrhage may be controlled by injections of adrenalin chlorid. It is advisable after the cauterization to apply for a few minutes a tampon soaked with formalin. After the curettage some advocate the application of zinc chlorid or iodized phenol. Permanganate of potassium solution is an excellent disinfectant.

When the area of disease is very extensive tamponades wet or dry may be used to control the hemorrhage and irrigation with potassium permanganate solution should be employed for the copious offensive discharge.

Sarcoma of the uterus is rare. Two varieties have been described: diffuse sarcoma of the mucous membrane and sarcoma of the uterine parenchyma. The symptoms of the former closely resemble those of cancer of the body of the uterus; of the latter, those of fibroid tumor of the uterus. The treatment is complete hysterectomy.

UTERUS, CERVIX.—See Cervix Uteri.

UTERUS, FIBROID TUMORS.—Fibroid tumors of the uterus are benign but not harmless. They undermine the health and shorten life by hemorrhage, interfere mechanically with the functions of vital organs, become septic, and undergo transformation into sarcoma.

Structure.—Uterine fibroid tumors consist of elements similar to those composing the normal structure of the uterine walls, in which they originate. Connective tissue and muscular fibers are found in varying proportions. The terms used to designate these growths are fibroma, myoma, fibromyoma, and myofibroma; the two latter indicate the varying preponderance of fibroid or muscular tissues. While of mixed character histologically, the natural history of the several varieties is practically the same; hence the common term of fibroid tumors will serve to designate the neoplasms under consideration. These growths vary in size from a small nodule the size of a pea to an immense mass weighing more than 100 pounds. They are seldom single, though one or more may outgrow all others and present the appearance of a single rounded or nodular tumor. They originate in the body of the uterus, most frequently from the posterior wall.

Classification.—It is customary to classify them in accordance with their relation to the normal uterine structures. When situated in the uterine wall, they are termed interstitial; when projecting outward beneath the peritoneum, they are called subserous; and when protruding into the cavity of the uterus, they are known as submucous. When starting from the supravaginal cervix and growing outward between the folds of the broad ligaments, they are termed intraligamentous. The tumors grow in the direction of least resistance and the proximity of the point of origin to the peritoneum or uterine cavity will determine whether a given fibroid tumor will be subserous, submucous, or interstitial. The tumor may be so connected with the uterine wall as to become pedunculated. As a result of traction, pressure, or atrophy the pedicle may become twisted, producing gangrene. When the tumor originates near the uterine mucosa and grows beneath that membrane, it may become extruded into the uterine cavity, forming a pedunculated tumor. This is known as a fibroid polypus. Such a tumor will gradually adapt itself to the form of the uterine cavity. Its presence excites uterine contraction, and after a time it will be forced through the cervix into the vagina. The vascular supply is lessened by this process, and sloughing is very common. The fibroid polypus is more frequently single than any other variety of fibroid tumor of the uterus.

Progress.—Uterine fibroid tumors vary in consistence from the soft, edematous myofibroma to the hard nodules almost wholly composed of fibroid tissue. As a rule, they are of slow growth; in exceptional instances they increase with the rapidity which characterizes ovarian tumors. They frequently cease to grow after the menopause, while in exceptional instances they take on increased activity after that change. In some cases the tumor reaches a certain growth and remains inactive, while in other instances it steadily increases until it occupies the entire abdominal cavity and causes serious symptoms by pressure. During menstruation and pregnancy tumors increase in size. After parturition marked diminution in size takes place, so that a tumor that was conspicuous becomes almost imperceptible.

Sequels.—The tumors under consideration are subject to several forms of degeneration. Edema of these growths is quite common. The entire structure of the tumor becomes infiltrated with a serous fluid. This condition is closely allied to cystic degeneration, in which the constituent elements of the tumor are displaced by serous fluid. Cystic cavities may occur as the result of several degenerative changes, the growth being then known as a fibrocystic tumor. Inflammation may be present in fibroid tumors, often resulting from instrumentation and other agencies. Suppuration may take place. Fibroid tumors of the uterus are prone to sarcomatous degeneration. Some pathologists maintain that uterine sarcoma invariably begins in degeneration of a fibroid tumor. Clinical observation has so far confirmed this view that fibroid tumors are generally regarded as predisposing to sarcoma. Carcinoma is frequently associated with fibroid tumors; but since carcinoma most frequently occurs in the cervix,

and fibroids in the body of the uterus, it cannot be claimed that fibroids are disposed to undergo carcinomatous changes.

Age, Race, etc.—Uterine fibroid tumors are common in both the white and black races, but more frequent in the latter. They are found in both nulliparous and multiparous women; indeed, these tumors are among the most common of all the diseases peculiar to women. Unmarried women and married women who have never conceived are especially prone to this disease; from which it is apparent that the arrest of menstruation by pregnancy and lactation, and the retrograde changes accompanying involution, are means of protection against the development of these neoplasms.

Symptoms.—Hemorrhage is the most conspicuous symptom of fibroid tumors of the uterus. While this symptom is observed in the majority of cases, it is not invariably present. Large interstitial and subserous tumors may exist without hemorrhage. Small subserous tumors may present no symptoms. Hemorrhage may occur as a profuse and prolonged menstrual period (menorrhagia), or as a continuous uterine hemorrhage (metrorrhagia). Hemorrhage may be so profuse as to exhaust the patient, or it may be only sufficient to produce a moderate degree of anemia. In cases of submucous tumors (fibroid polypi) the hemorrhage may be so severe as to exsanguinate the patient. The increased area and diseased condition of the endometrium account for the hemorrhage. The site, more than the size of the growth, determines the severity of the hemorrhage.

Pain is a common accompaniment of these tumors. It is the result of various causes, and hence varies in character. The pain of pressure corresponds more to the location than to the size of the growth. When the tumor springs from the lower uterine segment and fills the pelvic excavation, the pressure upon bladder, bowel, and nerve-trunks will give rise to more severe pain than when the tumor rises free above the pelvic brim. Pressure upon the bladder, producing vesical irritation, and pressure upon the bowel, inducing constipation and hemorrhoids, are common. Endometritis, salpingitis, and peritonitis are frequent complications, and cause constant and severe pain. The expulsion of submucous fibroid tumors from the uterus is accompanied by the pain of uterine contraction. The bladder and urethra may be so distorted by the growth of a fibroid tumor that the urine is voided with much pain and difficulty.

The diagnosis is made by observing the symptoms just described, together with careful physical examination. The presence of a tumor, its irregular outline and solid structure, together with its immediate attachment to the uterus, can be determined by bimanual examination. If the tumor is large, its firm consistency and nodular character can be detected by palpation through the abdominal parietes. Interstitial fibroid tumors producing symmetric hypertrophy of the uterus are liable to be mistaken for pregnancy. This is especially marked in the soft and edematous tumors. While generally the diagnosis between uterine fibroma and pregnancy is not difficult, yet one condition has been mistaken for the other, and the error was not discovered until the abdomen was opened. The coexistence of fibroid tumors and pregnancy is not very infrequent, and this fact should be borne in mind.

The differential diagnosis between ovarian cystoma and the soft, edematous variety of uterine fibroid tumors is often most difficult, and to distinguish between a fibrocystic tumor and an ovarian cystoma is also at times exceedingly difficult. Fluctuation exists with all of these alike, and the differential diagnosis can only be made by determining the relation of the growth to the uterus, as indicated by direct mobility of the cervix when the tumor is manipulated through the abdominal parietes. An error in diagnosis here is fortunately not of serious consequence, since the treatment of all tumors of such magnitude consists in removal by abdominal section.

Fibroid tumors springing from the lower segment of the uterus, with adhesions, may readily be mistaken for intrapelvic inflammatory exudate associated with pyosalpinx and ovarian abscess. The reverse of this is also true.

In the diagnosis of submucous fibroids direct exploration of the interior of the uterus with the finger will usually suffice to disclose the character of the growth.

Treatment.—The tendency of **submucous fibroid tumors** of the uterus is to spontaneous cure by becoming polypoid in character, to be afterward extruded from the uterine cavity by persistent uterine contraction. In a majority of cases presenting this form of fibroid growths the tumors will be found projecting from the external os. They vary in size from that of a walnut to large rounded tumors as large as the fetal head at term. If the tumor has been extruded from the uterine cavity through the cervical canal, its removal may be readily and safely accomplished. The danger of hemorrhage after excision in such cases is not serious. Indeed, the blood supply in such growths has been so reduced by the process of pedunculation and protrusion by uterine contraction that the tumor very frequently sloughs from obstructed circulation. It is, however, safer to constrict the pedicle with a wire snare or écraseur, thus slowly crushing the pedicle containing the vascular supply, than to divide it with knife or scissors. In cases of large fibroid polypi that fill the vagina completely it will often be necessary to remove the greater part of the tumor by morcellation before the surgeon can gain access to the pedicle. If the pedicle persists in bleeding after excision of the tumor, the vessels may be caught in a clamp forceps, and left thus secured for 24 hours. Usually, firm packing with gauze will suffice to control the bleeding. This, of course, should only be done after thorough scrubbing of the external genitals with hot water, soap, and brush, the application of an antiseptic douche, and all other aseptic precautions. For the operation, the patient should be placed on a table in the lithotomy position, the perineum should be retracted with Sims' speculum,

and the uterus should be brought down and steadied by means of strong tenaculum forceps.

If a submucous fibroid tumor is within the uterine cavity, it will be necessary to dilate the cervix in order to reach the growth and remove it. If the tumor is sessile and low down, and if it can be drawn down near the internal os, the capsule will have to be opened at the most dependent point and stripped away, when the tumor can be seized with the volsellum upon its uncovered surface and enucleated by the finger of the surgeon. Care must be observed, if instruments are used in enucleating, not to penetrate the wall of the uterus. If the capsule is not injured in this procedure, the hemorrhage will be slight, and gauze packing will readily control it. After completing the operation the vagina should be lightly packed with gauze, a pad applied to the vulva, and the patient kept quiet in bed for a week. After from 24 to 48 hours the gauze should be removed and the vagina douched with pure hot water.

The treatment of subserous and interstitial fibroid tumors of the uterus requires the exercise of sound judgment, based on the requirements of individual cases. When the tumor is of small size, unaccompanied by pain, hemorrhage, or other serious symptoms, operation should not be advised, and no special treatment will be required. Under these conditions the patient should be kept under occasional observation and no treatment need be instituted so long as the growth does not markedly increase and while health and comfort are maintained. This course is especially applicable to women with tumors of considerable size who are near the menopause. The mere presence of a small subserous or interstitial fibroid does not indicate any form of treatment and does not forbid activity and exercise on the part of the patient. It is only when such symptoms as hemorrhage with anemia, pressure, and pain are present that symptomatic and palliative treatment is indicated. For all these symptoms rest is most important. Especially should rest be observed during the menstrual periods. Mild purgation with salines relieves congestion by depleting the pelvic circulation, and should be conjoined with rest during the periods. For excessive hemorrhage various drugs —such as ergot, gallic acid, hydrastis, and some preparations of iron—are in popular favor for controlling the bleeding of uterine fibroids, but usually have proved wholly inefficient; and their use begets constipation and congestion, impairs the appetite and digestion, and interferes with the eliminative functions generally. Hemorrhage will be more restrained by rest, saline purgatives, unstimulating diet, and the moderate use of the hot vaginal douche than by the remedies mentioned. Recently, thyroid extract, internally administered, has been highly recommended to control the hemorrhage and to arrest the growth of uterine fibroids, but experience with its use, though limited to a comparatively few cases, has failed to justify the claims made for this remedy. For excessive hemorrhage the most efficient treatment is to curette the uterine mucosa and to pack the cavity with sterilized gauze. This operation, of course, should be done with careful observance of all antiseptic precautions and in a thorough and surgical way.

Electricity does not arrest the growth of the tumor, and the results claimed for it as a hemostatic have not been verified by general experience. Electropuncture has proved harmful instead of efficacious, on account of the traumatic peritonitis following this procedure.

With the improved technic of modern pelvic surgery the operation for removal of uterine fibroid tumors has become so perfected that palliative and expectant methods of treatment have given way to surgical intervention. In skilled hands, and especially with the facilities of modern hospital requirements, the mortality of operations for removal of these growths has been reduced quite as low as that following operations for the removal of ovarian tumors.

While the methods of treatment outlined may alleviate symptoms and prolong life, and while such treatment is eminently appropriate in cases of small tumors without active hemorrhage or severe pain, surgical measures alone can afford the patient permanent relief and cure. Hence, in the majority of cases resort to operative intervention is indicated. The adaptation of the operative procedure to individual cases requires the highest surgical skill and experienced judgment.

Formerly, when the results of operation were marked by severe mortality, women suffering from these tumors were consigned to invalidism, with much suffering, through the active period of life, looking to the menopause for relief. Many died from the pressure effects and hemorrhage of large tumors; others succumbed to the accidents, complications, and degenerations to which these growths are prone; while still others found the menopause deferred or the tumor growing actively after that period. With the perfected methods of modern surgery the dangers of operation have been reduced until they are less than the dangers inseparably connected with the natural progress of these tumors. Operative treatment is now so safe that it is not to be restricted to large tumors, or to smaller growths complicated in various ways by which life is directly threatened; but in cases of fibroid tumors in which the health is impaired by hemorrhage and pressure of less urgency, but sufficient to beget invalidism, permanent relief should be sought through operative intervention. When the tumor is growing actively, and the patient is suffering from pressure and is weakened by hemorrhage, protracted delay to await the increase of symptoms is inadmissible.

The operations which have been devised for the cure of uterine fibroids are: (1) Removal of the uterine appendages; (2) ligation of the uterine arteries through the vagina; (3) myomectomy; and (4) hysteromyomectomy. The first two procedures are practically abandoned. The operation of myomectomy (removal of the tumor and preservation of the uterus) is practised whenever practicable. In most cases of multiple fibroids, and in cases in which the uterus is distorted and enveloped by the growth, hysteromyomectomy is indicated. See Hysterectomy.

UTERUS, INFLAMMATION OF THE MUCOUS MEMBRANE (Endometritis).—Inflammation of the mucous membrane of the body of the uterus, or corporeal endometritis, may be acute or chronic.

Acute corporeal endometritis is the result of the introduction into the uterus of septic microorganisms. This usually occurs during labor or miscarriage, or it may result from operations, such as dilatation, or from the introduction of an unclean sound. It sometimes occurs as a complication of the exanthems. If the process is severe enough, it may involve the muscular tissue underneath the mucous membrane, when it is called metritis; or the peritoneal covering of the uterus may be invaded, when it is called perimetritis. See Colon Bacillus Infection.

Symptoms.—Acute corporeal endometritis is usually attended by considerable pain, of a dull, aching character. There are constipation and vesical irritability. The pulse is rapid and temperature in some cases is very high—from 104° to 106° F. Vaginal examination reveals a patulous cervical canal with a profuse purulent discharge escaping from it. The uterus is enlarged, boggy, and tender.

Treatment.—Acute corporeal endometritis following miscarriage or labor should be treated actively. The uterus should be thoroughly curetted, in order to remove any portions of decidua or membranes remaining after parturition. If the symptoms do not subside in the course of 24 hours, intrauterine douches of sterile water may be given 2 or 3 times daily. Free purgation, hot stupes to the lower abdomen, a generous diet of milk and broths, and an abundance of stimulation will be required. In the gravest cases hysterectomy will have to be performed. In less severe cases of acute endometritis rest in bed, vaginal douches of hot, sterile water, and purgation will be sufficient.

Chronic corporeal endometritis may result from an acute attack or it may be chronic from the beginning. One of the most frequent causes of this condition is gonorrheal infection. Chronic endometritis accompanies a variety of pathologic conditions of the uterus, such as displacements, subinvolution, laceration of the cervix, and fibroid tumors.

Two varieties of chronic endometritis have been described—glandular and interstitial.

The symptoms of chronic endometritis are usually well marked. There is pain, of a dull, aching character, most evident in the back and extending down the thighs. Leukorrhea is constant, and is quite characteristic. The discharge is thin, purulent, and blood-streaked. Menstruation is profuse, and lasts usually from 5 to 7 days. The patient's general health suffers; she loses weight and becomes anemic; there is a sense of great reduction in physical strength. Headache is a very common symptom. Nervous, digestive, and circulatory disturbances appear sooner or later. Physical examination reveals an enlarged, tender uterus. The cervical canal is patulous; the external os is eroded. The characteristic discharge can be seen escaping from the cervix.

The treatment of chronic corporeal endometritis will depend upon its cause. It may be necessary to replace a displaced uterus, to remove a fibroid polypus, or to repair a lacerated cervix or perineum. If the condition is due to gonorrheal or septic infection, or if the foregoing measures fail, curettage should be perforemd.

The steps of the operation are as follows: The patient is prepared for the operation, anesthetized, and placed upon the table in the dorsal position. The anterior lip of the cervix is seized with a tenaculum and is drawn well down toward the vulva. The cervical canal is dilated about 1 inch. A Sims sharp curette is introduced, and the anterior, lateral, and posterior surfaces of the uterus are carefully and thoroughly scraped. This is followed by careful scraping of the fundus and of the region around the uterine opening of the Fallopian tube with a Martin curette. The uterus is now irrigated with sterile water, and the vagina is packed lightly with iodoform gauze. The gauze is removed at the end of 24 hours, the bowels are evacuated at the end of the second day, and the patient is allowed to get out of bed at the end of 10 days or 2 weeks.

If the disease is gonorrheal in origin, the uterine cavity, after curettage and irrigation, should be wiped out with pure carbolic acid. The excess of carbolic acid may be removed by another douche. After curettage the first and sometimes the second and third menstrual periods are missed. Attention to the general health, diet, exercise, and condition of the bowels, and the administration of tonics will be required before complete cure is accomplished.

Tuberculous endometritis is rare and is generally secondary to tuberculosis of the tubes or cervix. Diagnosis may be made by the removal of caseous material by means of the curette, or by the tuberculin test. See Endocervicitis under Cervix Uteri.

UTERUS, PROLAPSE.—A sinking of the uterus below its normal level. There are a great many degrees of prolapse of the uterus. It may vary from a slight sinking of the organ to complete extrusion from the vulvar orifice.

Causes.—The most frequent cause of prolapse of the uterus is injury at childbirth—laceration of the perineum. Other causes are: relaxation and elongation of the uterine ligaments; loss of rigidity of the abdominal walls; diminution of the cellular tissue and fat of the pelvis; increase in the weight of the uterus from subinvolution or congestion; and, finally, anything that may cause an increase in intraabdominal pressure, as constant coughing, violent straining, or heavy lifting.

Symptoms.—The symptoms of prolapse of the uterus are not characteristic; neither do they correspond in severity to the degree of prolapse. Slight descent of the organ may cause more disturbance than complete prolapse. The patient usually complains of pain in the back, head, and thighs. The pain in the back is dull and aching in character, and is usually felt most severely over the sacrum. Added to this there is a dragging and feeling of loss of support in the pelvis. Constipation and irritability of the bladder are usually present.

Diagnosis.—Physical examination will readily reveal the condition. The cervix or body of the uterus may project from the vulva. In less severe cases the cervix may be found resting on the pelvic floor. Slight cases of prolapse are the most difficult to diagnose. It will be found, however, that the cervix is lower than normal, and that the uterus can be pushed further upward than usual. It should be remembered that when the patient lies on her back, the prolapse is less marked than when she is erect. Complete prolapse of the uterus should never be mistaken for inversion of the uterus or for a uterine polypus, since their only point of resemblance is in shape.

Treatment.—The treatment of prolapse of the uterus is operative, unless some contraindication to operation exists. In such a case some **mechanic device** should be tried for the support of the uterus. Pessaries are not to be recommended, as their constant use leads to irritation and excoriation of the vaginal walls. Probably the best means for supporting the uterus is by an instrument called Braun's colpeurynter. This instrument is worn only during the day, and can be introduced by the patient herself every morning. The uterus is replaced and the colpeurynter, well anointed with carbolized vaselin and containing about an ounce of water, is introduced into the vagina. It is then distended with air, thus making an even pressure on the vaginal walls and not causing ulcerations.

Operative treatment gives the most satisfactory results in prolapse. In slight cases of prolapse repair of the PERINEUM (*q. v.*) will effect a cure. The severer grades will require, in addition, some operation on the anterior vagina—anterior colporrhaphy. The best of these is Martin's operation for cystocele. Dudley advocates an elliptical bilateral denudation of the vaginal walls. See CYSTOCELE.

If the cervix is hypertrophied it should be amputated. See CERVIX UTERI.

These three operations—Emmet's operation on the perineum, Martin's operation for cystocele, and amputation of the cervix—are required in the usual case of prolapse. In addition, hysterorrhaphy may be advisable, since there can be no prolapse so long as the uterus maintains its normal position of anteflexion. These operations failing, HYSTERECTOMY (*q. v.*) may be performed.

UTERUS, REMOVAL.—See HYSTERECTOMY.

UTERUS, RETRODISPLACEMENTS.—Retrodisplacements of the uterus comprise retrolocation, retroversion and retroflexion. In **retrolocation** the organ may retain its normal relation to the pelvic axis, but the entire organ is displaced backward. This displacement is the result of some inflammatory process in the pelvic peritoneum by which the uterus has been fixed, most frequently by a collection in the retrouterine pouch which has been absorbed.

Retroversion is a rotation of the uterus on its transverse axis by which the fundus of the organ is carried backward and the cervix looks forward.

Retroflexion is a change in the vertical axis of the uterus in which there is a more or less acute angle on its posterior surface between the fundus and cervix. It is usually associated with retroversion, indeed, may be regarded as a later stage of that displacement. Both retroversion and retroflexion may vary from a slight backward displacement, to one of extreme degree, where the fundus in the former, is situated in the pouch between the rectum and the vagina, while the cervix looks directly forward or forward and upward. In the latter, the cervix may occupy the axis of the vagina, while the fundus is below its level. Retroversion is the first stage of prolapse, consequently it is very frequently associated with the latter condition. Not infrequently an anteflexed uterus will also be found retroverted.

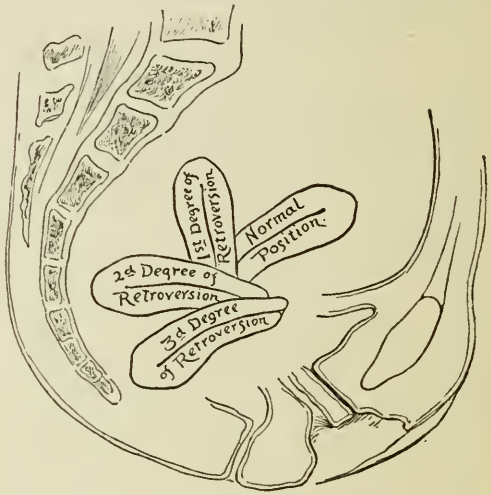


DIAGRAM OF THE DEGREES OF RETROVERSION OF THE UTERUS.—(*Penrose.*)

Etiology.—Backward displacements of the uterus are most frequently sequels of parturition. Without doubt, infection, to a more or less degree, is an essential factor. The uterus remains large and heavy, its ligaments, relaxed by the previous pregnancy, are kept in a continuous state of tension which prevents their involution, while the relaxed condition of the abdominal muscles from overdistention suspends the power of aspiration. Improper hygiene in both the pregnant and nonpregnant is an important consideration. Habitual distention of rectum and bladder, and the straining of constipation result in loss of muscular power and increased uterine displacement. Maintenance of the same waist measure, notwithstanding increase of size from pregnancy or additional adipose, necessarily causes greater intraabdominal pressure, and as the enlargement is unable to find accommodation elsewhere it is forced downward, not only adding to the displacement, but making it permanent. Flexions may be produced by irregular involution; thus an inflammation of the site of a placenta which had been implanted on the anterior uterine wall would result in more rapid involution of the posterior wall, causing it to become the string of the bow and draw the fundus

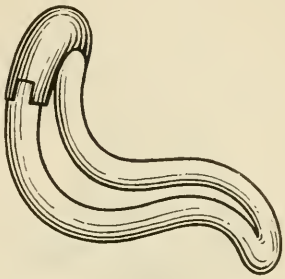
backward. Displacements are produced by growths as fibroids, in the uterus or, from the pressure of external tumors, as ovarian cysts, tubal enlargements and pelvic exudates. These displacements may occur in either the single or the married, the nulliparous or parous woman, though more frequent in the latter.

Symptoms are not characteristic. Patients complain of headache, backache, a sensation of weight and dragging in the pelvis, pain and points of anesthesia down the thighs, menorrhagia and leukorrhea, dysmenorrhea, vesical irritability, obstinate constipation, hemorrhoids and anal fissures increasing discomfort in standing and walking, all of which may be aggravated just preceding menstruation, but, as is well-known, these symptoms may be produced by other conditions. Their existence, however, should be sufficient cause for subjecting the patient to a careful pelvic examination.

Diagnosis.—Retrodisplacements are readily determined by the bimanual examination. The cervix is situated near the vaginal outlet, in the axis of the vagina, looking forward or even upward. The fundus is absent from its normal situation behind the symphysis, lies posteriorly, and sometimes on the rectum. In retroflexion there is a distinct angle between the fundus and the cervix. Retrolocation is recognized by the organ being drawn upward and fixed near the sacrum. The only condition in which the diagnosis is difficult is when the uterus is surrounded by a mass of exudate in which its relations are more or less lost, but here the inflammatory condition is the condition of greatest significance.

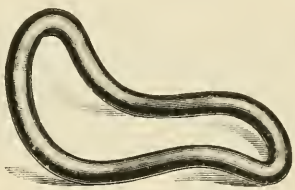
Treatment.—Mechanical and surgical measures may be employed. The mechanical measures—pelvic massage, medicated tampons and pessaries—are applicable where the condition is recent. Where the uterus is still heavy from subinvolution following a recent pregnancy its elevation and maintenance in a proper position by a tampon or suitable pessary so improves the circulation as to rapidly restore it to its proper size, when its ligaments will be sufficient to retain it. Tampons medicated by glycerin preparations have a hydragog effect on the uterus promoting its circulation and the more rapid absorption of the inflammatory or other products which caused the enlargement. They are especially beneficial as a supplementary treatment to pelvic massage in fixation of the uterus by inflammatory exudate. The necessity for operation in recent cases may frequently be avoided by the employment of this combined treatment. The exudate is absorbed, the uterus freed, and the abnormal position corrected. This plan of treatment is futile in old inflammatory conditions, and positively dangerous in the presence of suppuration. The maintenance of the uterus by the pessary in a corrected position is efficacious where the displacement and the condition is uncomplicated. The uterus must be capable of being placed in the correct position, and be so placed, before the pessary is inserted. The pessary does not correct the malposition, but maintains the organ when replaced.

Reposition and Insertion of the Pessary.—The uterus may be placed in its proper position in one of two ways. 1. With the patient in the dorsal position, the operator introduces, where possible, two fingers into the vagina with which the fundus is pushed up and the cervix backward; the other hand, on the abdomen, grasps the fundus and



Thomas' Retroflexion Pessary.

pulls it forward. The manipulation must be practised with the greatest gentleness and the continued cooperation of the patient be secured, otherwise but little can be accomplished. Occasionally, the prominence of the sacrum will be so marked that, by the methods just suggested, the fundus cannot be raised over it; in such circum-



Smith-Hodge Pessary.

stances, the cervix should be drawn upon with a tenaculum, or tenaculum forceps, and the fundus pushed forward with the finger in the vagina, after which the cervix can be carried backward with the forceps until the fundus is recognized by the external hand. 2. The patient should be placed in the genupectoral position and the vulva

Mundé Pessary.

opened with a retractor, when the atmospheric pressure will carry the uterus upward, but not necessarily with the fundus forward. Should it still remain retroverted, the cervix can be grasped with the tenaculum forceps and drawn downward, and then carried backward, when it will be replaced unless there are firm adhesions fixing it. In this position the pessary can be

introduced and carried under the uterus and its relation to the surrounding parts will be apparent to the eye of the physician. In the dorsal position the correction of the malposition is followed by the insertion of the pessary in the following manner: the left hand of the operator separates the labia

Pessary in Faulty Position.—(*Montgomery.*)

while the pessary, with its posterior bar held anteroposterior to the vulvar outlet, is made to impinge against the perineum and thus inserted until more than one-half the instrument is buried within the vagina, when it is rotated with the concavity of the greater curvature forward, and the

Pessary in Proper Position.—(*Montgomery.*)

index-finger of the right hand carries the posterior bar behind the cervix. The pessary should be sufficiently long to occupy the posterior vaginla fornix without undue pressure, and wide enough to fill the vagina and prevent displacement. The proper size of the pessary can be determined by measuring on the inserted fingers the length from the sacral promontory to the inner surface of the symphysis, and its width by the extent to which the fingers can be separated. An unduly large instrument will soon produce such ulceration and pain that it can not be worn and the cicatricial changes following its use will preclude the employment of any other instrument. An instrument too small will be inefficient and necessarily prejudice the patient against further mechanical procedure. Pessaries of infinite variety have been devised. They are all, however, modifications of the original Hodge pessary. Instruments with a thick and wide posterior bar, are, generally the best, and of these the Mundé and the Thomas are preferable.

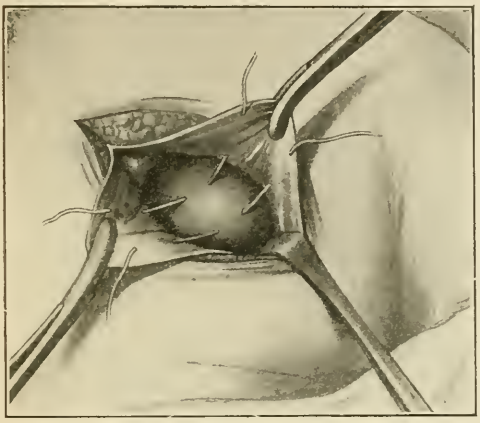
After the pessary has been inserted the patient should be directed to rise and sit down, if the presence of the instrument is unrecognized, she can be sent away with the assurance that it is unlikely to produce inconvenience. Should the instrument be partially protruded by straining at stool she should assume the genupectoral position before pushing it back. She should be instructed as to its removal and to permit the physician an opportunity within a week to see that it is causing no inconvenience. No pessary should be retained longer than two months without medical supervision, and the vagina should be kept clean by douching. Alkaline astringent douches should not be employed as they cause salts to be deposited on the pessary which roughen it and render its subsequent use a source of danger. When the pessary is continuously worn for a long period, it produces irritation and not unfrequently becomes more or less imbedded. In cases of chronic displacement, the pessary is objectionable as it is merely palliative and not curative. In retroflexion, it is very unsatisfactory as the uterus is likely to fold over the pessary, and the same condition occurs when the organ has not been properly replaced before the introduction of the instrument. It will be appreciated that the uterus must be freely movable and capable of replacement to make the employment of a pessary practicable. The pessary is contraindicated in lacerations of the cervix, and will not be retained when there has been extensive laceration of the pelvic floor, or in great relaxation of the vagina. At best, the instrument is a crutch, requiring care that it does no injury, and should be regarded as only a temporary expedient.

Surgical Measures.—The number of operative procedures devised for the correction of retrodisplacements is indicative that there exists no ideal procedure applicable to all cases, and that the operation must be adapted to the particular conditions present in the individual patient. Operations have been adapted to the round ligaments at their exit from the inguinal canal and within the peritoneal cavity, to the uterosacral ligaments, through the abdomen or the vagina, and various suspension or fixation operations through either vaginal or abdominal incision.

The Alexander operation was the earliest suggested and performed for the radical restoration

of the retrodisplaced uterus. (See Alexander's Operation). It is, however, applicable only to cases in which the uterus is freely movable, and consequently to those in which the operation is least demanded. It is a blind operation and not to be considered when the uterus is fixed by internal adhesions.

Ventrosuspension or *Ventrofixation* devised by Olshausen and perfected by Kelly was for a time performed more frequently than any other operation for retrodisplacements and afforded the advantage over the previously named operation that it permitted treatment of diseased conditions and freeing the fixed organ.



Sutures Introduced for Ventrosuspension. —(*Montgomery.*)

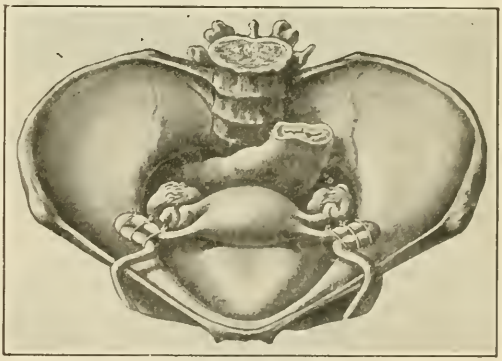
The operation consists of an incision about 2 inches long in the median line just above the symphysis through which the fundus uteri is brought up, and two sutures of silk, silkworm-gut or chromic catgut are passed through the fundus and peritoneum and a portion of the muscle on each side of the incision. The first stitch is on a line with the uterine cornua and the second, one-fourth of an inch behind it. The wound in the abdomen is closed by inserting a chromic catgut suture external to the aponeurosis on the right side of the upper angle of the wound, bringing it through the peritoneum and uniting the latter with a continuous stitch until the lower end is reached, when it is brought through the aponeurosis on the left side; silkworm sutures are then inserted through all the tissues above the peritoneum and the ends temporarily secured with hemostats when the aponeurosis is closed with the continuation of the peritoneal suture and tied at the upper angle of the wound. The tying of the silkworm sutures and the approximation of the skin edges between with plain catgut sutures completes the operation.

Chromic catgut sutures are preferable for securing the uterus as they will ultimately be absorbed and if they become infected are not the cause of the formation of a sinus and of prolonged suppuration as would occur in the nonabsorbable suture.

The portion of the fundus taken up in the suture is not more than one-half an inch in width as the aim is to construct a ligament which will lengthen and not firmly fix the uterus against the abdominal wall.

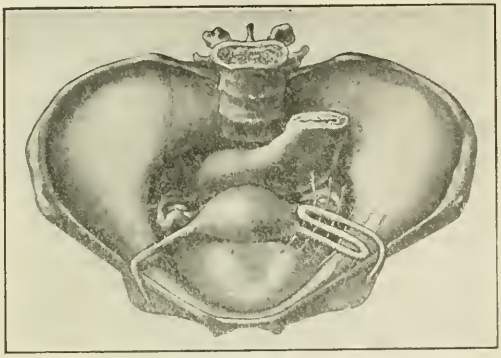
Vaginal Fixation.—Procedures aimed to maintain the uterus forward through an incision of the anterior vaginal fornix have been devised. Duhrrsen secured the anterior wall of the uterus without opening the peritoneum, Mackenrodt opened the peritoneum and placed the suture higher on the fundus, Gottschalk and Vineberg secured a loop of the round ligament in the vaginal wound, Ries through the vaginal incision made a slit in the anterior wall of the uterus and secured a loop of each round ligament in it. Experience disclosed that fixation operations exercised a baneful influence in subsequent pregnancy, producing more or less discomfort during the gestation and became a cause of dystocia at its termination. In spite of careful precautions the operator would sometimes find that as a result of a slight infection or some other cause, an intended suspension had become a fixation. When most favorable a cicatricial ligament was formed which, in quite a number of instances, permitted a knuckle of intestine to become wrapped about it and thus the result was peril, or even, death to the patient. The ligament frequently became attenuated and even broken, permitting the displacement to recur. A fixation operation is no longer considered as applicable to the child-bearing woman.

Intraperitoneal shortening has been done by folding the round ligaments as in the Wylie, Baer, and Mann operations; by denuding the peritoneum over a portion of the ligament, and suturing this to a raw surface on the front of the uterus, the desmopycnosis of Palmer Dudley; by carrying a loop of each ligament through a slit in the anterior uterine wall (Ries); by pushing a loop of each ligament through the broad ligament beneath the ovarian and securing it to the posterior uterine wall (Webster); or, by cutting the ligament near the uterus, tying the proximal end and securing the distal as in the Webster operation (Baldy); by resecting the ligament and uniting the divided ends, at the same time folding the



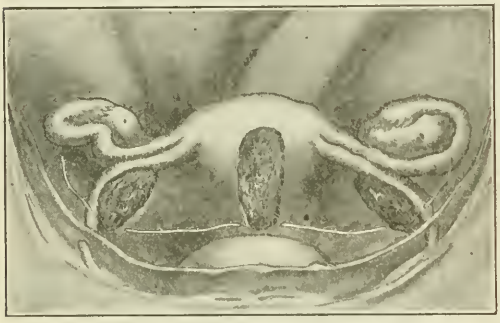
Wylie's Operation for Shortening the Round Ligaments within the Abdomen.—(*Montgomery.*)

anterior surface of the broad ligament (Bissell); by dragging a loop of each ligament through the abdominal wall and securing it on the external surface of the aponeurosis (Gilliam); by carrying



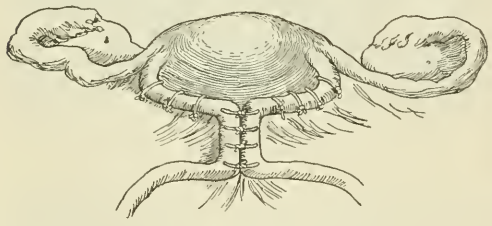
Mann's Operation for Intra-abdominal Shortening of Round Ligaments.—(*Montgomery.*)

this loop through an incision in the anterior leaflet of the peritoneum and securing it to the under surface of the rectus muscle (Simpson); or by carrying it outward between the layers of the



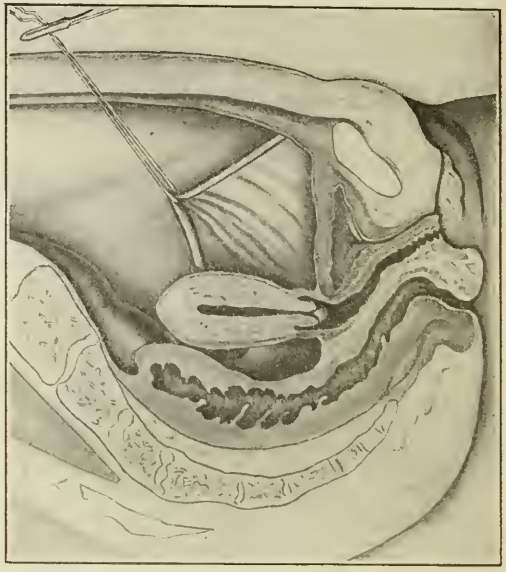
Dudley's Operation of Desmopycnosis.

broad ligament suturing it on the aponeurotic layer (Montgomery). Coffey depends on the cicatricial results of folding the peritoneum, especially in front of the uterus.

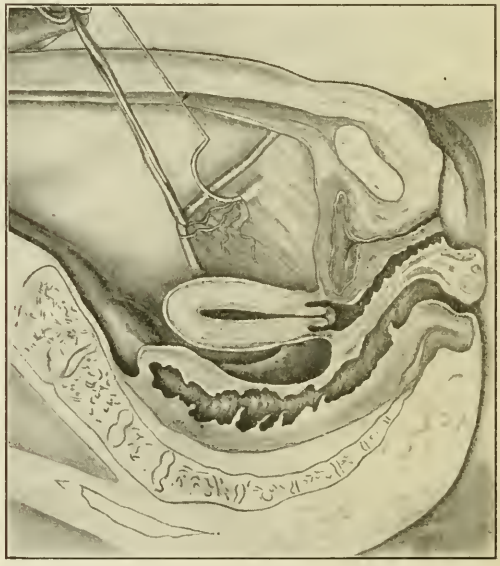


Dudley's Operation Completed.

A transverse crescent incision (Pfannenstiel) is made just above the symphysis, in the majority of cases in the hair line, through the skin, superficial fascia and the aponeurosis, the latter stripped from the muscle, when the recti and pyramidales muscles are separated in the median line and the peritoneum opened vertically. This incision permits ready access to the pelvic structures as it is



First Step in Montgomery's Modification of Gilliam's Operation.

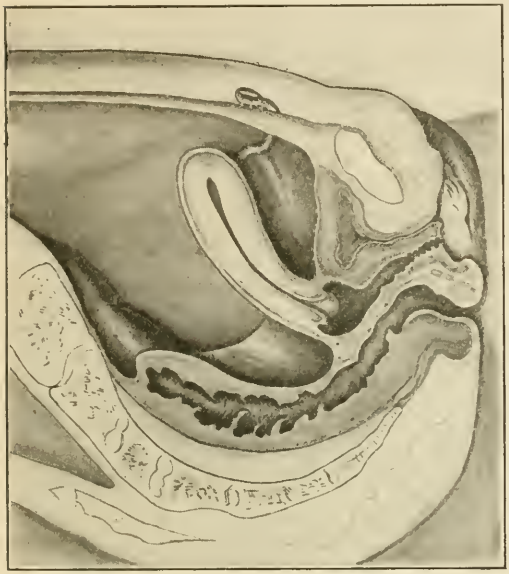


Second Step in Montgomery's Modification of Gilliam's Operation.

Showing ligament fixed with hemostat while temporary ligature is carried beneath anterior leaflet of broad ligament with a Deschamps needle.

directly over them. Diseased conditions of the tubes and ovaries are treated and adhesions separated.

A ligature is passed beneath the round ligament on either side, the ends of each ligature threaded into the eye of a sharp needle, while the round ligament is held tense in a pair of forceps, the threaded needle is carried through an opening in the anterior leaflet of the broad ligament between its layers until the reflexion of the peritoneum on the anterior wall is reached when it is plunged through and the ends of the ligature removed from the needle and temporarily secured by hemostat. After the opposite ligature is brought through, it is drawn taut and a pair of pointed scissors closed pushed through the opening made by the needle and the blades slightly separated, when



Completed Operation.—(*Montgomery.*)

the loop of the ligament is easily drawn through. Each loop is secured, by a few chromic catgut stitches. The wound is closed by a chromic catgut suture passed at its upper angle through muscle and peritoneum and afterward as a continuous suture through the peritoneum only, until the lower angle is reached when it is brought out through the muscle and continued in the reverse direction through the muscle edges to the upper angle, where it is tied. Care is exercised not to produce such traction on this suture as to strangulate the muscle. The aponeurosis is likewise closed with a continuous chromic catgut suture, while the skin is united by a continuous suture of plain catgut. Consequently, there are no sutures to remove, and the deeper surfaces are maintained in firm apposition.

This procedure has a number of advantages: there is no place for the intestines to become imprisoned and form unfortunate adhesions, the uterus is supported by ligaments capable of involution and evolution, the patient has the minimum danger of subsequent hernia, and the scar is obscured by the regrowth of the pubic hair.

As has been indicated, there is no operative procedure which will serve in all cases. Where the displacement is accompanied by prolapse, it may be necessary to supplement the procedure by plastic operation on the anterior vaginal wall and the pelvic floor. Lacerations of the cervix should be repaired or the cervix amputated when the latter procedure is preferable.

Intraperitoneal shortening of the uterosacral ligaments, or in case of their extreme attenuation, the quilting together of the peritoneum behind the cervix to lessen the depth of the retrouterine pouch may be necessary to maintain the uterus.

UTERUS, RUPTURE OF.—See Postpartum Hemorrhage.

UVA URSI (Bearberry).—The dried leaves of *Arctostaphylos uva-ursi*. It contains gallic and tannic acids, and 3 principles, *arbutin*, a bitter glucosid, neutral, crystalline, resolvable into glucose and hydroquinone; *ericolin*, bitter and amorphous; *ursone*, resinous, neutral, crystalline and tasteless. It is astringent, tonic, and diuretic. It was formerly much employed in calculous disorders of the bladder. It is given in chronic gonorrhea or gleet, in pyelitis, and in cystitis. It turns the urine dark colored or black when taken in overdose. It has been used in incontinence of urine, in dysuria and strangury, and in uterine hemorrhages; also as a diuretic in cardiac dropsy. Dose, 10 grains to 1 dram in infusion or decoction. **Arbutin** is the glucosid. Dose, 5 to 15 grains.

UVULA, DISEASES.—**Inflammation of the uvula** (**uvulitis**) often accompanies severe pharyngeal catarrh. The uvula appears red, swollen, and edematous, and often considerably lengthened. If the treatment for the associate pharyngeal catarrh does not relieve the condition, scarification may be practised.

Elongation of the uvula may be due to chronic pharyngeal catarrh or to enlargement of the tonsils and associate conditions. If the elongated uvula comes in contact with the back of the tongue or with the mucous membrane of the larynx, there is a troublesome, tickling cough. The treatment for the causative conditions should be instituted, and if they fail, the organ must be amputated. See Palate, Pharyngitis (Chronic), Rhinitis (Chronic), Tonsils.

V

VACCINATION AND VACCINIA (Cow-pox).—Vaccina is an eruptive disease of the cow, horse, camel, or other animal. Transferred to man by inoculation, it affords protection for varying periods against small-pox. This fact was discovered by Edward Jenner in 1798.

Vaccination is performed by scratching the cuticle slightly and rubbing virus obtained from a calf, or child suffering from vaccinia into the scarifications or abrasions.

The etiology of cow-pox is unknown, though there is strong presumptive and experimental evidence that it is but a modified form of small-pox. Jenner believed this to be the case, and his observations have been confirmed by Gassner, Viborg, Theile, Ceely, Babcock, and many others, down to the present day, when King, Simpson, Leonhard, Voight, and Fisher claim success in producing vaccine of variolous origin; and while it is rather at variance with many known biologic factors, still the so-called spontaneous cow-pox almost invariably makes its appearance in the immediate neighborhood of genuine small-pox.

The Virus.—Undoubtedly, the best form of vaccine virus to use is a glycerinated emulsion of the pulp of the vesicle from a healthy calf. Under the modern method of preparing, this is stored for from 4 to 6 weeks. During this time the glycerin destroys all extraneous organisms, while the organisms of vaccinia increase in power. Prepared in this form, the vaccine virus retains its activity for many months, and when used, produces the typical pock of vaccinia and is accompanied by very moderate local or constitutional disturbances and by only a slight febrile reaction. There is no doubt that the pronounced areola, swelling of the limb, tenderness of neighboring glands, and more or less grave depression occasionally seen, are the results of the accompanying organisms either contained in the vaccine or accidentally introduced subsequently; but as they were inseparable under the old methods of production, many laymen and some physicians still regard with doubt the success of a vaccination unaccompanied by "sore arms."

Virus dried on points cannot be sterilized by any process known at the present time, and under the strictest precautions that can be observed it will be contaminated in the vast majority of cases; hence it is wise to use the glycerinated virus when obtainable. Every physician appreciates the fact that it is difficult thoroughly to disinfect the human skin, for the reason that several varieties of organisms find their habitat upon its surface, in and under the superficial layers and also deep down in the hair follicles. In the cow this is more marked.

It has been found by repeated culture tests that the normal serum, which in health is sterile, drawn from the scarifications on an animal before vaccination, and after a most thorough antiseptic toilet, is in the vast majority of cases contaminated by a variety of organisms, most, if not all, of a non-pathogenic character; but one especially persistent streptococcus has certain cultural and microscopic characteristics leading to the belief that under proper stimulus it might be awakened into harmful activity.

Deep pitting of the resulting cicatrix is probably caused by the action of some of these extraneous organisms. Thorough immunity can be conferred by subcuticular inoculation with sterile virus in which very little, if any, scar is left.

Technic.—It is well to bear in mind, when vaccinating a child, that the remaining scar is unsightly, and on a girl's arm, in certain stations of life, a disfigurement to be avoided, if possible. This fact cannot be overlooked, and it is well to be guided by the mother's wishes, as there is no reason why some other portion of the body, such as the outer aspect of the thigh or the calf of the leg, should not be selected, provided the parts where the blood-vessels are thinly covered or where there are large masses of lymphatics are avoided. In the absence of such reason or in the case of a boy the classic site, above the insertion of the deltoid on either arm, possesses advantages besides that of custom. This area is readily accessible for operation and inspection, and can be protected from violence.

Vaccination is usually performed during the first 4 months of life, and, if unsuccessful, should be repeated at intervals, immunity, so called, being rare; the failure, in a vast majority of cases, is due to poor or inert virus.

Having selected a site, cleanse the surface with alcohol or ether, applied with a piece of absorbent cotton; then wash thoroughly with boiled water, or, if there is reason to suspect infection of any sort—such as suppurating wounds, contagious diseases, etc., in the same family or house—it is well to use a solution of bichlorid of mercury 1:5000 or 5 percent phenol solution, being careful to wash away every trace of the antiseptic with boiled water; otherwise, the vaccination will probably be unsuccessful. It is rarely necessary to use the stronger antiseptics in children or adults of cleanly habits and surroundings.

Grasp the limb with the left hand, stretching the skin between the index-finger and the thumb, blanching it and scarify one or two spots by cross-hatching, thus bringing to the surface a little serum, each spot to be about 1/3 of an inch square, and to be separated by an inch of healthy skin in order to prevent coalescence of the vesicles if more than one scarification is made. Bear in mind that one typical vesicle the size of a pea affords as much and as thorough protection as will a dozen larger ones. However, it is well, at times, to perform

multiple vaccinations on a child whose parents are at all reluctant and not likely to return in case the primary vaccination fails, the larger number of spots lessening the danger, as one is almost certain to introduce the active principle of vaccinia into one or more of the spots. Care and thoroughness, if virus is active, will insure success in single-spot primary vaccinations.

An ordinary sewing-needle is by all means the best kind of scarifier. It can be obtained in every house, and is furnished by some of the producers with each vaccination. It is readily sterilized by passing it through the flame of a match, candle, gas, or other light. It will tear rather than cut the cutaneous vessels and absorbents, doing away with bleeding, and by slightly bruising the tissues, prepares a more favorable soil for the vaccine organism to grow upon. If virus dried on ivory points is used, the point itself makes a good scarifier. The physician should never use a pocket lance or scarifier unless it can be, and is, thoroughly sterilized before each vaccination. And he should not overlook the fact that all these precautions are useless if his own hands are not surgically clean. The virus selected is rubbed into the scarification, either by reversing the needle and using the eye, or by, what is preferred, a little splint of hard wood (an orange-wood toothpick with one end spade-shaped answers perfectly). Rub the virus well into the scarification, and keep uncovered until dry. It is well to protect the forming scab, especially in young children, by some form of shield. Many, however, prefer a sterile gauze compress fastened by adhesive plaster. It is important to protect the crust or scab from violence, as it undoubtedly is the best protective, unless it becomes very purulent. In this case it should be removed with a sharp curette and treated as an infected wound.

Hutchin has suggested a method which is especially valuable in children: After the site selected is cleansed, a bit of cotton wet with liquor potassæ is applied for 2 or 3 minutes. After its removal, the site is dried and gently rubbed with moist cotton. Thus the epidermis is readily removed and the vaccine may be applied and allowed to dry.

In normal vaccination there is a gradual increase of redness at the point of inoculation, and on the third day there is a slight shotty feeling, followed by small vesicles on the fourth and more pronounced vesicular on the following day, the vesicles becoming confluent on the seventh day, when the temperature reaches its maximum. About the eleventh or twelfth day the areola should disappear and the scab begin to dry. This continue until about the twenty-first day, when it becomes detached, leaving a healthy, cicatrized base. See also SMALL-POX.

VACCINE THERAPY.—See SERUM THERAPY AND VACCINE THERAPY.

VAGINA, HEMORRHAGE.—Hemorrhages from the genital tract of the female are naturally divided into two classes: (1) Hemorrhages complicating pregnancy, labor, or the puerperium; (2) hemorrhages occurring in the nonpregnant woman.

1. **Hemorrhages Complicating Pregnancy, Labor, or the Puerperium.**—

A. **Hemorrhages of Pregnancy.**—

(1) Placenta prævia.

(2) Premature separation of a normally situated placenta.

(3) Rupture of varicose veins of the vagina or vulva.

(4) Apoplexy of the decidua or placenta.

B. **Hemorrhages of Labor.**—

(1) Placenta prævia.

(2) Premature separation of a normally situated placenta.

(3) Relaxation of the uterus.

(4) Lacerations of the cervix, vagina, or vulva.

(5) Rupture of the uterus.

(6) Inversion of the uterus.

(7) Hematoma of the vulva or vagina.

C. **Hemorrhages of the Puerperium.**—

(1) Retained secundines.

(2) Displaced uterus.

(3) Displaced thrombi.

(4) Fibroid tumors.

(5) Pelvic engorgement.

(6) Hypertrophied decidua.

(7) Carcinoma.

2. **Hemorrhages Occurring in the Nonpregnant Woman.**—

A. **In Virgins before the Age of Thirty.**—

(1) Uterine congestion the result of cold or exposure.

(2) Endometritis.

(3) Polypi and fibroid tumors.

(4) Retrodisplacement of the uterus.

B. **In Married Women before the Age of Thirty.**—

(1) Subinvolution.

(2) Laceration of the cervix.

(3) Endometritis.

(4) Retrodisplacements of the uterus.

(5) Polypi and fibroid tumors.

C. **In Virgins or Married Women after the Age of Thirty.**—One should always suspect, in addition to the above conditions:

(1) Carcinoma of the cervix.

(2) Carcinoma of the body of the uterus.

(3) Sarcoma of the uterus.

Hemorrhage from the female genitalia may also occur as the result of traumatism of any kind. Certain constitutional disturbances may cause it, such as purpura, scorbutus, and hemophilia.

For the differential diagnosis of the various conditions causing hemorrhage from the vaginal orifice, see under the respective headings, as CERVIX UTERI, LABOR, PLACENTA PRÆVIA, POST-PARTUM HEMORRHAGE, UTERUS (Fibroid Tumors), etc.

VAGINAL DOUCHE.—The value of the hot douche was made known by Emmet. It should be given with a gravity syringe while the patient is in a recumbent position; the more prolonged, the larger the quantity, and the higher the temperature (115° to 120° F.), the more enduring will be the effect. The ordinary fountain syringe, a large vessel with a tube leading from its lower end, or an ordinary pitcher with a rubber tube carried to and

held at its bottom by a weight, may be used. Instead of the ordinary rubber, wooden, or metal nozzle, a glass end-piece is preferable as it can be more readily cleansed. When preferred, the water may be medicated with astringents, such as alum, sulphate of zinc, acetate of lead, hydrastis, or hamamelis; or with antiseptics, as boric acid, carbolic acid (2 to 5 percent), or permanganate of potassium (1 to 2 percent), and acid sublimate (1 : 5000 to 1 : 2000) are valuable. The antiseptic injections are of especial value in vaginal discharge, more particularly when of a specific character. The advent of menstruation is considered as contraindicating irrigation, but it may be resumed before it ceases, particularly when the odor is offensive or the parts are irritated. using plain water at a temperature of 100° F. If the vaginal discharge is particularly offensive, as in malignant disease, a douche of thymol solution, 1 or 2 percent, is a most excellent deodorizer. Astringent douches are used in excessive vaginal secretion, but should not be used when the patient is wearing a pessary; as the salts are deposited upon the instrument, roughen its surface, and thus increase the irritation (Montgomery).

VAGINAL FISTULA.—Fistulous openings may exist between the bladder, the urethra, the rectum, the ureter, and the vagina.

Vesicovaginal fistula is much the most frequent. It is usually the result of labor.

Symptoms.—Incontinence of urine is the first symptom. It usually appears about 6 or 8 days after labor, and is constant or not, depending upon the position of the opening. If the fistula is in the upper part of the vagina, incontinence may appear only when the bladder is distended or when the patient assumes the recumbent position.

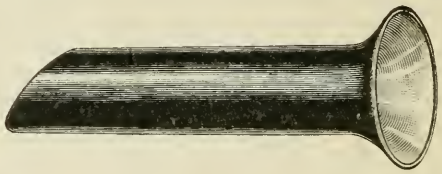
As the result of incontinence of urine, irritation, inflammation, and sloughing of the vaginal mucous membrane may occur. The vulva and inner part of the thighs become affected, and phosphatic deposits accumulate on the skin and mucous membrane. The kidneys may become infected secondarily.

The treatment consists in closure of the fistulous opening by a plastic operation. The edges of the opening must be denuded, and then closely approximated by interrupted sutures of silkworm-gut. If the condition has existed for some time and there are inflammation, excoriation, phosphatic deposits, and contraction, preparatory treatment will be necessary. This consists of rest in bed, frequent vaginal douches of boric acid solution, applications of nitrate of silver solution to the excoriated areas, and stretching or incision of any contracting or adhesive bands that might interfere with the result of the operation.

Rectovaginal fistula is also the result of labor. The important symptom is the passage of flatus and feces into the vagina. Treatment should consist in closure of the fistulous opening by a plastic operation.

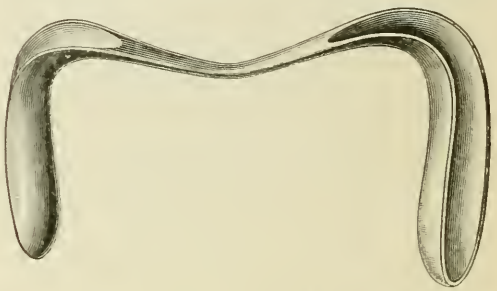
VAGINAL SPECULUM.—A vaginal speculum is an instrument through which a visual examination is made of the cervix and the vaginal walls. The instruments most commonly used are some form of bivalve speculum and the Sims duckbill speculum. They have largely supplanted the tubular (Ferguson) speculum by reason of their far wider range of application. They have the advantages of being self-retaining and of affording a much better exposure.

Popular forms of bivalve specula are those of Collins and of Goodell. The bivalve speculum is



Ferguson's Speculum.

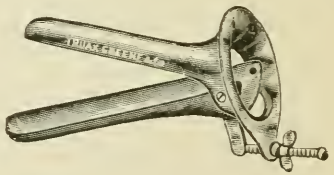
introduced with the woman in the lithotomy position; the plane of the blades held obliquely, so that the edges may correspond to the vaginal sulci. The tip of the instrument should be passed directly toward the cervix. After it has been partially introduced, the blades should be turned so that they lie transversely, and as they are separated by the thumb-screw at the handle, the



Sims' Speculum.

cervix and the vaginal vaults come into view. This instrument can be used for inspecting the external os uteri, the cervix, and the vaginal vaults and walls; for applications to the uterus, cervix, and vagina; and for dilating and curetting the uterus.

The Sims speculum may be introduced with the woman in the dorsosacral, the Sims, or the genu-



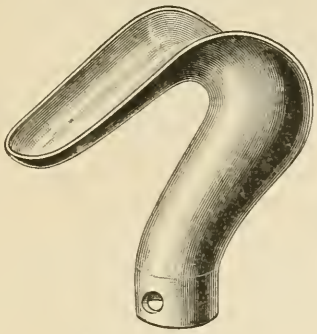
Higbee's Bivalve Speculum.

pectoral position. In some cases the examination is facilitated by the use of an instrument for depressing the anterior vaginal wall. The Sims speculum gives the most perfect view of the cervix and vagina, and can be used advantageously in all operations upon the cervix and vagina.

In the lithotomy position for retracting the

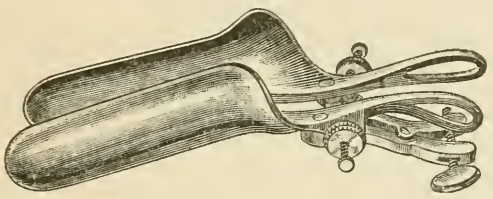
perineum the Edebohls speculum to which a weight is attached is the most satisfactory.

VAGINISMUS.—A painful, spasmodic contraction of the muscles surrounding the lower part of the vagina and the vulva. It is caused by attempts at coitus or by digital or specular examination.

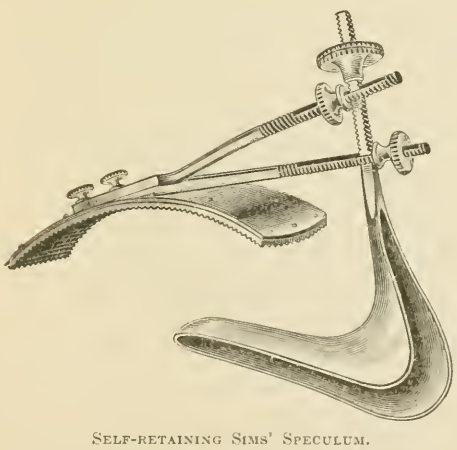


Edebohl's Speculum.

This condition is usually seen in newly married neurotic women. There is usually some exciting cause, such as a rigid hymen, a small vaginal orifice, a urethral caruncle, or an ulcer, a fissure, or some inflammatory condition around the vulva. Occasionally, it is a purely neurotic condition. It is sometimes seen in old women as a complication of kraurosis vulvæ.

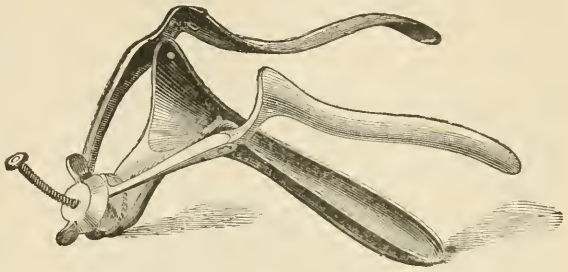


Goodell's Speculum.



Self-retaining Sims' Speculum.

The treatment of this condition consists, first of all, in ascertaining its exciting cause. This, if possible, must be removed. A rigid hymen may be incised and a small vaginal orifice may be dilated. A urethral caruncle should be excised, and any inflammatory condition around the vulva should be appropriately treated.



Trivalve Speculum.

A vaginal suppository containing 1/2 grain of cocain, introduced 15 minutes before intercourse, will sometimes prove effective. Gradual or forcible dilatation of the vagina will occasionally give relief.

In the gravest cases it will be necessary to make incisions in the direction of the posterior vaginal sulci. These incisions should be deep enough to divide the underlying muscles and fasciæ; and to prevent retraction a glass vaginal plug should be worn for a few days. When the condition is a purely neurotic one, constitutional remedies should be employed.

VAGINITIS.—Inflammation of the vagina, or vaginitis, is usually secondary to some other condition, such as vulvitis, endometritis, or a fistula of the bladder or rectum. Occurring as a primary condition, it is usually due to gonorrhea. Four varieties of vaginitis have been described—simple, granular, senile, and emphysematous.

The symptoms of vaginitis are pain and a sense of fulness in the pelvis—which are increased by walking or movement of any kind—and a purulent discharge. As the disease becomes chronic it tends to localize itself particularly to areas about the ostium and vaults.

The treatment in the acute stage consists of rest in bed and mild purgation, and in the employment of vaginal douches. The douches should consist of a gallon of hot boric acid solution (1 dram to 1 pint) every 2 or 3 hours. After the acute symptoms have subsided, douches should be given every 3 hours of potassium permanganate (1:4000), or bichlorid of mercury (1:4000). After 2 weeks the douches may be given 4 times a day of double the strength. In chronic cases after the subsidence of acute symptoms, astringent douches are employed, *e. g.*, zinc sulphate (1/2 dram) and powdered alum (1 dram) added to a quart of water, or potassium permanganate (1:2000) or argyrol solution 25 to 50 percent. The vaginal walls are cleansed and painted with nitrate of silver solution (1 dram to 1 ounce) and boroglycerid tampons are inserted. Tampons of ichthyol in lanolin (1:4) are valuable. Treatment should be continued until all evidence of the disease has disappeared.

VAGUS NERVE.—See Pneumogastric Nerve.

VALERIAN.—The dried rhizome and roots of *Valeriana officinalis*. It contains a *volatile oil*, from which are developed by oxidation *valerene*, $C_{10}H_{16}$, a terpene; *valerol* or Baldrian Camphor, $C_{12}H_{20}O$; and *valeric acid*, $C_5H_{10}O_2$, which occurs also in many other plants and in cod-liver oil. The valeric acid of pharmacy is obtained as a product of the oxidation of amylic alcohol, and from it are formed the various valerates. It is not therapeutically identical with the natural acid. Dose of the powdered root, 10 to 45 grains. It is antispasmodic and is gently stimulant to the nervous system and the organs of circulation. In full doses it increases heart action, producing exhilaration; in toxic doses, diarrhea, vomiting, reduced sensibility, and mental disturbance. It is excellent in hysteria, in convulsions due to worms, in the coma of typhus fever, and in whooping-cough.

Preparations.—**V., Flext.** Dose, 10 to 45 minims. **V., Tinct.,** 20 percent. Dose, 1/2 to 2 drams. **V., Tinct., Ammoniat.,** valerian 20, aromatic spirit of ammonia enough to make 100 parts. Dose, 5 to 45 minims. **V., Ol.,** the volatile oil (unofficial). Dose, 1 to 5 minims. The oil is the best preparation to use, as the tinctures are extremely nauseous, and the fluidextract is too bulky.

VALGUS.—See Talipes Valgus.

VALIDOL.—The menthol-ester of valeric acid containing 30 percent of free menthol. A carminative and antihysteric, combining the activities of its components. It is said to produce no gastric irritation and is recommended in hysteria and seasickness and the vomiting of pregnancy. Dose, 10 to 15 drops on sugar.

VALVULAR DISEASE.—See Heart-disease (Organic).

VALYL.—Valeryldiethylamid. A compound of valeric acid and diethylamin. It is a sedative, nervine, antispasmodic, similar to valerian. Dose, 2 or 3 gelatin capsules, each containing 2 grains.

VANILLA.—The fruit of *V. planifolia*, an orchid found in tropical America, and of other species of the genus. Its odor is due to a methyl-ether, *vanillin*. It is an aromatic stimulant, sometimes employed in hysteria and low fevers, but it is used chiefly as a flavor. **V., Tinct.,** 10 percent. Dose, a few drops, according to the flavor desired. **Vanillin,** $C_8H_8O_3$, crystallizes in stellate groups of colorless needles, is soluble in hot water, alcohol, and ether. It has a warm, aromatic taste. Commercial vanillin is in part prepared from the inner bark of white pine and from eugenol. Dose, 1/4 to 1 grain.

VAPOR BATH.—The application for therapeutic purposes of steam (medicated or otherwise), or of some other vapor, to the surface of the body, in a suitable apartment or apparatus. See Bath.

VAQUEZ'S DISEASE.—See Erythremia.

VARICELLA (Chicken-pox).—Varicella is an acute contagious disease, characterized by a cutaneous eruption of papules, vesicles, and, occasionally, pustules; by mild constitutional symptoms, and by the absence, as a rule, of complications and sequels.

Etiology.—The specific poison has not been isolated, but it has been proved that the contagium of the disease is found in the vesicles. Varicella is directly very contagious, and it may, in rare cases, be carried by a third person. Children of any age may be affected by it, but one attack gives immunity. The period of incubation is from 14 to 16 days.

Symptoms.—In many cases the eruption is the first symptom, though there may be noticed slight fever and general indisposition for 24 hours preceding it. The eruption consists of first a macule and then a papule, but these so rapidly become vesicular that the vesicle is usually the first lesion noticed. The vesicle is tense transparent or slightly yellow, and is about the size of a split pea. The eruption appears first upon the upper part of the body and upon the neck, scalp, and face. Usually, the face escapes with a few lesions, but the hairy scalp contains quite a number.

The vesicles frequently form on the mucous surface of the lips, mouth, throat, conjunctiva, and progenital region; and when occurring on these parts, bear a characteristic appearance, owing to the fact that they quickly lose their delicate covering, and then resemble aphthous ulcers with a well-marked red zone around them.

The eruption appears in successive crops, and different stages are found at the same time and in close proximity. The eruption begins to disappear in a few days after its appearance. Some of the vesicles become flaccid or slightly umbilicated from the absorption of their contents, and others rupture, either spontaneously or from scratching. They finally dry up and the crusts drop off, leaving small circular marks, which soon disappear. In cases in which the vesicles have become infected or in which they are very deep, permanent scars or pits remain.

Pustules may develop in consequence of irritation or infection, or in feeble or poorly nourished children. In rare cases there may be necrotic inflammation around the site of the pock, a condition to which is given the name **varicella gangrænosa.**

In mild cases about a dozen vesicles may appear upon the body; but when severe, the skin may be covered in certain regions. In mild, uncomplicated cases the temperature reaches 101° to 102° F., and lasts only two or three days, being highest when the eruption is appearing and falling gradually as it fades. There are no characteristic constitutional symptoms, but there is present more or less severe indisposition, as found associated with any febrile disease, the child frequently not being ill enough to remain in bed.

Complications.—Erysipelas may occur from infection by the vesicle, and acts as a serious complication. Mild adenitis is occasionally seen. Nephritis may occur, but it is rare as a result of varicella. The other infectious diseases of childhood (measles, scarlet fever, etc.) quite frequently occur just before, at the same time, or closely following chicken-pox, and when present at the same time, render the diagnosis in some cases very difficult.

Diagnosis.—As a rule, the diagnosis of varicella offers no special difficulty. The fact that the eruption appears in crops, so that papules, vesicles, and crusts are seen in close proximity; that the vesicles are unilocular; and that they are never confluent, serve to distinguish it from other eruptive affections. In certain cases, however, it is difficult, if not impossible, to distinguish this disease from a mild form of variola. The following table will aid in the diagnosis:

	Varicella.	Variola.
Incubation,	Two weeks.	One to two weeks.
Prodromes,	None, or slight.	Three or four days in duration; active; severe.
Efflorescence,	On the skin; rapidly becomes vesicular; not umbilicated; unilocular; irregular; numerous; universally distributed in successive crops; vesicles differ greatly in size; on pricking, collapse entirely.	Under the skin; a slow progressive development from a macule to a papule, to an umbilicated vesicle, to a pustule; multilocular; regular; not numerous; defined in its localization; lesions, as a rule, of uniform size; on pricking, collapse partially.
Desquamation,	Slight crust formation.	Pronounced crust formation.
Duration,	Short; 1 week to 10 days.	Long; 3 to 4 weeks.
Type,	Mild.	Severe.
Temperature	Irregular; not high.	Rises suddenly; remains high until papules are developed, when it falls considerably; rises again during development of the pustules.

Prognosis.—The prognosis is invariably good, except when the disease occurs in weak and debilitated children whose hygienic surroundings and care are faulty.

Treatment.—Isolation should be enforced in schools and institutions containing many young children. In homes, unless the younger children are delicate, quarantine is unnecessary. In most cases the constitutional symptoms are so mild as to require no treatment. It is best at the outset to place the child in bed for a few days and to sponge daily with warm, carbolized water, applying carbolized vaselin to the vesicles to allay the itching. Later, when the crusts have formed, the following ointment is useful:

Apply locally:

℞.	Carbolic acid,	♏ xv
	Boric acid,	ʒ jss
	Glycerin,	ʒ iij
	Rose-water,	ʒ j
	Water, enough to make	ʒ iv.

Apply to affected parts once daily.

Or:

℞.	Carbolic acid,	♏ v
	Ichthyol,	ʒ jss
	Vaselin, enough to make	ʒ j.

Apply on soft cloth once daily.

℞.	Ichthyol,	gr. x
	Zinc ointment,	ʒ j.

A light diet, of milk, soups, and eggs. If the tongue is coated, calomel (1/8 grain) may be given every 1 1/2 hours until 4 or 5 doses have been taken.

Care should be taken to keep the skin clean and to prevent scratching. In all cases the urine should invariably be examined several times during and following the attack. Quarantine should be instituted for 2 weeks.

VARICOCELE.—Dilated and varicose condition of the spermatic veins.

The causes of varicocele are not definitely known. It has been attributed to an abnormally lax state of the parts, induced by debility and general want of tone; to congestion from too early or continual excitement of the sexual organs; to occupations involving prolonged standing; and to certain anatomic peculiarities (all of which, however, are present in every healthy male) such as the great length of the spermatic veins, the dependent position of the testicle, the plexiform arrangement of the veins in the scrotum, etc. But it often occurs in men in good health, and in whom the parts are not lax. The reasons given for its much greater frequency on the left than on the right side are: (1) that the left vein is longer than the right; (2) that an obstacle is offered to the outlet of the left vein by its opening at right angles into the renal vein; (3) that the blood-pressure is less in the vena cava than in the renal vein; (4) that the left vein is crossed by the sigmoid flexure, and is hence liable to be pressed upon by fecal accumulations. Spencer believes that the presence of the large veins is due to a congenital variation from the normal process of development, whereby many of the veins of the wolffian body (from which the spermatic veins are formed) remain unobliterated, and capable of being dilated by anything obstructing the return of venous blood from the testicle. More of these veins, he says, are normally obliterated on the right than on the left side.

Symptoms and Diagnosis.—There may be merely a sense of weight and fulness in the scrotum, or dragging or even severe pain, worse after the day's work, but relieved by recumbency. The symptoms, however, are often more mental than physical, the patient fearing impotence or sterility, and sometimes becoming hypochondriacal in consequence. The varicose veins, which may sometimes be seen through the skin of the scrotum, form a soft, irregular, opaque, knotted, pyriform mass, in which there is a distinct expansile thrill or impulse on cough. The swelling is confined to the scrotum, and although it may be reduced on the patient's lying down, it does not go back with a gurgle or slip like a hernia, and

gradually returns when the patient rises, notwithstanding that the finger is placed over the external abdominal ring. The testicle, though perhaps, as a rule, a little smaller than natural, is seldom much atrophied.

Treatment.—In the vast majority radical measures are entirely out of place; varicocele seldom causes inconvenience after early manhood is past. A suspensory bandage should be worn, one that is not too warm or too complicated; the parts should be bathed with cold water night and morning; the bowels should be opened regularly; a fair amount of exercise should be taken; and stimulants, sexual excitement, etc., should be avoided. It is only when the health is impaired that the weight of the part is noticed. Occasionally, however, this is not sufficient; the patient may wish to enter the Government service; both sides may be involved; the varicocele may be serious from its size, the rapidity of its enlargement, or the danger of rupture or phlebitis (which is not uncommon in connection with gout); the testis may be irritable and tender, or the patient very much troubled about its condition. In those cases in which there is any reason to fear the development of hypochondriasis, every endeavor must be made to divert the patient's attention from the disorder; but too often the attempt ends in complete failure, and, though the prospect is not an inviting one, there is no alternative. Pearce Gould considers operation advisable in all cases in which varicocele develops before puberty.

Operation.—The older method, in which a ligature was passed around the veins subcutaneously in one or more places, is practically abandoned: the result is uncertain, and there is great risk of transfixing a vessel. Even the addition of subcutaneous section does not increase the security. The method ordinarily adopted is to expose the veins freely, so that the structures to be dealt with can be seen; isolate the vas deferens with the spermatic artery, ligate the vessels above and below, and excise the intermediate portion. Pearce Gould, however, considers subcutaneous section with the cautery preferable.

The patient is placed under an anesthetic, the parts are shaved and cleansed, and an incision of sufficient length is made along the cord, exposing the fascia that surrounds the veins. The vas is then carefully separ ted at the back, taking care not to isolate it, but to leave the fascia around it untouched; a catgut ligature is passed around the rest of the fascia and the veins above, a second ligature below, and the intervening portion is excised. Practically, if the separation is commenced above, all the veins are included but one or two little ones with the vas. The length to be excised depends, as Bennett has shown, upon the height to which it is wished to raise the testicle, and after excision the two cut ends should be sutured together, so that the shortening of the fascia may help to support the gland. No drainage tube is needed, unless there has been much handling. The swelling afterward is considerable, and the testis may be a little tender, but orchitis does not follow. An ice-bag may be applied for 48 hours as a precaution. The patient should remain in bed for 10 days or 2 weeks, by which time the induration will have disappeared, and should wear a suspensory bandage for some months (Moullin).

VARICOSE VEINS.—A vein is said to be varicose when it is permanently and unequally dilated, and when its coats have undergone certain degenerative changes. A varicose condition is most common in the veins of the lower extremities and in the veins of the rectum and testicle. See Hemorrhoids, Varicocele.

The causes may be considered under the heads of increased intravenous pressure and changes in the vein-walls.

Increased intravenous pressure may be due to: (1) Organic affections of the heart whereby the return of venous blood is impeded. (2) Obstruction to the circulation in the portal system, a cause chiefly affecting the hemorrhoidal veins. See Hemorrhoids. (3) Pressure upon the veins, such as may be exerted (*a*) by the gravid uterus or by a tumor of the uterus or of the ovaries on the iliac veins; (*b*) by an aneurysm of the abdominal aorta on the inferior vena cava; (*c*) by fecal accumulation on the hemorrhoidal veins; (*d*) by a tumor in the groin on the femoral vein; (*e*) by an ill-fitting truss on the spermatic veins (see Varicocele); or (*f*) by a tight garter on the saphenous veins. (4) Prolonged standing, which has a tendency to cause the accumulation of blood in the veins of the lower extremity. (5) Severe muscular exertion, whereby an increased amount of blood is driven by the contraction of the muscles from the deep into the superficial veins.

Some authors consider this last the chief, if not the only, cause of varicose veins of the lower extremities. They maintain that the pressure of the blood first produces a dilatation of the superficial veins where the intermuscular veins empty into them; that this dilatation, being frequently repeated, becomes permanent; that the valves, in consequence, are unable to close and protect the veins, and, being thrown out of use, gradually undergo atrophy, while the weight of the column of blood, from the inefficiency of the valves, becomes further increased and the veins are still further dilated.

Changes in the Vein-walls.—These consist principally of a hereditary weakness, a want of muscular tone, and an inflammatory softening of the walls. Varicose veins are more common in men than in women, owing to their more frequent exposure to the exciting causes. Women, however, are peculiarly liable to them during pregnancy.

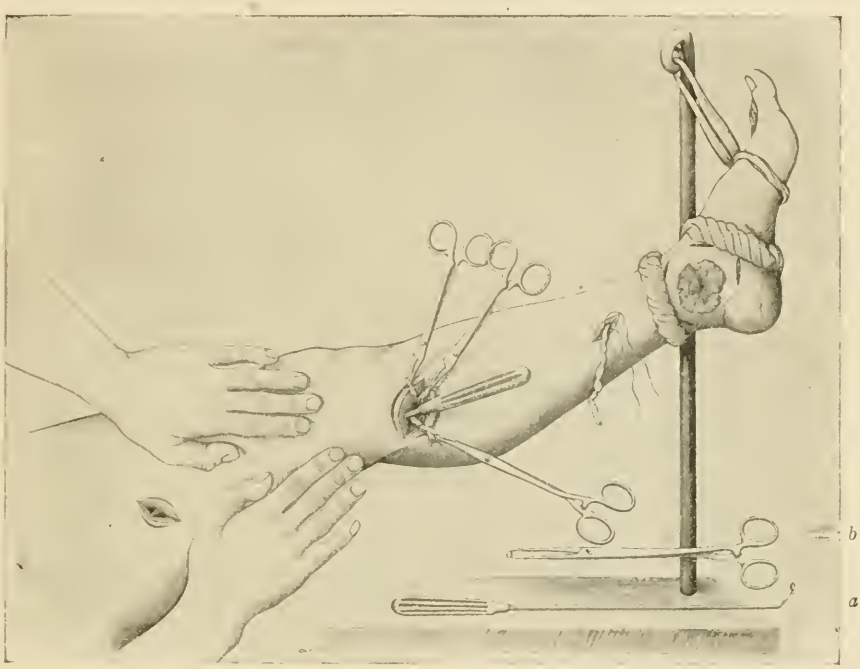
The symptoms usually complained of are fatigue and a sense of fulness of the limb after exercise or prolonged standing, and perhaps cramp, coldness of the feet, swelling and edema of the ankle, and numbness of the leg. Sometimes there is deep-seated pain. The tortuous vein or veins meandering up the leg is a characteristic sign, and cannot be mistaken. When the smaller radicals are affected, bluish clusters of minute veins are visible here and there, especially about the ankle and knee.

Treatment is palliative and radical.

Palliative.—All obstructions must be removed, as far as possible. Tight garters are exceedingly injurious. In pregnancy the patient must rest as much as possible, or as much as is consistent with health, and should wear a bandage or an elastic stocking both during and for some time afterward. The bowels must be kept well open, and prolonged standing and excessive walking should be avoided, although a reasonable amount of exercise, avoiding fatigue, is decidedly beneficial.

If the varix has made its appearance suddenly after exertion, the walls of the vein must be carefully protected from strain for some considerable time. The limb should be kept at rest in the horizontal position, for 2 or 3 weeks, according to the size of the vein, and then carefully supported.

In the majority of cases all that can be done is to caution the patient against the evil effects of standing, etc.; to maintain the general health by means of tonics, combined with good food, fresh air, and a fair amount of exercise; and to supply some kind of support. Silk anklets, elastic stockings, and the appliances generally in use serve the purpose for which they are intended very ill; they produce the maximum of constriction when first applied, and then each week relax more and more until replaced; they are usually much too tight, and generally cause considerable wasting of the muscles. If worn once, the limb becomes so used to their pressure that the patient can hardly be induced to leave them off. Bandages of thin flannel, domet, or perforated rubber are much better, as they can be put on with just sufficient pressure and no more, instead of an iron rule being followed in all cases alike. Upward friction and massage should be practised every night when the appliance is removed. If bleeding threatens, the part should be well bandaged and kept at rest; if it breaks out (the usual situation is the lower third of the leg), the limb must be raised at once. The hemorrhage is exceedingly profuse, but it comes from the proximal or cardiac end, and raising the limb stops it instantly. If inflammation sets in and the veins become hard and painful, showing that they are filled with clots, the patient should be confined to bed and the limb should be placed in a slanting position on a leg-rest and covered with lead lotion.



Mayo's Operation.

Radical.—In a certain number of cases the radical cure may be tried. As a rule, it is only advisable when the superficial veins are concerned, and when the part involved is limited in extent. Sometimes, however, it is beneficial in cases of varicose ulcer, in which the persistence of the sore appears to be dependent upon the vein. The choice lies between acupressure (with or without subcutaneous division), ligation, and excision.

Acupressure.—This is performed by passing a flat needle beneath the vein, while it is pinched up with the finger and thumb, and then twisting a figure-of-eight suture over the ends, protecting the skin beneath by means of a piece of bougie or quill. The needles should be about 3/4 of an inch apart, and the vein may be divided subcutaneously between them with a tenotomy knife. They should not be left in for more than a week, and if any

inflammation occurs, the time should be shortened. Failure is not infrequent, and there is always the risk of transfixing the vein.

Ligation.—A small incision is made over the vessel and an aneurysm needle is passed around it and threaded with catgut. The ligature left when the needle is withdrawn is tied and the ends cut short. This method may be combined with the former, ligatures being placed in the intervals between the pins. Subcutaneous ligation may be tried in suitable cases.

Excision.—This is by far the most effective method. The skin over the vein is reflected, the incision being as far as possible longitudinal; the vessel is carefully isolated from the surrounding tissue, a double ligature (catgut) is placed around it at each end and around each branch, and the whole intervening portion is excised.

C. H. Mayo excises the long saphenous vein in the following manner: the vein exposed and isolated near the saphenous opening and divided between ligatures and the peripheral portion grasped with a hemostat. The vein is passed through the loop of Mayo's dissector. Guided by the vein the dissector is pushed under the skin down to a point near the knee. The skin is incised over the end of the dissector. The vein clamped, pulled out through the wound, ligated and the loose portion excised. If the dissector is obstructed in its work by adhesions around the vein, the closed forceps is passed alongside it and when the adhesions are reached the blades of the forceps are slightly opened. In the same manner as many other veins are removed as may be necessary. The dissection is made from above downward to avoid the danger of detaching thrombi and throwing them into the circulation.

Schede's operation consists in making an incision completely around the leg down to the deep fascia and doubly ligating all the divided veins.

VARIOLA.—See SMALL-POX.

VARIOLOID.—See SMALL-POX.

VASELIN.—See PETROLATUM.

VASOCONSTRICTORS.—Drugs that increase the contractile power of the vessels, lessening the circulation therein and raising the blood-pressure; hence they are used to check hemorrhage and cut short inflammations. The principal agents are: Adrenal extract, adrenalin, antipyrin, cotarnin, hydrastinin, strychnin, hamamelis, atropin (small doses), opium (small doses), cocain, ergot, digitalis, squill, strophanthus, iron, camphor, sulphuric acid, barium salts, lead salts, silver salts, zinc salts, cold (locally).

These agents act upon the local vasomotor mechanism in the walls of the vessels, hamamelis affecting the venous system especially. Cold is one of the most powerful agents of this class, and is also a cardiac sedative. Adrenal extract produces an enormous rise of the blood-pressure, due to its extraordinary contractile power over the muscular fibers in the walls of the arterioles. Adrenalin is said to be 625 times more powerful in this respect than the extract. Digitalis, squill, and strophanthus, in small doses contract the vessels, but in large doses dilate them.

VASODILATORS.—Drugs that produce dilatation of the peripheral vessels, and increase the rapidity of the circulation, thus equalizing the blood-pressure and relieving internal congestions. The most useful are alcohol and ether, as they stimulate the action of the heart simultaneously with the vascular relaxation. The chief are: Alcohol, ether, nitrous ether, nitroglycerin, amyl nitrite, potassium nitrite, sodium nitrite, erythrol tetranitrate, belladonna (at last), stramonium (at last), hyoscyamus (at last), opium (full doses), ipecacuanha, Dover's powder, thyroid extract, chloral, chloroform, ammonium acetate, tartar emetic, hydrocyanic acid, aconite (?), heat (at first).

The nitrites are our most certain, in fact almost our only certain remedies to dilate the blood-vessels (Wood). The dilating action of amyl nitrite and other nitrites is due either to weakening of the muscular walls of the arterioles or to paralysis of the vasomotor terminals therein. Alcohol, ether and opium probably depress the vasomotor center. Aconite does not affect the vaso-motor center of the vasomotor nerves, hence the lessened arterial tension induced by it is due to its depressant action on the heart alone (Ringer). Atropin and its congeners act on the vessels differently in different doses, and at different stages in its action.

Vasodilators are often called vascular stimulants or stimulants of the circulation; but there is this difficulty of speaking of stimulants or sedatives of the circulation, that if both the heart and the vessels are stimulated at the same time, the action of the one tends to counteract that of the other. On the other hand, a drug which weakens the heart may increase the circulation by dilating the vessels, thus acting as a vascular stimulant (Brunton).

VEINS, INFLAMMATION (Phlebitis).—Phlebitis, or inflammation of veins, may be divided into the simple and the septic or spreading.

Simple phlebitis, formerly known as **adhesive phlebitis,** is a simple local inflammation of the vein-wall, and may terminate in resolution, in obliteration of the vein, or, more rarely in the formation of a localized abscess.

Causes.—(1) Injury of the vein-walls; (2) simple inflammation of the surrounding tissues; (3) the formation of a noninfective thrombus in a vein; (4) gout or the gouty diathesis; (5) certain conditions of the system the exact nature of which is not known, the phlebitis being then spoken of as idiopathic.

Symptoms.—When the vein is superficial, it can be felt as a hard, knotted cord, standing out under the skin and surrounded by inflamed cellular tissue. It is exceedingly tender to the touch, but, unless the periphlebitis is very acute, and the vein is quite under the surface (as in the case of a varicose internal saphena), the skin is seldom much reddened. There is often a very considerable degree of pain and stiffness, especially on movement, or when the limb is allowed to hang down; and sometimes there is profound constitutional disturbance. In the case of the deeper

veins the diagnosis chiefly rests upon the deep-seated hardness and tenderness, the peculiarly clumsy appearance of the part, the sense of weight and pain when the limb is allowed to hang down, the relief as soon as it is raised, and the evident distention of the more superficial vessels. Generally, a certain amount of superficial edema can be detected on the distal side of the obstruction: around the malleoli, for example, in cases of phlebitis of the deep veins of the leg.

Gouty, rheumatic, and syphilitic phlebitis can only be distinguished by the other symptoms that accompany these disorders; they have no certain distinctive character of their own, although the gouty variety is occasionally metastatic. They all have a decided tendency to symmetry, they affect the superficial veins rather than the deep ones and the lower limbs much more frequently than the upper. Recurrence is exceedingly common in the gouty variety, and may continue in the syphilitic form all through the secondary period, but it is seldom that permanent obliteration is caused by either gout or syphilis.

Treatment.—Rest is absolutely essential until at least all trace of inflammation and tenderness has disappeared. Serious extension of the thrombus and detachment of outlying fragments, causing embolism, are rare accidents, considering the very large number of cases of phlebitis of varicose veins of the leg; but they do happen occasionally, and every precaution must be taken to avoid them.

Elevation is no less essential, for the sake of the return circulation and to relieve tension. Cold lead lotion, as a rule, causes the inflammation to subside within a few days; but in cases of gout, and when the arteries are atheromatous, belladonna (equal parts of the extract and glycerin) and warmth should be used instead. The bowels should be kept well open; the diet should be light, without stimulants, and if there is any evidence of gout, rheumatism, or syphilis, appropriate remedies should be employed. Afterward, when all the inflammation has subsided, the patient may be allowed to go about with a support; if the leg is much wasted, or has a tendency to remain cold or edematous, massage may be used to improve the circulation.

Suppurative Phlebitis.—This, too, may originate either as a periphlebitis or in the interior. Examples of the former are often seen in diffuse inflammation of the cellular tissue; the pyogenic organisms rapidly destroy the coats of the veins, spreading along the loose cellular tissue around them, and causing them to slough or to melt away into the purulent fluid that fills up every interstice. As the endothelium is approached coagulation takes place, and although the thrombus shares the fate of all the rest of the structures, fortunately, in the vast majority of cases, the coagulation extends sufficiently far and with enough rapidity to act as a barrier and to prevent the poison from spreading far and wide in the circulation. If it fails, or if it is broken down, general pyemia is almost certain. This is of common occurrence in acute suppurative osteomyelitis and in otitis media, infective inflammation, with thrombosis, spreading along the coats of the veins into larger and larger trunks, until at length the puriform clot that fills the vessel gives way and is scattered all over the body, causing metastatic abscesses wherever it enters.

Acute spreading phlebitis of the same character, and ending in embolic pyemia in the same way, may begin in the interior of a vein as well as around it. This, of course, unless pyemia has already developed, can only take place after the cavity of the vein has been opened. Usually, under these circumstances, the vessel either collapses at once or a coagulum forms and extends up to the next set of valves or to the next larger branch. If, however, septic decomposition sets in before organization has taken place, and lends its aid to the micrococci of suppuration, the clot melts away at once into an infective puriform fluid, and there is every chance of a wide-spread distribution of infective emboli all over the body, even before the rest of the tissues succumb or before the diffuse cellulitis assumes alarming proportions (Moullin).

VEINS, INJURIES.—Rupture or subcutaneous laceration of a vein occasionally occurs from causes similar to those producing rupture of an artery—an accident, moreover, with which it is frequently associated. When the vein is of large size, much blood may be extravasated into the tissues, and may produce gangrene by pressure on the vessels carrying on the collateral circulation, though such a result is much less common than after rupture of an artery. The blood, except when the extravasation is large, is usually absorbed, but it may break down and suppuration ensue.

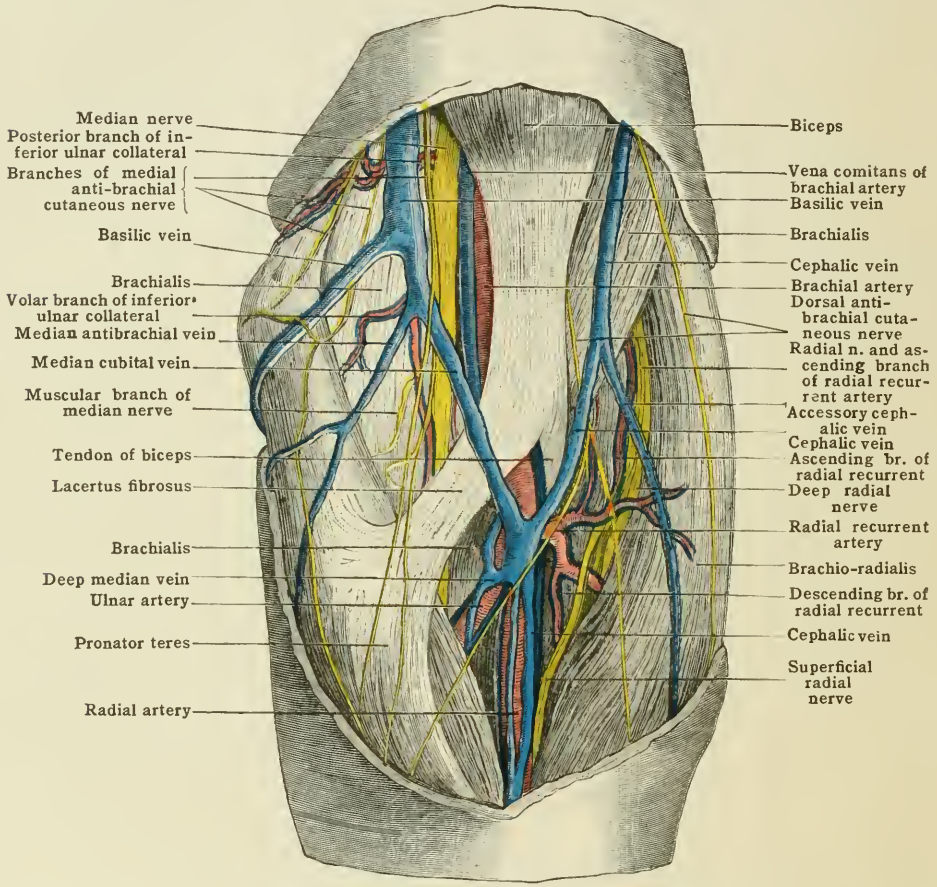
Wounds.—Punctured and incised wounds, when small and parallel to the long axis of even large veins, readily heal by adhesive inflammation without obliteration of the lumen of the vessel. At times, however, a clot may form in the wound, and successive layers may be deposited upon it until ultimately the vein is occluded. When a vein is completely cut across, as in amputation, it usually collapses as far as the next pair of valves, a clot forms as high as the first collateral branch, and the vein becomes permanently occluded. In consequence, however, of the vein-wall containing less elastic and muscular tissue than an artery, bleeding sometimes continues unless stopped artificially.

Treatment.—When the wound is a mere puncture in the continuity of the vein, unless it is found that pressure will control the hemorrhage, the coats should be nipped up by forceps and a lateral ligature applied. If a vein continues to bleed during an amputation, it should be tied like an artery. A large wound, or one made in the longitudinal axis of a large vein, necessitates ligation of the vein in two places, and the division of the vessel between the two ligatures. See Arteries (Injuries).

The dangers of wounds of veins are: (1) Hemorrhage; (2) inflammation of a septic character, and the attendant risks of blood-poisoning from the

detachment of the infected clots; (3) entrance of air.

Entrance of air into veins is fortunately a rare accident. It sometimes happens in operations about the root of the neck, where the disposition of the cervical fascia prevents the veins collapsing and thus allows air to be sucked in during inspiration. Air is known to have entered a vein by the hissing sound during inspiration, the escape of frothy blood from the vein on expiration, the urgent dyspnea, and the state of collapse into



THE BEND OF THE ELBOW WITH THE SUPERFICIAL VEINS.
(From a dissection by Dr. Alder Smith in the Museum of St. Bartholomew's Hospital.)—(*Morris' Anatomy.*)

which the patient immediately falls. On listening over the heart a peculiar churning sound can be heard. Death in fatal cases usually occurs in a few minutes, and is due to the admixture of blood and air preventing the circulation through the capillaries of the lungs, and so causing distention and paralysis of the right side of the heart.

Treatment.—The finger should at once be placed over the hole in the vein to prevent more air entering, and a clamp or ligature should be applied as soon as practicable. Pouring water into the wound has been suggested both as a means of preventing the further entrance of air during inspiration, and of allowing that which is already in to bubble out during expiration. The patient should be placed with his head low to insure a sufficient supply of blood to the brain, and for the same purpose the arteries of the extremities should be compressed, while injections of ether or of brandy should be given subcutaneously to stimulate the heart. Artificial respiration should not be performed until the vein is secured, lest more air be sucked in. To guard against the accident the veins should be clamped before division, and in removing a tumor traction should not be made at the moment the vein is severed (Walsham).

VEINS, VARICOSE.—See VARICOSE VEINS.

VENEREAL DISEASES.—See SYPHILIS, CHANCROID, GONORRHEA.

VENESECTION (Phlebotomy).—Venesection, though not so often employed in modern surgery as in ancient days, has been considerably discussed lately, and is again coming into use. It is at times most beneficial in very acute inflammations in young and plethoric subjects.

The blood may be taken from one of the veins of the arm—usually from the median basilic vein,

as that is the larger vessel—or from the external jugular vein. In bleeding from a vein of the arm, a bandage or tape is carried twice around the arm a little above the elbow, to obstruct the vein, and is tied in a bow. Grasping the arm with the left hand, with the thumb steadying the vein, the surgeon makes an incision into the vessel, holding the lancet with the blade between his forefinger and thumb, about 1/2 of an inch from the point, to prevent it penetrating too deeply. The blood is directed into a graduated bleeding-bowl, the flow, if necessary, being increased by having the patient firmly grasp a stick. When sufficient blood has been taken (usually about 10 ounces) the constricting tape is untied, a pad is placed over the incision, and the ends of the tape are carried across the pad to below the joint, then around the arm, and again over the pad, where they are tied.

Uses.—Sanquirico has established that within certain limits venesection never produces functional alterations or disturbances in the nutrition in animals. Maragliano has reported a number of tests and experiments demonstrating that impoverishing the blood has no injurious effect upon the evolution of infective diseases, but is even directly beneficial when the lungs are not working properly and are unable to eliminate the excess of carbonic acid formed in a blood particularly rich in red corpuscles. Traube expressed this fact when he stated that persons whose blood contains fewer red corpuscles than the average are less affected by pulmonary disturbances than others, and that even a small amount of lung surface is sufficient to eliminate their carbonic acid. This fact explains the manifest improvement after venesection in pneumonia, which he has observed again and again in his own practice; the dyspnea and cyanosis decrease, while the elimination of carbonic acid increases. On the other hand, in cases of circumscribed pulmonary lesions the elimination of carbonic acid decreases after venesection, showing that the elimination had been practically normal. Recent research (Robin) has proved that venesection promotes oxidation processes in pneumonia, and everything tends to the assumption that when the corpuscles are inert, they are useless. Maragliano agrees with Zakharine that venesection is especially beneficial in active congestions with hemorrhage, especially hemorrhage of the respiratory apparatus and brain. The amount necessary to obtain the mechanic effect required in these cases is from 200 to 400 c.c. Zakharine even ascribes a revulsive action to phlebotomy, claiming that the congestion may be drawn to a remote vascular region; and Calabrese adds two corroboratory observations of severe, rebellious hemoptysis in tuberculosis, arrested by a few leeches applied to the base of the thorax.

Maragliano has dwelt upon the advantages of venesection in eliminating the toxins circulating in the blood, especially in renal or pulmonary insufficiency, or when there is some obstacle to the passage of bile into the intestines, and also in the autointoxications resulting, usually, from the suppression or functional alteration of the organs designed for the defense of the organism against the poisons it manufactures spontaneously. Bouchard has demonstrated that 500 grams of blood taken from a uremic subject contain 8 grams of extractive matters: *i. e.*, about the same amount as is eliminated normally by the kidneys during 24 hours. The attempt has been made in cerebrospinal meningitis to clear the blood by venesection of all the toxic substances accumulating in it; and favorable results have been obtained with venesection, combined with the injection of salt solution, in diplococcic toxemia, especially in regard to the complicating hyposystolic phenomena, although these facts are not yet fully established. In uremic intoxication, an amount varying from 500 to 1000 c.c. is withdrawn. The simultaneous injection of salt solution allows greater quantitites of blood to be withdrawn. See Infusion of Saline Solutions.

Baccelli reports that he has seen most remarkable results follow venesection, especially in capillary bronchitis and acute nephritis. He explains its action in the latter case by the fact that the peripheral pressure of the effusion in inflammation of Bowman's capsule compresses the small blood-vessels and retards the circulation through the delicate apparatus of the glomerulus, from which the entire functional economy of the kidney suffers; the epithelium undergoes fatty degeneration, and the urine diminishes in quantity, with symptoms of progressively increasing toxemia. He has saved and even secured complete regeneration of the kidney in many cases of this nature by opening a vein in the foot.

VENOM.—See Bites and Stings (Snake-bites).

VENOUS INFUSION.—See Infusion of Saline Solutions.

VENOUS INJECTION.—See Intravenous Injection.

VENTILATION.—The dilution and removal of all impurities that collect in the air of inhabited rooms, the most common of which is CO_2, the presence of which may be tested for by Lange's method. It consists of shaking, in a bottle full of the air to be tested, 1/2 of an ounce of clear fresh lime-water. If the air contains 7 parts to 1000 of CO_2, a turbidity of the fluid will occur.

In hospitals the fundamental principle of ventilation observed is that each adult person confined in a space of 1000 cubic feet requires 3000 cubic feet of fresh air an hour in order to prevent the proportion of carbon dioxid in the room from rising above 0.06 percent. This estimate is based on the fact that each adult expires, on the average, 0.6 of a cubic foot of carbon dioxid an hour.

Ventilation may be *natural*, due to the forces constantly acting in nature, or *artificial*, the result of measures introduced by man. The former is brought about by the agency of the wind and by diffusion, or the power that gases of different densities possess of mixing with one another.

Artificial ventilation is brought about either by extracting the foul air from the room, or by forcing pure air into the room, and is affected by means of fans, heat, gas, or steam.

Natural ventilation is aided by means of tubes or shafts employed as inlets and outlets. The out-

lets are guarded by cowls, which prevent the entrance of rain, increase the extracting effect of the wind, and check the tendency to down-draft. A most valuable agent in this ventilation is the chimney. Windows also may be utilized for the same purpose.

The estimation of CO_2 in the air may be made by the following methods:

1. *Minimetric method*, when the proportion of CO_2 is not less than 1 part to 1000. The analysis is made by the use of a solution of sodium carbonate with phenolphthalein as an indicator.

2. *Pettenkofer's method* has for its basis the fact that if air containing CO_2 is brought into contact with barium hydroxid in solution, a combination takes place between the barium and CO_2 immediately, and insoluble barium carbonate is precipitated.

3. *Szydlowski's method* consists in comparing a given volume of the air to be tested with a sample of air from which CO_2 has been removed; the difference of pressure is recorded by means of a mercurial column.

4. *Reiset's method* calculates the amount of CO_2 in the air from the difference found between the titration of a given volume of barium water before and after the passage of the air through it.

Methods of Ventilation.—There are various methods of securing ventilation, some of which are as follows:

In the *Auburn* or *Pentonville system* of ventilating prisons the cells are arranged in blocks of several tiers in height, and each block is surrounded by an outer building, between the walls of which and the doors of the tiers of cells on each side there is an open corridor, not divided by floors corresponding to the floors of the several tiers. The air is drawn from this corridor into the cells.

Boyle's ventilator is an arrangement of mica valves allowing air to pass out, but allowing no back-draft.

Cooper's ventilator is a series of apertures in the glass of a window-pane arranged in a circle so as to be more or less completely closed by a circular disc having corresponding apertures and moving upon a central pivot.

Ellison's ventilating bricks are bricks perforated with conic holes, and fixed in the walls, with the apices of the cone on the outside. They are not likely to produce a draft.

Hinckes-Bird's method consists in placing a movable block of wood under the entire length of the lower window-sash.

Louvred panes are a form of window-ventilation by which an upward direction is imparted to the incoming air. These panes take the place of one or more of the squares of glass, and may be either opened or closed.

McKinnell's ventilator is a combined outlet and inlet ventilator, which is applicable in the case of upper rooms or rooms in single-story houses. It consists of two tubes, the one encircling the other, the inner acting as the outlet, and being fitted with a cowl.

The *Sheringham valve* is a common form of inlet in windows or walls for the purposes of ventilation. The entrance to the opening in the wall is guarded by a strainer to keep out dust, while on the inside is a valved iron plate with closed sides and hinged at the bottom. This opening is usually placed near the ceiling.

The *Smead-Dowd system of ventilation* is an artificial system of ventilation in which the outlets are at the bottom of the sheeting along the floor-line, and open into spaces beneath the floor. These spaces are connected with flues, down which the air is drawn by the powerful action of the furnace-chimney.

Tobin's tube is another means of ventilation, the air from without entering through a hole in the wall and being conducted by an upright tube into the upper portion of the room.

VERATRIN.—A mixture of alkaloids obtained from the seeds of *Asagræa officinalis*. See VERATRUM. It is an exceedingly poisonous local irritant, and is used mainly as an external application for neuralgia, gout, and rheumatism. Dose, 1/50 to 1/10 grain. Two preparations for external use are official—**Oleatum Veratrinæ** (containing 2 parts of veratrin dissolved in 50 parts of oleic acid and olive oil to 100) and the **Unguentum Veratrinæ** (containing 4 parts of veratrin and 6 parts expressed oil of almond incorporated with 90 parts of benzoinated lard). In practice, more than 6 parts of alcohol are necessary to dissolve the veratrin; chloroform and acetic acid are better solvents than alcohol. Veratrin is revulsant and parasiticide. When brought in contact with cutaneous surfaces, it is exceedingly irritating, producing a feeling of warmth, followed by a sense of tingling.

In neuralgia, especially in tic douloureux, the ointment of veratrin, rubbed into the affected part until it causes a sense of tingling, is often productive of great relief.

℞. Ver trin,	gr. xxv
Alcohol,	ʒ vj
Glycerin,	ʒ ij.

Paint along the course of the affected nerve with a camel's-hair brush twice daily.

This should not be applied if inflammatory symptoms are present. Veratrin has been highly commended by some ophthalmic surgeons as a remedy in orbital neuralgia. It is applied to the temple and brow in the form of ointment, containing from 1 to 4 grains to the dram, according to the degree of irritation desired and the sensitiveness of the skin. The proportion in the official ointment is 1 part in 26.5. Great care is necessary to keep it out of the eye, as it causes a violent and persistent conjunctivitis. The oleate (1 : 50, U. S. P.) is an excellent preparation. It is doubtful whether, as an external application, this drug has any therapeutic effect that cannot be attributed to the counterirritation it produces.

VERATRUM VIRIDE (Hellebore).—The dried rhizome and roots of *Veratrum viride*, American hellebore, or *veratrum album*, white hellebore. They contain the alkaloids *jervin*, *pseudojervin*, and *rubijervin;* but veratrum viride contains also *veratrin* (*cevadin*), and veratrum album contains

also *protoveratrin*, *protoveratridin* and other alkaloids. Dose, 1 to 3 grains.

Asagræa officinalis, *veratrum sabadilla*, *cevadilla*, is the source of the official veratrin, and is a mixture of alkaloids. It contains the alkaloids *veratrin* (*cevadin*), *cevadillin*, *sabadin*, *sabadinin*, and another base known as *Wright's veratrin*. It is a violent emetic and cathartic, and is actively poisonous; it is now little used, except as an insect powder. For this use it is highly valued, as it destroys many insects which the ordinary buhach does not affect. Veratrum viride is a powerful depressant of the heart and a paralyzant of the spinal cord. Its action is similar to that of aconite, but is regarded as inferior. The chief use is as a circulatory sedative in acute, sthenic, or dynamic inflammations. It is highly esteemed in puerperal fevers, pneumonia, pleurisy, hepatitis, peritonitis, cerebritis, and aneurysm. It is contraindicated in conditions of exhaustion or depression, or if vomiting is feared.

In *poisoning* by veratrum viride cardiac stimulants, atropin, strychnin, and external heat are indicated. **V., Flext.** Dose, 1 to 4 minims. **V., Tinct.**, 10 percent. Dose, 10 to 30 minims.

VERMIFORM APPENDIX.—See Appendicitis.

VERMIFUGE.—See Anthelmintics, Worms.

VERONAL.—Diethyl Malonylurea.—It is a very efficient and rapid hypnotic in doses of 8 to 10 grains, given in some hot liquid. It induces a practically normal sleep, does not affect the heart, circulation or kidneys, and is free from after-effects. It is particularly efficient when mixed with sulphonethylmethane (trional) in the proportion of two parts of the former to one of the latter (*e. g.*, gr. viii with gr. iv).

VERONAL-SODIUM.—Sodium diethyl-barbiturate. Its action and dosage are the same as veronal, but it is said to act more rapidly by reason of its greater solubility.

VERRUCA.—See Warts.

VERSION.—See Fetus (Positions and Presentations).

VERTIGO (Dizziness).—A subjective state in which the individual affected, or the objects about him, seem to be in rapid motion, either of a rotatory, circular, or to-and-fro character.

The etiology of an attack of vertigo depends upon the particular variety.

Ocular vertigo results from the paresis of one or more of the ocular muscles, or from eye-strain.

Aural or auditory vertigo, or Ménière's disease, results from disease of the semicircular canals and cochlea. Ménière's Disease (*q. v.*), properly so called, is a sudden severe vertigo, the result either of a hemorrhage or of a serous or purulent exudation into the semicircular canals.

Gastric vertigo is the most common variety, and results either from stomachic or intestinal dyspepsia, disordered hepatic function or constipation. The mechanism of the vertigo is complex. There are two factors; one consists in the toxic effect of the imperfectly oxidized materials that accumulate in the blood; the other is reflex. An impression made on the end-organs of the pneumogastric nerve in the stomach is reflected over the sympathetic ganglia.

Nervous vertigo is associated with migraine and with sick or nervous headache, and is also caused by physical or nervous excesses and by the immoderate use of tea, coffee, alcohol, and tobacco. It is also a result of many of the organic diseases of the brain.

Senile vertigo is the result of the disordered cerebral circulation resulting from changes in the heart and vessels.

Symptoms.—In all varieties of vertigo the symptom of a sensation of objects moving around the patient, or of the patient moving around objects that remain stationary, is present in some degree. The attack of giddiness comes on suddenly, with indistinctness of vision and slight confusion of the thoughts. The patient may fall, unless he grasps something to steady himself. Nausea and vomiting, and cardiac palpitation with tinnitus aurium, are often associated with the vertiginous sensations. There is no loss of consciousness.

In ocular vertigo the attack is usually the result of reading, writing, sewing, or other close application of the eyes, the ordinary symptoms of vertigo being preceded by headache, nausea, specks before the eyes, and pain in the eyeballs.

The prognosis is favorable in ocular and gastric vertigo. Unless the result of organic disease, the prognosis is favorable in nervous vertigo. In auricular vertigo the prognosis is fair, but in genuine Ménière's disease the prognosis is unfavorable, as it is also in senile vertigo.

Treatment.—For ocular vertigo rest for the eyes is necessary and properly adjusted glasses are required. For cases of Ménière's disease rest in the recumbent position and the use of full doses of quinin, 10 to 15 grains daily for a long period, as suggested by Charcot.

For gastric vertigo a careful regulation of the diet is indicated. At the beginning of the treatment it is often of great advantage to place the patient on an exclusively milk diet, gradually widening the variety of food as improvement occurs. If these cases a course of arsenic is often serviceable. If the digestion is torpid, the use of tincture of nux vomica is indicated. If the bowels are constipated, benefit is obtained from fluid-extract of cascara sagrada.

For nervous vertigo the removal of the exciting cause and the use of such remedies as iron, quinin, and strychnin, either alone or variously combined, are demanded. For senile vertigo a highly nutritious but easily digested diet, the use of pure stimulants, and a course of mercuric chlorid, or arsenic with tincture of nux vomica, are advisable.

In all varieties of vertigo the habits of the patient must be most abstemious, excluding tobacco, tea, coffee, highly seasoned foods, malt liquors, and alcohol unless particularly indicated.

VESICAL CALCULUS.—See Bladder (Stone).

VESICANTS.—See Counterirritation.

VIABILITY.—Ability to live; applied to a child at the time of birth. The term indicates the capacity for independent existence. Viability has

chiefly to be determined by the age of the fetus and by its condition as regards formation, health, and strength. It also depends in some measure upon the season of the year and upon the climate in which the child is born.

The earliest period at which a child can be born, in temperate climates, and be capable of living and of reaching maturity, is usually regarded as about 7 months, or 210 days. Cases are on record of children born at the sixth month who were reared.

Signs of maturity are: Strong movements and cries directly after birth; the body is of a clear pink or red color, and is covered with sebaceous matter; the mouth, nostrils, eyelids, and ears are open; the nails reach, if not extend beyond, the finger-tips; the hair and eyebrows are completely developed, the hair of the head being about an inch long; the skull is somewhat firm, the fontanels are not far apart; the four portions of the occipital bone are distinct, and the external auditory meatus is cartilaginous; the testicles have passed the inguinal ring; there is meconium at the end of the large intestine or it is freely discharged and urine is passed; there is a point of ossification in the center of the cartilage at the lower end of the femur. The power of suction has developed, as evidenced by placing a nipple or the finger in the mouth. The ordinary length of the child is from 16 to 20 inches and the weight is from 4 to 7 pounds.

Between the sixth and seventh months the length of the fetus is from 10 to 14 inches. The skin is of a dusky red color and is covered with down and sebaceous matter; the pupillary membranes are disappearing and the nails do not reach to the ends of the fingers. Meconium may be found at the upper end of the large intestine and the testicles are situated near the kidneys. Points of ossification may be found in four divisions of the sternum and in the astragalus. The center of the body at the sixth month is at the lower end of the sternum, while at the seventh month it is a little below the sternum. The length of the child at eight months is from 14 to 18 inches; its weight is from 3 to 5 1/2 pounds. The skin is rosy and is covered with fine short hairs, with distinct sebaceous envelope; the nails reach to the ends of the fingers, and the pupillary membranes have entirely disappeared; the testicles have descended into the inguinal ring, and there is a point of ossification in the last vertebra of the sacrum. The middle of the body is nearer to the umbilicus than to the sternum.

The signs of immaturity are: The head is out of proportion to the body; the body center is high up; the pupillary membranes are present; the testicles are undescended and the genital organs are of a deep red color; the skin is intensely red, mottled, and coated by a downy covering, sebaceous matter being absent; the nails are imperfectly formed. Movements are feeble; there is inability to suck; artificial heat is necessary; sleep is almost unbroken; the discharges of meconium and of urine are infrequent and imperfect; and the mouth, nostrils, and eyelids are closed.

The tests of live birth are appended:

Breslau Test.—If the intestines and stomach of the infant were found to float in water on removal from the body it was thought to be proof that the child was born alive. This test is of no value.

Hydrostatic Test.—Suggested by Raygat. It consists in placing the lungs in water and noting their specific gravity. If inflation has occurred, they will float. This test is valuable.

Ploucquet's Test.—This consists in estimating the ratio of the weight of the lungs to the weight of the body of the child. Ploucquet laid down this rule; that *before respiration* the weight of the lungs compared to the weight of the body was in the ratio of 1 : 70, and that *after respiration* it was in the ratio of 1 : 35. The test is of but slight value.

Static Test.—Also called *Foderé's* or *Schmidt's test*. This consists in ascertaining the absolute weight of the lungs, and comparing this weight with the average lung weights of still-born children and of children who have died soon after birth. Foderé fixes the weight of the lungs of still-born children born at term at 480 grains (1 ounce), and 960 grains (2 ounces) as the weight of the lungs soon after breathing has been established. This test is also of but slight value.

VIBURNUM.—**V., opulus,** cramp bark. Dose, 10 to 45 grains. Dose of the fluidextract, 10 to 45 minims. This drug is valued as a remedy for uterine and abdominal pains. **V. prunifolium,** black haw, is also derived from the bark of a shrub of the same natural order. It contains tannic, oxalic, citric, and malic acids, and sulphates and chlorids. It also contains 2 resins, viburnin and viburnic acid, the latter of which is identical with valeric acid.

The fluidextract (dose, 10 to 45 minims) is the only preparation. The drug is considered a nervine, and is antispasmodic, astringent, diuretic,

Spirillum of Vincent and the Fusiform Bacillus; Other Organisms are also Present.—(*Rosenberger and Coplin.*)

and tonic; it is especially useful in preventing abortion, in the nervous diseases of pregnancy, and in spasmodic dysmenorrhea. It may be administered with cannabis indica, with morphin and other nerve sedatives, and with aromatics. Nausea and vomiting are often excited by it. There is no exact observation concerning its physiologic action.

Liquor sedans is a utero-ovarian sedative and anodyne. Each fluidounce contains of black haw and golden-seal, each 60 grains; Jamaica dogwood, 30 grains; aromatics, a sufficient quantity.

VINCENT'S ANGINA.—A form of sore throat due to two organisms, the *fusiform bacillus* and the *spirochæta darticola*. It occurs chiefly in children and young adults; the eruption of the wisdom teeth is said to be a predisposing factor. Bad hygiene, and the use of alcohol and tobacco are favoring conditions.

Symptoms.—Two forms are recognized: (1) The *ulceromembranous* variety, which is the most common (occurring in about 98 percent of the cases) and in which both the bacillus and spirochete (or spirillum) are found. In this form there are malaise, sore throat, headache, fever, dysphagia, and fetid breath; later ulceration of one or both tonsils occurs. (2) The *diphtheroid* variety, which occurs in about 2 percent of cases only. This form is due to the fusiform bacillus alone, and is characterized by a distinct false membrane or an inflamed base. Otherwise the symptoms are the same as those found in the ulceromembranous variety.

Diagnosis.—A smear and culture will decide whether the case is one of diphtheria or not.

Treatment.—An antiseptic mouth wash, and the application of tincture of iodin twice a day are indicated. The disease is not amenable to antitoxin. On account of the presence of a spirillum, salvarsan has been tried and (it is claimed) with satisfactory results.

VINEGAR (Acetum).—An impure, dilute acetic acid produced by acetous fermentation of wine, cider, or other fruit-juice. In pharmacy a solution of the active principles of certain drugs in dilute acetic acid. There are two official vinegars: **Acetum Opii** (vinegar of opium) (black drop); containing opium, 10 percent; nutmeg, 3 percent; sugar, 20 percent. It is used as a sedative. Dose, 2 to 15 minims. **Acetum Scillæ** (vinegar of squill), containing 10 percent squill. It is used as an expectorant. Dose, 15 to 45 minims. See ACETIC ACID.

VINUM (Wine).—The fermented juice of fruits, especially that of grapes. White wines are made from the pulp; red wines from the pulp and skins, the latter yielding the coloring-matter.

When medicated, wines (vina) are practically the same as tinctures. The menstruum directed to be used is the official white wine (vinum album), which should contain from 7 to 12 percent by weight of absolute alcohol. It is, however, reinforced by the addition of alcohol to the amount of 5 to 17 1/2 percent in all the medicated wines. In the two ferric wines the alcoholic reinforcement is in the shape of the tincture of sweet orange peel. The wine of coca is made with red wine. The official wines are 10 in number, 2 of which are not medicated, namely white wine and red wine.

Vinum Album (White Wine).—An alcoholic liquid, made by fermenting the juice of fresh grapes, the fruit of *Vitus vinifera* freed from seeds, stems, and skins, and subjected to the usual cellar-treatment for fining and aging. A pale, amber-colored or straw-colored liquid, having a pleasant odor free from yeastiness, and a fruity, agreeable, slightly spirituous taste, without excessive sweetness or acidity.

Vinum Rubrum (Red Wine).—An alcoholic liquid, made by fermenting the juice of fresh, red-colored grapes, the fruit of *Vitus vinifera*, in presence of their skins, and subjected to the usual cellar-treatment for fining and aging. A deep red liquid, having a pleasant odor free from yeastiness, and a fruity, moderately astringent, pleasant and slightly acidulous taste, without excessive sweetness or acidity.

There are eight medicated wines official in the U. S. P., as follows:

TITLE.	ACTIVE CONSTITUENTS.	PROPERTIES AND DOSE.
VINUM:		
Antimonii.....	Tartar-emetic, 0.4 percent.	Expectorant (15 minims).
Cocæ.....	Coca, 6.5 percent.	Stimulant (4 drams).
Colchici seminis..	Colchicum seed, 10 percent.	Diuretic (30 minims).
Ergotæ.....	Ergot, 20 percent.	Emmenagogue, parturient (2 drams).
Ferri.....	Cit. iron and ammon., 4 percent.	Tonic, (4 drams).
Ferri amarum....	Cit. iron and quinin, 5 percent.	Tonic (2 drams).
Ipecacuanhæ....	Fldext. ipecac, 10 percent.	Expectorant (15 minims).
Opii.....	Granulated opium, 10 percent.	Sedative (8 minims).

See WINE.

VIOFORM.—Iodochloroxyquinolin. Nioform. Antiseptic and hemostatic in action, it is recommended as an ideal substitute for iodoform.

VIRUS, VACCINE.—See VACCINATION.

VISCEROPTOSIS. (Glénard's Disease, Enteroptosis, Gastroptosis, Splanchnoptosis).—By reason of relaxation of the ligaments, the organs in the abdomen are found below their normal position. Loss of elasticity of the abdominal muscles is a predisposing cause. This may result from gastro-intestinal autointoxication, from repeated pregnancies, from pressure of clothing, from hemorrhages. In some cases only one organ may be displaced.

Symptoms.—Nervous dyspepsia, anorexia, constipation or diarrhea may be found, although some cases present no symptoms. There may be abdominal distention, eructations, pains after eating, nervous symptoms such as headache, vertigo, insomnia, emaciation, or chlorosis is frequently found.

Treatment.—If symptoms exist, they may be relieved by a wide bandage or other appliances (such as pads, springs, trusses, or corsets). Lavage is useful in gastroptosis. For permanent relief operation is necessary.

VISION, DEFECTS.—See AMBLYOPIA, BLINDNESS, FIELD OF VISION.

VISION, TESTS. Test-cards.—It has been discovered that the smallest retinal image that can be perceived at the macula corresponds to a visual angle of 1′. The visual angle is the angle included

between two lines drawn from two opposite edges of the object through the nodal point. Following this principle, test-types have been constructed in such a manner that every letter is so made that when at its proper distance it subtends an angle of 5′. It is well to have two series of letters, to avoid doubtful results from the patient learning the positions of the letters on a single card.

The mode of procedure in determining the acuity of distant vision with test-types is as follows: The patient is placed with his back to the light in front of the test-cards, which should be hung at a distance of 5 or 6 meters, and should be well illuminated by artificial light from a reflector, about 2 feet away and to one side. The eye not under examination is then covered, and the patient is asked to read the lowest line possible. If, seated at 6 meters' distance, he reads the line marked 6 meters, his visual acuity is expressed by the fraction 6/6; if he reads the line marked 4 meters, he has remarkable acuteness of vision, and we express it by the fraction 6/4; if he is amblyopic, or ametropic he will not be able to read the 6-meter letters, and may possibly read only the line marked 15 meters, when his visual acuity is expressed by the fraction 6/15. Some surgeons prefer to use feet instead of meters in their estimations, and to seat their patients at about 20 feet from the card, expressing the visual acuity by using 20 for the numerator and the foot-number of the card seen as the denominator. It sometimes happens that the patient is not able to read any letter on the card at 6 meters' distance. In such a case he should gradually approach the card or the card should be brought toward him, until the top letter is distinguished. This distance is noted, and serves as the numerator in the fraction of visual acuity.

With illiterates it is best to use a regular illiterate card, consisting of lines shaped like the plain capital letter **E**. The patient is asked to tell which way the prongs of the **E** point—upward, downward, to the right, or to the left. More difficult are the Burchardt dots for counting. These cards are constructed on the Snellen principle. For foreigners special cards have been constructed. The German and Hebrew letters are often of value in hospital work.

Testing Near Vision.—The test-cards usually employed to estimate the accommodation are after the model of Jaeger, and are merely printers' types of various sizes. These cards have the advantage of closely resembling the work ordinarily done by the eye in reading, but have the disadvantage that they are not arranged on any scientific plan. It is possibly better to use cards in which each word is composed of several letters constructed in strict conformity with the Snellen basis of letter-formation.

The mode of procedure with the near type is to find the furthest and nearest point at which the smallest recognizable type is readable. In presbyopes it is necessary to use a convex lens of a strength varying with the age of the patient. Each eye should be examined separately. See also Blindness (Tests).

VITILIGO (Leukoderma).—An acquired pigmentary affection, characterized by variously sized and shaped whitish patches with hyperpigmented borders.

Symptoms.—The condition manifests itself as rounded, oval or irregular, milk-white or pinkish-white spots, which tend to spread slowly or rapidly, at times coalescing and producing large patches. These are smooth, soft, sharply defined, and neither elevated nor depressed. The surrounding skin shows increased pigmentation, being usually brownish-yellow in color. The hairs upon the affected areas may or may not turn white. The disease progresses slowly, becoming conspicuous only after a duration of years. In rare cases the affection may involve the greater part or, indeed, the whole of the body. Vitiligo lasts throughout life. The eruption may occur upon any portion of the cutaneous surface, although it is prone to elect the backs of the hands and the trunk. There are no subjective symptoms. Disfigurement is the sole inconvenience. The affection is frequent in negroes, in whom it produces a most striking appearance.

Etiology.—Vitiligo occurs in adult life. In many cases there is no ascertainable cause. It is due, in all probability, to a disturbance of innervation. It is occasionally associated with morphea, alopecia areata, and exophthalmic goiter.

Pathology.—The skin is normal, with the exception of an unequal distribution of coloring-matter. In the white spots there is total absence of pigment whereas in the darkened borders the pigment is abnormally increased.

Diagnosis.—Vitiligo is to be distinguished from chloasma, tinea versicolor, morphea, and leprosy.

In both chloasma and tinea versicolor the patches are brown, whereas in vitiligo they are white. Furthermore, tinea versicolor is scaly, and the fungus is found in the scales. Morphea shows structural alteration of the skin, and the patches in leprosy are anesthetic.

Prognosis.—In rare cases spontaneous recovery has been observed, but the affection may be said to be practically incurable.

Treatment is highly unsatisfactory. Duhring advises the long-continued administration of arsenic. Locally, lotions of corrosive sublimate or acetic acid, as recommended in chloasma, may be applied to the pigmented borders, with a view to dissipating the color and lessening the contrast.

VITREOUS, DISEASES.—The corpus vitreum forms the principal part of the globe of the eye. It consists of 98.6 percent of water. The remainder is composed of transparent fibers extending in all directions. Between these fibers are the compartments in which the nearly pure water, or vitreous humor, is contained. The vitreous is pierced in an irregular sagittal direction by the central canal, about 2 mm. in diameter. In the embryonic state the hyaloid artery traverses this canal, and sometimes persists after birth. The vitreous is contained in a delicate membrane, called the hyaloid membrane.

Hyalitis, or inflammation of the vitreous, is not an independent disease, but is generally associated

with inflammation of the uveal tract, particularly of the ciliary body, which causes disturbances of nutrition. It is characterized by change in consistency and by partial disorganization. Opacities, in the form of threads, clouds, or separate flocculi, are seen and cause subjective visual disturbance; and, provided the medium is sufficiently clear, are detected by the ophthalmoscope.

The treatment is constitutional, and under all circumstances should be directed to the cause. It consists chiefly of mercurials and iodids and of leeches to the temple.

VITRIOL.—See SULPHURIC ACID.

VOICE IN DIAGNOSIS.—The voice is the sound produced by the vibration of the vocal bands, modified by the resonance organs. It is of great value in diagnosis.

The Voice in Health.—If the ear is applied over the larynx or trachea of a healthy person, and he is directed to count "twenty-one, twenty-two, twenty-three," in a uniform tone and with moderate force, there is perceived a strong resonance with a sensation of concussion or shock, and a sense of vibration, thrill, or fremitus, the voice seeming to be concentrated and near the ear. Often the articulated words are distinctly transmitted (laryngophony). The sounds thus heard are termed **the normal laryngeal resonance.**

If the ear or stethoscope is applied over the third rib anteriorly on either side of the chest of a healthy person, and he is directed to count "twenty one, twenty-two, twenty-three," in a uniform tone, with moderate force, a confused distant hum is perceived, of variable intensity, accompanied by more or less vibration, thrill, or fremitus, most distinct in adults, but notably weaker in women than in men. This sound is termed the **normal vocal resonance.**

If the ear or stethoscope is applied over the third rib anteriorly of a healthy person, and he is directed to whisper, in a uniform manner, the words "twenty-one, twenty-two, twenty-three," there is heard a sound corresponding closely in character to the sound of expiration over the same region during the act of forced respiration; or, in other words, a feeble, low-pitched, blowing sound. This sound is termed the **normal bronchial whisper,** and is produced by the air in the bronchial tubes during the act of respiration.

The Voice in Respiratory Diseases.—The normal vocal resonance, as heard over the third rib of the chest anteriorly on either side, may be altered in intensity:

1. *Diminished or absent.*
2. *Increased or exaggerated.*

Or its resonance may be of the character of:

3. *Bronchophony.*
4. *Pectoriloquy.*
5. *Egophony.*
6. *Amphoric voice.*

The vocal resonance may be diminished or feeble in bronchitis with free secretion, in pleurisy with effusion, or in complete consolidation of the lung structure and the bronchial tubes.

The vocal resonance is absent in pneumothorax and in pleurisy with effusion.

Exaggerated vocal resonance differs from the normal resonance in a slight increase of its density. It denotes a slight degree of solidification of lung tissue, and is chiefly of value in the diagnosis of tubercle.

Bronchophony, or the voice concentrated near the ear, raised in pitch and in intensity, denotes complete consolidation of the pulmonary tissue in those parts in which the sound is abnormally present.

Pectoriloquy is complete transmission of the voice to the ear, the articulated words being distinctly recognized. It has a close resemblance to the resonance heard over the larynx in health. Its presence indicates either a pulmonary cavity or more complete consolidation—in other words, an exaggerated bronchophony.

Egophony is a modification of bronchophony, consisting in tremulousness of the voice, its character being nasal or bleating, somewhat suggestive of the cry of a goat. When heard, it may be considered a sign of pleurisy with slight effusion or of pleuropneumonia.

Amphoric voice, or "the echo," as it is sometimes called, is a musical sound, of a somewhat hollow, metallic character, like that produced by blowing into an empty bottle. It is sometimes produced in large cavities within the lung, but is especially incident to pneumothorax.

Increased bronchial whisper is a sound in which the whispered words are abnormally intense and are higher in pitch than in the normal bronchial whisper. It has the same significance as exaggerated vocal resonance. See CHEST (Examination).

The Voice in Other Morbid Conditions.—There are many other changes of the voice that may occur in different conditions, and that may be of value as indicating morbid states. There are differences in the cry of infants—the normal cry, indicating hunger; the cry of irritability or pain (see INFANTILE SYMPTOMS); the changes with respiratory disorders. Skene notices the morbid state of the voice, indicating circulatory disturbances, cases of heart disorder, and Bright's disease, including hyperemia of the vocal cords, lowering and modifying the tone and quality. Anemia raises the pitch of the voice, and a concealed hemorrhage may be detected by one whose attention has been called to this point. He refers to the importance of noticing the condition of the voice as indicating the nervous state before performing major operations, and also to its testimony as showing the amount of shock after an operation. The voice is also of value as indicating the reaction from this condition, and sometimes is the first and only symptom. The voice as an indication of apathetic conditions is also of importance, and frequently is of very valuable prognostic significance. There is a liability to take this apathetic tone as an indication of contentment, a wrong diagnosis resulting. Skene speaks of the expression of the voice after abdominal operations, and of the peculiar voices of the insane. The last, however, he does not venture

to remark on extensively. He says that it is necessary, in order thoroughly to utilize this feature in diagnosis, to have had considerable experience, and to possess a normal sense of hearing and ready appreciation of the varieties of quantity and characteristics of sound; but especial refinement of the sense is not necessary.

VOICE, LOSS.—See APHONIA, DYSPHONIA, LARYNGITIS.

VOLVULUS.—See INTESTINAL OBSTRUCTION.

VOMITING.—Vomiting is produced: (1) By local causes, such as irritation of the stomach from disease of the organ (cancer, ulcer, dyspepsia, gastritis), or from the ingestion of certain varieties of food or drugs; (2) by reflex causes, such as cerebral diseases, disease of the spinal cord, heart-, lung-, or kidney-disease, abdominal tumors, pregnancy, intestinal obstruction, peritonitis, general nervousness, and constipation; (3) by infectious diseases, such as scarlet fever, typhoid fever, cholera, small-pox, yellow fever, malarial fever, and tuberculosis.

Character of Vomitus. Solid or Liquid Food.—Solid food may be ejected from the stomach immediately after it has been taken, as in certain varieties of dyspepsia, and after the ingestion of partly decomposed food.

Acid Vomiting.—This variety usually occurs in cases of dyspepsia with hyperacidity attended by constipation. The fluid is generally thin and highly acid, giving rise to pyrosis, or "water-brash." Excessive flatulence is usually present, attended by heartburn. In many cases the condition is relieved by correcting constipation. See FLATULENCE, CONSTIPATION, GASTRIC NEUROSES.

Mucous Vomiting.—In this variety the vomitus is, for the most part, composed of thick, glairy mucus; it occurs in acute and chronic gastritis.

Bilious Vomiting.—Bile may find its way into the stomach when reversed peristalsis occurs, as in obstruction of the bowels in the early stages, in impaction of a gall-stone, and in malarial fever or yellow fever.

Fecal vomiting occurs in the later stages of intestinal obstruction.

Bloody vomit (hematemesis) is seen in gastric cancer, in ulceration of the stomach, in yellow fever, and in some cases of cirrhosis of the liver.

Purulent vomit is due to rupture of an abscess into the stomach or esophagus.

Profuse Vomiting.—Profuse vomiting is generally due to gastric dilatation, as seen in cases of gluttony, prolonged debauch, and gastric cancer. In most instances it occurs a long time after eating. The material usually contains sarcinæ ventriculi if due to cancer, and sometimes if due to ulcer of the stomach.

Vomiting due to Cerebral Causes.—Vomiting due to intracr nial disease generally occurs soon after the food has been taken, and is usually unattended by premonitory feelings of nausea or discomfort. Gowers states that when this variety of vomiting is accompanied by persistent pain in the head, and when it occurs with increased frequency, it should always give rise to suspicion of cerebral disease. In such cases optic neuritis would point directly to intracranial disturbance.

Vomiting in Infectious Diseases.—Vomiting occurs during the onset of most of the infectious diseases, especially in children.

Treatment of Vomiting.—No well-defined rule can be laid down that would apply to all varieties of vomiting. Persistent effort must therefore be made to find the exciting cause of the act of vomiting, and it should be treated upon general principles. Cold applications and ice by the mouth will allay the irritability of the stomach. In cases of collapse heat may be used locally. Cocain may be administered in severe cases. The usual treatment of the vomiting of indigestion or debauch is the administration of calomel in small doses (1/10 grain every hour), followed by a purgative. Bismuth subnitrate, cerium oxalate and validol have been recommended. The immediate diet must be very scant and should be chiefly liquid. See EMETICS, ANTIEMETICS.

VOMITING OF PREGNANCY.—There is a physiologic, an exaggerated, and a pernicious vomiting in pregnancy. The first two forms are of minor importance; the last is a serious affection, requiring active treatment. See PREGNANCY (Pernicious Vomiting).

VULVA, DISEASES.—**Inflammation** of the vulva, or vulvitis, is usually the result of gonorrhea. It may be due to irritating discharges from other conditions, such as cancer of the cervix, corporeal endometritis, or a vesicovaginal fistula. In children it is seen not infrequently as the result of uncleanliness.

The symptoms are pain and burning of the vulva with more or less discharge. The parts are inflamed and somewhat edematous.

Treatment consists in rest in bed and in frequent cleansing of the vulva with boric acid solution (1 dram to 1 pint). As the acute symptoms subside the inflamed areas may be painted with a 2 percent solution of nitrate of silver. This should be repeated daily until all evidence of the disease has subsided.

Should the inflammation become localized in the mucous or sebaceous glands of the vulva, the affected glands should be punctured and cauterized with pure carbolic acid.

Hematoma of the vulva is usually a complication of labor, and is the result of subcutaneous rupture of a vein. It generally occurs as the result of other forms of traumatism.

Treatment consists in thorough cleanliness of the parts and in slight compression of the tumor, which will cause its rapid absorption. Should infection occur, the tumor should be incised and the blood-clot turned out, and the cavity should be irrigated and packed with gauze.

Papilloma of the vulva is usually the result of venereal disease. It is sometimes caused by uncleanliness, and may exist as a complication of pregnancy. Papillomata occur usually in two forms—as small, isolated, warty growths, or as distinct cauliflower-like tumors.

The treatment is excision. The small warts may be snipped off with scissors, after which their

bases should be cauterized. The larger growths should be excised and the wounds should be closed with interrupted sutures.

Pruritus.—Itching of the vulva may be due to a variety of causes. It not infrequently occurs as the result of irritating discharges, or it may be due to tubal or ovarian disease or to uncleanliness. Diabetic urine may cause this disease, or it may exist without any ascertainable cause, when it is called idiopathic pruritus. The intense itching of the vulva causes scratching and rubbing, which are finally followed by irritation, inflammation, and discharge.

Treatment consists in relieving the cause. If it is due to discharge from the uterus, measures should be taken to prevent this. A vaginal tampon should be worn and perfect cleanliness should be practised. Diabetic urine should be prevented from coming in contact with the vulva, and the patient should exercise care in thoroughly drying herself after urination. Local applications will sometimes be of value. One of the best is:

℞. Tincture of opium,
Tincture of iodin,
Tincture of aconite, } each, ʒ v
Carbolic acid, ʒj.

This may be applied to the parts 2 or 3 times daily.

The following ointment may be employed:

℞. Menthol, ʒ j
Lanolin, ʒ ij.

In some cases cauterization with pure carbolic acid may give relief.

W

WAHOO.—See Euonymus.

WALCHER'S POSITION.—See Gynecologic Examination (Table of Postures and Positions).

WARBURG'S TINCTURE.—See Quinin.

WAR SURGERY.—The great war has brought about many modifications in surgical practice and has given rise to much literature. A clearing house for both the "modifications" and the "literature" is much to be desired, but at present it seems far away. The first step in the treatment of wounds is to check the hemorrhage, combat the shock, alleviate pain, apply a simple antiseptic such as tincture of iodin, and then add a gauze dressing and bandage. The patients must be put in such a condition that they may be forwarded with as little harm and suffering as possible. A tourniquet should not be applied if there is a likelihood of its having to remain on for a long time. On arrival at the main dressing station, the first dressing is removed, the wound cleaned, thoroughly dressed and (when necessary) immobilization provided for. Successful treatment depends on the early removal of septic matter, and the bearing in mind that the "keynote of military surgery is time." It is a continual endeavor to obtain treatment of the wound within the precious first 24 hours. If the surgery in the Casualty Clearing Station is well carried out, the method of antiseptic treatment employed is of minor importance. It is desirable to adopt a method which will not interfere with subsequent methods at the base, and which will not require attention during transport. During transport, water, food, blankets and morphine are among the main requirements; and there should always be some one at hand who is competent to pack a bleeding wound. Numerous antiseptics have been recommended, and, later on, modified or discarded in favor of something newer. The *Carrel-Dakin Method* will be found described under that heading. Infected wounds are treated (wherever possible) by excision. With regard to the choice of method of wound treatment, the following summary is given by Hull (*Surgery in War*): "Amidst the bewildering mass of methods and treatments which have been advocated and used, one surgical principle alone stands impregnable, and that is the surgical removal of the septic tissues. Provided the surgical treatment is correctly carried out at the proper time, it is immaterial what particular treatment is adopted. . . . It is very difficult to compare various treatments, methods, and antiseptics in connection with gunshot wounds. There will always be a certain number of bad results, whatever treatment is adopted, and there will always be a still larger number of good results. So many factors are operative in the production of results that fallacies in judgment are almost inevitable. . . . The bismuth-iodoform-paraffin and particularly other antiseptic pastes composed of flavine, brilliant green, chloramine-T, and other similar antiseptics, appear to deserve a place in military surgery. The simplicity of the treatment, the facilities which such measures offer during transport, and the absence of frequent dressing give the paste treatment a certain preference, but it postulates the wounds are fit for closure. In spite of the scientific excellence of the Carrel-Dakin treatment, it is unsuited for transport except under elaborate special organization. Special Carrel-Dakin trains, with adequate fixed apparatus and specially trained and supervised staffs, would be necessary. Otherwise the setback which these cases will experience during evacuation will entirely negative the excellence of the results. These remarks apply equally to any form of irrigation treatment and, to a lesser degree, to all forms of treatment which entail dressing during transport. During the early stages of treatment in casualty clearing stations we are limited to a choice of a few methods, all of which offer great advantages from the point of view of transport—antiseptic pastes, salt sac drains, and flavine dressings. Provided the wounds are receiving treatment within the first twenty-four hours, and they are not of an extensive nature involving comminution of bone, Hull recommends a paste treatment and delayed primary suture. If the wounds are extensive and heavily infected, and cancellous tissue is involved, with extreme comminution of bone, the use of B. I. P. or any paste is contraindicated. If wounds cannot be completely excised, removing all infected tissue, paste treatment of any kind is negatived, and even more strongly so if foreign bodies cannot be removed. The expectation of gas gangrene or severe infection, owing to the nature of the fighting, will again make the use of any antiseptic paste treatment dangerous and unsuitable. In the case of wounds for which direct closure or paste treatment is unsuitable, Hull recommends dressing the wound with salt sac drains, soaked with flavine or other non-irritating reagent, inhibiting the growth of micro-organisms, before transport. The advantage of this method is that it does not interfere with subsequent treatment. The wound may be sutured when the patient arrives at the base, or treated by Carrel's instillation method if sepsis has occurred. The treatment of wounds at the base resolves itself into the treatment of lightly infected wounds with saline solution or flavine solution 1:3000 in 3 per-cent salt solution until the wounds are ready for suture. Moderately infected wounds should be treated with gauze soaked in flavine or some non-irritating antiseptic, and the more heavily infected wounds by the application of the Carrel technic. Acutely suppurating heavily infected wounds are little influenced by any antiseptic. Free drainage and the preventing of pocketing and loculation are

of the utmost importance. Counter-incisions are desirable. The removal of the tryptic pus and the determination of a large blood supply and its attendant exudation of serum are the factors to be obtained. Heat in the form of fomentations is still the best method of obtaining a rich supply of blood fluids; the addition of a hypertonic solution of salt is an advantage, and salt sac drains. Hot fomentations of salt solution with suitable surgical treatment forms one of the most satisfactory treatments for this type of wound. In some cases marine or rubber sponges may be packed in a wound to rapidly remove by capillary attraction the tryptic pus and to supply the necessary heat. These sponges require changing hourly, and the conservation of heat by an electric heating apparatus."

Gas Gangrene.—This is an acute infection caused by the *Bacillus perfringens* in the presence of necrotic tissue. It is believed to be carried into the wound by the missile and the clothing. "Once the wound is infected, the occurrence of gangrene is favored by several conditions: (1) delay in cleansing the wound and removing the cloth and foreign body; (2) excessive damage to the tissues and the presence of necrosed tissue and blood clot; (3) extensive comminution of bone; (4) interference with the blood supply; (5) the presence of sepsis; (6) unsuitable treatment, *e.g.*, the injudicious use of B. I. P. and antiseptic pastes in infected wounds without efficient surgical treatment" (Hull).

The condition is to be *prevented* by early excision of the wound, removal of all foreign material, and thorough cleansing and drainage. Tourniquets, tight bandages, and strong antiseptics must be avoided.

Treatment consists, at first, in wide excision of the wound, and dressing with saline or Dakin's solution; transportation is harmful, and if the condition spreads amputation may be necessary. If the condition spreads, and localized gangrene extends to the muscles, resection of the muscles or amputation of the limb will be imperative. The following *indications* are given by Hull (*Surgery of War*): "*Indications for resection:* (1) When gas gangrene has not gone beyond the stage of anerobic infection, the infection is limited to superficial and necrotic tissue. A simple wide excision of the wound is indicated. (2) When the skin is tense and distended, and the blanching is giving place to a gray cream color, gangrene is established. If at this stage upon exploration the gangrene is found to be limited to a single muscle, resect. (3) If crepitation be limited to an area of a few inches and the color has not progressed beyond the dirty gray stage, and the gangrene be found to be limited to a group of muscles, resect. (4) When amputation is impossible on account of the clinical condition of the patient, resection may be performed irrespective of the future usefulness of the limb. *Indications for amputation:* (1) When purple areas or blebs in the skin have already appeared; (2) when crepitation is extensive, evidencing extensive infection of underlying muscle; (3) when complicating a compound fracture; (4) when important vessels and nerves are injured; (5) when a joint is involved; (6) when resection of the infected area would result in a useless limb; (7) when the distal pulse in the limb cannot be felt."

Trench Feet.—This condition is due to cold, damp, fatigue, interference with the circulation in the limbs, and inactivity. Cold alone is probably not the cause; one or more of the other factors must be present. Humidity and the wearing of tight leg gear are potent predisposing agents. In the mild stages of the condition the foot is white, swollen, numb, and painful; red or purple blotches appear, and the patient may experience pain or anesthesia in the foot; the skin of the foot is not ulcerated. In the next stage the foot shows blisters, ulcers, and gangrenous patches, but only the superficial tissues are affected. Later on the deeper structures are involved, and gangrene of the toes or whole foot results.

Prevention of the condition depends on a removal of the predisposing causes. Particular attention should be given to the avoidance of constriction by tight boots and puttees. Massage of the feet, dryness, cleanliness, and warmth are all beneficial.

Treatment consists in massage of the feet with warm oil, and in the use of the "paraffin bath." "Commercial paraffin with a melting point of about 45° C. is heated and placed in metal foot-baths. The feet are placed in the paraffin, heated to about 60° C., for half an hour daily. At the conclusion of the paraffin bath the feet are painted over with hot liquefied paraffin and a layer of wool applied." This hastens recovery and relieves the pain.

The literature of *War Surgery* is very extensive, and readers in search of more information are advised to consult Hull's "*Surgery in War*," from which much of the above has been derived. See Wounds, Carrel-Dakin Method.

WARTS (Verrucæ).—Pinhead-sized to bean-sized circumscribed elevations of the skin due to epidermal and papillary hypertrophy.

Symptoms.—Various forms of warts are distinguished:

Verruca Vulgaris.—This is the common wart seen upon the hands. It is a pea-sized, rounded, rough or smooth, broad-based elevation, yellow or brownish in color. It may occur singly or in numbers.

Verruca Plana.—This is distinguished from the ordinary wart by being flat and broad. Flat warts are pea-sized or fingernail-sized, but slightly elevated, and of a brownish or blackish color. They occur in numbers, usually upon the backs of elderly individuals (**verruca senilis**). Occasionally, numerous small flat warts occur upon the face.

Verruca Filiformis.—These warts are slender, thread-like outgrowths, about 1/8 of an inch in length, occurring chiefly upon the face, eyelids, and neck.

Verruca Digitata.—These are slightly elevated pea-sized to fingernail-sized excrescences, with numerous digitations branching out from the base. The scalp is the most common site.

Verruca Acuminata (Pointed Condyloma, Venereal Warts).—These are pinkish or reddish, sessile or pedunculated, pointed vegetations occurring about the mucocutaneous surfaces (penis, labia, anus, mouth, etc.) of young individuals. Occurring upon the genitals, they are bathed in an offensive puriform secretion. These warts grow rapidly, not infrequently attaining the size of an egg. They bear at times a strong resemblance to a raspberry, to cauliflower, or to a cockscomb.

Etiology.—It is probable that at least some forms of warts are due to microorganisms, and that they are autoinoculable and contagious. Venereal warts are caused by contact with irritating secretions containing, in all probability, the causal microorganisms.

Pathology.—Warts consist of a hyperplasia of the papillæ of the corium and the overlying layers of the epidermis. A vascular loop is found in the center of each wart. In the acuminate variety the connective tissue and vascular hypertrophy is marked, while the horny layer is but slightly hyperplastic.

Treatment.—Warts may be removed by caustics, excision, erasion, or electrolysis. The best caustics to be employed are nitric acid, caustic potash, chromic acid, or glacial acetic acid. These should be cautiously applied from time to time until the disappearance of the wart. An excellent method is to scrape away the wart with a curette and to apply the stick of nitrate of silver to the base.

Salicylic acid in collodion or alcohol is often successful in causing the disappearance of warts.

℞. Salicylic acid, ʒ j
Alcohol, ʒ j.
Apply 2 or 3 times a day.

Or—

℞. Salicylic acid, ʒ j
Collodion, ʒ j.
Apply twice a day.

The use of a 1:500 corrosive sublimate solution is sometimes efficacious, as is also an alcoholic solution of resorcin, 30 grains to the ounce.

Filiform or digitate warts may be snipped off with curved scissors, the base being subsequently cauterized. Venereal warts may be washed with solutions of alum, tannin, or chlorinated soda, and then dusted with calomel, or they may be cauterized with nitric, carbolic, or chromic acid. Cleanliness should be strictly enjoined.

It has been claimed recently that chrysarobin is a specific for warts. The surface of the warts is carefully thinned with a sharp, fine glass-paper which gives better results than paring with a knife, as the patient is less afraid of injuring himself and can more conveniently handle the paper. Chrysarobin may be applied either in a 10 percent solution of the ordinary gutta-percha solution or in a 10 percent ether solution. It is best to apply the chrysarobin at night, and to advise the patient to put on an old stocking, to prevent soiling the bedclothing. Application once a day in this way seems ordinarily to be sufficient, but in obstinate cases it should be applied both night and morning.

The influence of chrysarobin is not only upon the keratinized portion of the skin, but also upon the proliferated blood-vessels in the papillary central part, for both disappear and true skin is formed over the surface.

WASSERMANN REACTION.—See Syphilis.

WATER (Aqua). H_2O.—Natural water in its purest attainable state is a colorless, limpid liquid, devoid of odor or taste, and neutral in reaction. Besides entering into the composition of most of the official extracts, fluidextracts, and many other pharmaceutic preparations, from it are prepared the official waters Aquæ (see Aqua), and also the following: **Aqua Destillata** (distilled water), H_2O: 1000 parts of water are distilled, the first 100 parts obtained being thrown away and 800 parts preserved. It is as near chemically pure water as can be obtained.

Uses of Water in the Human Body.—Water constitutes between 60 and 66 percent of the human body. Its uses have been well summarized by W. G. Thompson as follows: "(1) It enters into the chemical composition of the tissues. (2) It forms the chief ingredient of all the fluids of the body and maintains their proper degree of dilution. (3) By moistening various surfaces of the body, such as the mucous and the serous membranes, it prevents friction and the uncomfortable symptoms which might result from their drying. (4) It furnishes in the blood and lymph a fluid medium by which food may be taken to remote parts of the body and the waste matter removed, thus promoting rapid tissue changes. (5) It serves as a distributor of body heat. (6) It regulates the body temperature by the physical processes of absorption and evaporation."

Nomenclature of Water.—See Aqua.

Therapeutics.—Cold water or ice has many external applications of value in the treatment of disease. As a wet pack it is used in tonsillitis, diphtheria, and croup. Cold baths are the most effective antipyretic in the high temperature of fevers, and the cold wet pack is used for the same purpose. Ice or cold water is applied to the head in acute cerebral congestion, and to the spine in chorea, etc.; also locally in hemorrhoids, bubo, orchitis, and to the uterus in postpartum hemorrhage. Cold effusion to the body is employed as a preventive of spasmodic croup, as well as to lessen the tendency to taking cold. See Bath.

Hot water externally—as fomentations, hot wet pack, hot baths, etc.—is most effective in reducing local congestion and in setting up resolution of local inflammation. Hot fomentations to the renal region are useful in functional inactivity of the kidneys. The hot spinal douche is used in affections of the spinal cord and meninges, and in the backache of women. The hot wet pack is highly esteemed in inflammation of the chest organs, and hot injections are useful in chronic inflammation of the uterus. Hot-water dressings

for wounds are strongly favored by many surgeons. Vapor and Turkish baths are used as diaphoretics in advanced kidney-disease, in acute and chronic rheumatism, in mineral poisoning, and in syphilis. Warm baths, with cold applications to the head, are of value in infantile convulsions and chorea. See BATH.

Internally, water is chiefly of value as a diuretic, and, if hot, as a diaphoretic. A glass of cold water before breakfast daily is often an effective means of overcoming constipation, while the drinking of hot water an hour before each meal has been of great benefit to many dyspeptics. The value of the popular teas in chronic diseases is almost entirely due to the diluent, diuretic, and diaphoretic actions of the hot water used.

In moderate quantity water is necessary to digestion, but large amounts weaken digestion by diluting the gastric juice. Ice-cold water, if freely used, suspends the action of pepsin and depresses the nerves of the stomach and lowers its blood supply. In some subjects the free use of water internally favors the deposition of fat.

WATER, EXAMINATION.—A potable water is one that is *apparently fit* to drink.

An unpotable water is one that is *obviously unfit* to drink.

Characteristics of a good drinking water are: (1) It should be clear and limpid. Cloudy and muddy waters should be avoided. (2) It should be colorless. A greenish or yellowish color is usually due to vegetable or animal matter in solution or to organisms. (3) It should be odorless; especially free from sulphuretted hydrogen or putrefactive animal matter. (4) It should not be too cold, but should have a temperature of from 46° F. to 60° F. (5) It should have an agreeable taste; neither flat, salty, nor sweetish. A certain amount of hardness and dissolved gases gives a sparkling taste. It should contain from 25 to 50 c.c. of gases per liter, of which 8 to 10 percent is carbon dioxid and the rest oxygen and nitrogen. (6) It should be as free as possible from dissolved organic matter, especially of animal origin. (7) It should not contain too great an amount of hardness. A certain quantity of saline matter is necessary, however, to give it a good taste. It should not contain over three or four parts of chlorin in 100,000 parts of water (Bartley).

Diseases Which may be Transmitted by Drinking Water.—Typhoid, cholera, dysentery, diarrhea, indigestion, goiter, vesical calculi, intestinal worms, lead poisoning.

At the present day the subject of drinking-water involves the interest, attention, and welfare of every civilized community. The question of health largely depends upon the water consumed, in which may reside the microorganisms of disease and death. In chemic examination the determination of chlorids, of nitrites, and of free and albuminoid ammonia gives an index as to contamination, yet the proof is not absolute.

When, however, an attempt is made to isolate the causative factors in such diseases as typhoid fever, cholera, etc., insurmountable difficulties may present themselves, from the fact that a few microorganisms are scattered throughout a large volume of water, and that the portion of water selected for examination may yield negative results. This condition was instanced in Philadelphia during an epidemic of typhoid fever the origin of which was traced to a burst sewer-pipe that discharged its contents into the water-supply of a certain reservoir. The disease was wide-spread among those who consumed this water, whereas persons in other sections of the city remained comparatively free. A thorough bacteriologic examination of the water failed to show the presence of the typhoid bacillus.

Again, all varieties of potable water contain bacteria, most of which do not seem to be detrimental to health, while water which may contain a few pathogenic bacteria gives rise to epidemic diseases. It is important, therefore, to determine a "standard" in this respect. After the definite number of colonies have been found in a given quantity of water, a sudden fluctuation of this number may indicate contamination.

Qualitative Bacteriologic Analysis of Water.—By this is meant the isolation and study of different species of bacteria in drinking-water.

In collecting the sample extreme care should be exercised to avoid its contamination. If water is to be collected from a hydrant or spigot, it should be allowed to run for from 15 to 20 minutes; if from a spring or lake, it should be taken from about a foot beneath the surface. The specimen should be examined near the region where the sample is procured, and as soon as possible after its collection.

Abbott states that: "In the qualitative analysis it is necessary that a small portion of water—one, two, three, five drops—should first be employed, from which plates are to be made in order to determine the *approximate* number of organisms; also the amount of water necessary to use for each set of plates. Duplicate plates are always to be made—one set upon agar-agar, which should be kept in the incubator at the temperature of the body, and one set upon gelatin, to be kept at from 18° to 20° C." As soon as the colonies have developed, the plates are to be carefully studied and the results compared with subsequent inoculations into animals.

Quantitative Estimation of Bacteria in Water.—The results of the quantitative estimation of bacteria in water are expressed in terms of the number of individual organisms to a definite volume. The water should be examined in the spot where it is collected.

Collection of the Water.—For this purpose a glass bulb drawn out into a pointed extremity and sealed while hot should be used. The stem should be broken off under water, when, owing to negative pressure, the bulb fills with water.

The number of organisms in a fixed volume is approximately determined by the plate or tube method, at first selecting 1 or 2 drops, and finally 1 c.c. of water. If the original drop of water contained too many colonies to be counted, it should

be diluted with 10, 25, or 100 volumes of water, the results being expressed in terms of the number of bacteria to a cubic centimeter of water.

It is always essential to make duplicate plates.

Method of Counting the Colonies on Plates.—For this purpose the Wolffhügel's counting apparatus is used. When the colonies are quite small, an ordinary hand lens may be used. Esmarch also has devised an apparatus for counting the number of colonies of bacteria in water.

Chemic Analysis of Water.—In order to determine the fitness of a water for potable purposes both chemic and bacteriologic examinations are necessary. While the value of drinking-water may be judged by the chemic method alone, the evidence is not absolutely conclusive, because it is desired most frequently to determine whether or not there is pollution from sewage, and this information cannot always be derived from a chemic examination. Unfortunately, the bacteriologic examination does not always tell this, because it is hard to obtain a standard of water in which a certain number of colonies of bacteria can be allowed to a cubic centimeter; and also on account of the fact that the typhoid bacillus or other pathogenic organism is seldom found, because so few bacteria exist in comparatively large quantities of water, and thus erroneous results may be derived from the examination.

A method of analysis, though seemingly primitive, may and does frequently present such evidence as to prevent the use of contaminated water; this method may be called "examination by the senses," and, according to Blyth, "water that is evidently turbid, that possesses an odor and an unpleasant taste, requires no analytic processes to condemn it entirely; such water is unsuitable for drinking purposes."

Another simple water test is as follows: Into a stoppered, ground-glass, perfectly clean bottle put 5 ounces of the water to be tested. To the water add 10 grains of pure, granulated, white sugar. Cork tightly, and set in a window exposed freely to light, but not to the direct rays of the sun. Do not disturb the bottle, and keep the temperature as near 70° F. as possible. If the water contains organic matter, within 48 hours an abundance of whitish specks will be seen floating about; and the more organic matter, the more specks. In a week or 10 days, if the water is very bad, the odor of rancid butter will be noticed on removing the stopper. The little specks will settle to the bottom, where they appear as white, flocculent masses. Such water should not be used for potable purposes.

Drinking-water should be free from such elements as lead, copper, barium, zinc, manganese, chromium, and arsenic. After eliminating these elements, the chemic analysis of drinking-water resolves itself into the estimation of (1) the total amount of solids; (2) amount of chlorids; (3) amount of free and albuminoid ammonia; (4) amount of nitrates; (5) presence or absence of nitrites; (6) amount of hardness; (7) organic matter.

Percentage of Elements Allowed in Potable Water.

Total solids,	30	parts to	100,000
Chlorids (NaCl),	2 or 3	parts to	100,000 (suspicious).
Free and albuminoid ammonia,	0.15	parts to	1,000,000
Nitrates,	3 or 4	parts to	1,000,000
Nitrites,	none		
Hardness ($CaCO_3$),	20 grains	to	100,000
Organic matter,	——		

The total solids are determined by evaporating a given quantity of water and weighing the residue.

The chlorids are usually estimated as NaCl, and are determined by a standard solution (not a normal solution) of nitrate of silver. In this way the molecular weight of $AgNO_3$ is expressed in milligrams (170 being the molecular weight of $AgNO_3$ when dissolved in 1000 c.c.):

1000 c.c. equals 170.0 grams
100 c.c. equals 1.70 grams
1 c.c. equals 0.0170 grams. (170 milligrams)

Free and Albuminoid Ammonia.—For the estimation of free and albuminoid ammonia the most delicate apparatus must be used and exceedingly careful methods must be exercised. The requisites are (1) Nessler's solution; (2) solution of ammonium sulphate; (3) solution of sodium carbonate; (4) solution of potassium permanganate; (5) distilled water free from ammonia.

Nessler's solution is prepared by dissolving 50 grains of potassium iodid in a small quantity of hot water and adding, while the solution is hot, a strong aqueous solution of mercuric chlorid (40 grams to 300 c.c. of water) until the red precipitate just redissolves; filter, add to the filtrate a strong solution of 200 grams of patassium hydrate, filter, dilute to 1000 c.c., add 5 c.c. of a saturated solution of mercuric chlorid, allow the precipitate formed to settle, decant the clear fluid, and preserve it in a glass-stoppered vial.

To determine the amount of *free ammonia*, the water to be examined is placed in a retort with a small quantity of solution of sodium carbonate and distilled. The amount is determined by the Nessler solution, and a known quantity of ammonium sulphate is used as an indicator.

To determine the amount of *combined or albuminoid ammonia*, the distillate is freed from ammonia, potassium permanganate is added, and successive portions are tested until less than 0.01 milligram of NH_3 is obtained, deduct ammonia due to potassium permanganate and the result gives albuminoid (free) ammonia.

The nitrates are determined by evaporating 2 of 3 liters of water, adding caustic lime, heating, transferring to a Liebig condenser, and introducing a thin sheet of zinc plated with copper. The distillate is then evaporated with platinum tetrachlorid and the amount of nitrates is calculated from the spongy platinum in terms of nitric acid.

Nitrites.—The following method is sometimes used. It consists in placing the water to be

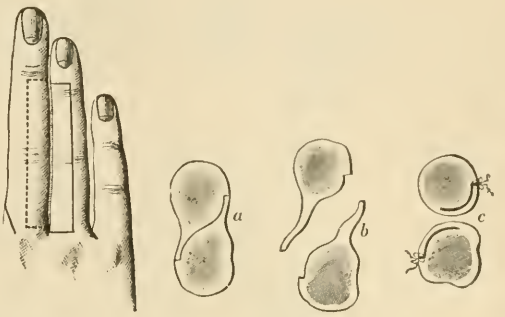
tested in a narrow glass cylinder and adding 1 c.c. of a solution of sulphuric acid (35 percent), and afterward a solution of metaphenylenediamin, with a solution of argentic nitrate of known strength as an indicator, similar comparisons are made with the metaphenylenediamin until the two colors are identical, when the amount of nitrites in the given sample can be calculated.

Hardness is mainly due to the bicarbonates of calcium and magnesium. To determine the hardness of water a solution of soap is made by dissolving 10 grams of soda soap in 1 liter of 90 percent alcohol; filter this and add 100 c.c. of the filtrate to 100 c.c. of distilled water and 33 c.c. of alcohol. Then prepare a solution of calcium chlorid by adding a small quantity of dilute hydrochloric acid to calcium carbonate, dissolving the residue in 1000 c.c. of water; dilute 10 c.c. of this with 100 c.c. of water, and add soda soap, shaking gently until a lather forms that remains unbroken for 5 minutes. From this as an indicator the amount of hardness is determined in a given sample of water.

Organic Matter.—Evaporate 250 c.c. of water to dryness in a platinum dish, first in a water-bath, then in an air-bath, and reweigh. Heat again to a low red heat until all the organic matter is destroyed, add water saturated with CO_2, evaporate, dry, and weigh. Repeat the process with CO_2. The difference between this weight and the first expresses the amount of organic and volatile matter. Organic matter of animal origin—such as sewage—during oxidation first changes into nitrous acid and nitrites, then into nitric acid and nitrates. The presence of nitrites is always a cause for suspicion. Any increased amount of nitrates should be carefully watched. The presence of nitrites, with an unduly large proportion of chlorid and of free and albuminoid ammonia, indicates the presence of sewage. In fresh sewage nitrites and nitrates may be diminished or absent.

WEANING.—See INFANT (Care), MILK (Mother's).

WEBBED FINGERS (Syndactylism).—This condition is treated by incising the web in such a way as to form a flap which is used to cover the raw surface between the roots of the fingers, or by raising two flaps of skin by an incision along the middle of the palmar surface of one finger, and another along the dorsal surface of the other finger; the flaps are then separated and wrapped around the fingers.



OPERATION FOR WEBBED FINGERS.—(*Stimson.*)

WEIGHTS AND MEASURES.

TROY WEIGHT

Grains.
24 = 1 dwt.
480 = 20 dwt. = 1 oz.
5760 = 240 dwt. = 12 oz. = 1 lb. = 22.816 cu. in. of distilled water at 62° F.

AVOIRDUPOIS WEIGHT

Drams.	*Ounces.*	
16 =	1 =	437.5 grains troy.
256 =	16 =	1 lb. = 1.2153 lb. troy.
6400 =	400 =	25 lb. = 1 quarter.
25,600 =	1,600 =	100 lb. = 4 quarters = 1 cwt.
512,000 =	32,000 =	2000 lb. = 80 quarters = 20 cwt. = 1 ton.

APOTHECARIES' WEIGHT

Grains.
20 = 1 scruple.
60 = 3 scruples = 1 dram.
480 = 24 scruples = 8 drams = 1 oz.
5760 = 288 scruples = 96 drams = 12 oz. = 1 lb.

APOTHECARIES' MEASURE

60 minims = 1 fluidram.
8 fluidrams = 1 fluidounce.
16 fluidounces = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon.

Forty-five drops of water, or a common tablespoonful, make about 1 fluidram; 2 tablespoonfuls, about 1 fluidounce, a wine glassful is about 1 1/2 fluidounces; and a teacupful, about 4 fluidounces.

Liquid or Wine Measure

Gills.
1 = 7.2187 cu. in.
4 = 1 pint 28.875 cu. in.
8 = 2 pints = 1 quart = 55.75 cu. in.
32 = 8 pints = 4 quarts = 1 gallon.
2016 = 504 pints = 252 quarts = 63 gallons = 1 hogshead.
4032 = 1008 pints = 504 quarts = 126 gallons = 2 hogshead = 1 pipe.
8064 = 2016 pints = 1008 quarts = 252 gallons = 4 hogsheads = 2 pipes = 1 tun.

Long Measure

Inches.								
12	= 1	foot.						
36	= 3	feet	= 1	yard.				
72	= 6	feet	= 2	yards	= 1	fathom.		
198	= 16.5	feet	= 5.5	yards	= 2.75	fathoms	= 1	perch.
7920	= 660	feet	= 220	yards	= 110	fathoms	= 40	perches = 1 furlong.
63,360	= 5280	feet	= 1760	yards	= 880	fathoms	= 320	perches = 8 furlongs = 1 mile.

Square Measure

Sq. Inches.	*Sq. Feet.*						
144	= 1						
1296	= 9	= 1	sq. yard.				
39,204	= 272.25	= 30.25	sq. yards	= 1	perch.		
1,568,160	= 10,890	= 1210	sq. yards	= 40	perches	= 1	rood.
6,272,640	= 43,560	= 4840	sq. yards	= 160	perches	= 4	roods = 1 acre.

An acre is 69.5701 square yards; or, 208.710321 square feet.

A township is 6 miles square = 36 sections.
A section is 1 mile square = 640 acres.
½ section is ½ mile square = 160 acres.
1/16 section is ¼ mile square = 40 acres.

The standard United States bushel is the Winchester bushel (cylinder form, 18½ in. diameter, and 8 in. deep). = 2150.42 cubic inches.

The English Imperial bushel = 2218.192 cubic inches. = 1.03152 U. S. bushels.

The English quarter = 8 Imperial bushels. = 8¼ (nearly) U. S. bushels. = 10.2694 cubic feet.

Solid Measure

Cu. In.
1728 = 1 cubic foot.
46,656 = 27 cubic feet = 1 cubic yard.

Dry Measure

Pints.
1 = 33.6 cubic inches.
2 = 1 quart = 67.2 cubic in.
8 = 4 quarts = 1 gallon = 268.8 cubic in.
16 = 8 quarts = 2 gallons = 1 peck = 537.6 cubic in.
64 = 32 quarts = 8 gallons = 4 pecks = 1 bushel.

Metric or French Weights

	Gram.	*Troy Grains.*	*Avoir Ounces.*	*Avoir Pounds.*
Milligram =	0.001	= 0.01543		
Centigram =	0.01	= 0.15433		
Decigram =	0.1	= 1.5433		
Gram =	1	= 15.43316	= 0.03528	0.0022047
Decagram =	10		= 0.3528	= 0.022047
Hectogram =	100		= 3.52758	= 0.220473
Kilogram =	1000		= 35.2758	= 2.204737
Myriogram =	10,000			= 22.04737
Quintal =	100,000			= 220.4737
Tonneau =	1,000,000			= 2204.737

Metric or French Dry and Liquid Measures

	Lit.	*U. S. Cu. In.*		*U. S.*
Milliliter =	0.001	= 0.061	= Liquid 0.00845	gill.
			= Dry 0.0018	pint.
Centiliter =	0.01	= 0.61	= Liquid 0.0845	gill.
			= Dry 0.018	pint.
Deciliter =	0.1	= 6.1	= Liquid 0.845	gill = 02.113 pint
			= Dry 0.18	pint.
Liter =	1	= 61.02	= Liquid 2.113	pints = 1.057 quarts.
			= Dry 1.8	pints = 0.908 quart.
Decaliter =	10	= 610.16	= Liquid 2.641	gallons.
			= Dry 9.08	quarts = 1.135 pints.
		U. S. Cu. Ft.		
Hectoliter =	100	= 3.531	= Liquid 26.414	gallons.
			= Dry 2.837	bushels.
Kiloliter =	1000	= 35.31	= Liquid 264.141	gallons.
			= Dry 28.374	bushels.
Myrialiter =	10,000	= 353.1	= Liquid 2641.4	gallons.
			= Dry 283.7	bushels.

Metric or French Linear Measure

	Meter.	*U. S. In.*	*Ft.*	*Yd.*	*Mile.*
Millimeter[1] =	0.001	= 0.03937	= 0.00328		
Centimeter[2] =	0.01	= 0.3937	= 0.03280		
Decimeter =	0.1	= 3.937	= 0.32807	= 0.10936	
Meter =	1	= 39.3685	= 3.2807	= 1.0936	
Decameter =	10		= 32.807	= 10.936	
Hectometer =	100		= 328.07	= 109.36	= 0.0621347
Kilometer =	1000		= 3280.7	= 1093.6	= 0.6213466
Myriameter..... =	10,000		= 32,807	= 10,936	= 0.213466

[1] Nearly 1/25 of an inch.
[2] Full 3/8 of an inch.

Metric or French Square Measure

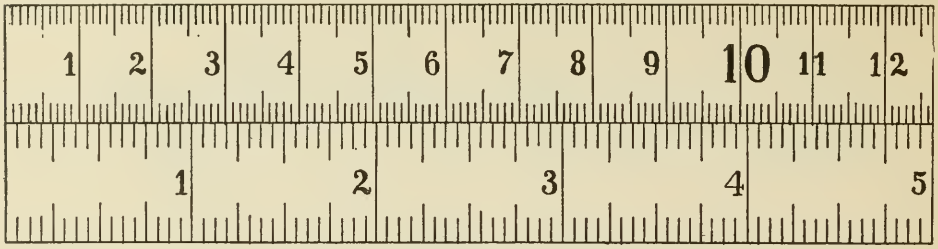
	Sq. Meter.	*U. S. Sq. In.*	*Sq. Ft.*	*Sq. Yd.*	*Acre.*
Sq. centimeter	= .0001	= 0.155	=		
Sq. decimeter	= .01	= 15.5	= 0.10763	= 0.01196	
Centiare	= 1.	= 1549.88	= 10.763	= 1.196	= 0.00025
Are	= 100.	= 154988	= 1076.3	= 119.6	= 0.0247
Hectare	= 10,000.		= 107,630	= 11,959	= 2.47
Sq. kilometer	= 0.38607 sq. mile.				= 247
Sq. myriameter	= 38.607 sq. miles.				= 24,708

COMPARISON OF U. S. FOREIGN WEIGHTS AND MEASURES

	Weights.		Liquid Measures.		Dry Measures.	
	Name.	U. S. lb. Av.	*Name.*	U. S. gal.	*Name.*	U. S. bush.
Austria,	Pfund	= 1.235	Euner	= 14.95	Nutze	= 1.745
Bremen,	Pfund	= 1.099	Stubchen	= 0.851	Scheffel	= 2.103
Buenos Ayres,	Libra	= 1.0127	Frasco	= 0.627	Fanega	= 3.894
China,	Catty	= 1.3333	.....	.....	Sei	= 3.472
Cuba,	Libra	= 1.0119	Arroba	= 4.1	Fanega	= 3.124
Denmark,	Pund	= 1.1025	Pott	= 0.255	Fonda	= 3.948
England,	Pound	= 1	Imp. gallon	= 1.2003	Imp. bu.	= 1.0315
France,	Kilo	= 2.0246	Liter	= 0.2642	Hectoliter	= 2.838
Hamburg,	Pfund	= 1.0683	Ohm	= 38.278	Fass	= 1.56
Japan,	Monme	= 3.858	Masa	= 0.459		
Mexico,	Libra	= 1.0119	Frasco	= 0.4	Fanega	= 1.547
Norway and Sweden,	Skalpund	= 0.937	Kamea	= 0.662		
Papal States,	Libbra	= 0.7475	Barile (w'e)	= 15.412	Rubblio	= 0.836
Portugal,	Libra	= 1.0119	Almude	= 4.422	Alqueire	= 0.393
Russia,	Funt	= 0.907	Vedro	= 3.249	Chetviert	= 5.956
Turkey,	Oke	= 2.834	.....	.....	Kilo	= 1.001

TABLE FOR CONVERTING METRIC WEIGHTS INTO TROY WEIGHTS

Grams.	Exact Equivalents in Grains.	Approximate Equivalents in Troy Weights. Ounces.	Drams.	Scruples.	Grains.	Grams.	Exact Equivalents in Grains.	Approximate Equivalents in Troy Weights. Ounces.	Drams.	Scruples.	Grains.	Grams.	Exact Equivalents in Grains.	Approximate Equivalents in Troy Weights. Ounces.	Drams.	Scruples.	Grains.
0.01	0.1543				1/6	3.0	46.297			2	6 1/4	23.0	354.944		5	2	5
0.02	0.3086				1/3	4.0	61.729		1		1 3/4	24.0	370.376		6		10 5/6
0.03	0.4630				1/2	5.0	77.162		1		17 1/6	25.0	385.809		6	1	5 1/3
0.04	0.6173				7/11	6.0	92.594		1	1	12 5/6	26.0	401.241		6	2	1 1/2
0.05	0.7717				3/4	7.0	108.026		1	2	8	27.0	416.673		6	2	16 3/4
0.06	0.9260				1/10	8.0	123.459		2		3 1/2	28.0	432.106		7		12 1/10
0.07	1.0803				1	9.0	138.891		2		18 1/10	29.0	447.538		7	1	7 1/2
0.08	1.2347				1 1/4	10.0	154.323		2	1	14 1/4	30.0	462.970		7	2	3
0.09	1.3890				1 1/2	11.0	169.756		2	2	9 3/4	31.0	478.403		7	2	18 5/6
0.1	1.543				1 1/2	12.0	185.188		3		5 1/3	32.0	493.835	1			13 1/3
0.2	3.086				3	13.0	200.621		3	1	3/4	40.0	617.294	1	2		17 1/10
0.3	4.630				4 3/4	14.0	216.053		3	1	16	45.0	694.456	1	3	1	10 1/2
0.4	6.173				6 1/4	15.0	231.485		3	2	11 1/2	50.0	771.617	1	4	2	11 5/6
0.5	7.716				7 3/4	16.0	246.918		4		6 1/10	60.0	925.941	1	7	1	6
0.6	9.259				9 1/4	17.0	262.350		4	1	2 1/4	70.0	1080.264	2	2		1 1/4
0.7	10.803				10 3/4	18.0	277.782		4	1	17 1/2	80.0	1234.588	2	4	1	14 1/2
0.8	12.346				12 1/3	19.0	293.215		4	2	13 1/2	90.0	1388.911	2	7		9
0.9	13.889				14	20.0	308.647		5		8 3/4	100.0	1543.235	3	1	2	3 1/4
1.0	15.432				15 1/2	21.0	324.079		5	1	4 1/10						
2.0	30.865			1	10 5/6	22.0	339.512		5	1	19 1/2						



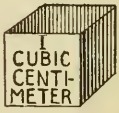
ONE BEER QUART 146.9mm in height.

ONE IMPERIAL QUART 144.6 " " " "

ONE DRY QUART 140.2 " " " "

ONE LITER 127.3 " " " "

ONE U.S QUART LIQUID OR WINE MEASURE 120.4 " "



Circular base 100 millimeters in diameter.

TABLE FOR CONVERTING TROY WEIGHTS INTO METRIC WEIGHTS

Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.
1	0.0648	16	1.037	31	2.009	46	2.980	61	3.952	76	4.924	91	5.896	300	19.440
2	0.1296	17	1.102	32	2.073	47	3.045	62	4.017	77	4.989	92	5.961	360	23.328
3	0.1944	18	1.166	33	2.138	48	3.110	63	4.082	78	5.054	93	6.026	400	25.920
4	0.2592	19	1.231	34	2.203	49	3.175	64	4.147	79	5.118	94	6.090	480	31.103
5	0.3240	20	1.296	35	2.268	50	3.234	65	4.211	80	5.183	95	6.155	500	32.396
6	0.3888	21	1.361	36	2.332	51	3.304	66	4.276	81	5.248	96	6.220	600	38.875
7	0.4536	22	1.426	37	2.397	52	3.369	67	4.341	82	5.313	97	6.285	700	45.354
8	0.5184	23	1.490	38	2.462	53	3.434	68	4.406	83	5.378	98	6.350	800	51.833
9	0.5832	24	1.555	39	2.527	54	3.499	69	4.471	84	5.442	99	6.414	900	58.313
10	0.6480	25	1.620	40	2.592	55	3.564	70	4.535	85	5.507	100	6.479	960	62.207
11	0.7130	26	1.685	41	2.656	56	3.628	71	4.600	86	5.572	120	7.776	1000	64.792
12	0.7776	27	1.749	42	2.721	57	3.693	72	4.665	87	5.637	150	9.719		
13	0.8424	28	1.814	43	2.786	58	3.758	73	4.730	88	5.702	180	11.664		
14	0.9072	29	1.869	44	2.851	59	3.823	74	4.795	89	5.766	200	12.958		
15	0.972	30	1.944	45	2.916	60	3.888	75	4.859	90	5.831	240	15.552		

WEIL'S DISEASE (Acute Febrile Jaundice, Infectious Jaundice, Bilious Typhoid).—An acute infectious disease, characterized by fever, jaundice, muscular pain, and enlarged liver and spleen.

Etiology.—Unknown. The latest view is that the disease is caused by a spirochete—the *Spirochæta nodosa*. It occurs in the summer months, and attacks men in preference to women; butchers, brewers, and alcoholics are particularly liable to the disease.

Symptoms.—The illness begins suddenly with a chill, fever (102° to 104° F.), and epigastric pain; jaundice, headache, and muscular pains soon follow; the stools are apt to be clay-colored; a rapid pulse is quite common, and herpes is frequently noted; the liver and spleen are enlarged. The urine is dark and contains bile pigment, sometimes albumin and casts and blood. Fever lasts from 8 to 14 days and is remittent in character.

Diagnosis.—Bilious malarial fever may be excluded by the absence of plasmodia in the blood. The presence of fever, muscular, joint and epigastric pain distinguish it from catarrhal jaundice. Acute yellow atrophy of the liver and phosphorous poisoning are excluded by the mild course and favorable outcome.

Prognosis is generally good.

Treatment.—General symptomatic treatment is indicated: calomel, salines, and cold water enemata are beneficial; heat and massage with chloroform liniment may help the muscular pains.

WERNICKE'S SIGN (Hemiopic Pupillary Inaction).—If a bright light is thrown into the eye and the pupil reacts, the integrity of the reflex arc is demonstrated. It is possible, in cases of lateral hemianopsia, to throw the light into the eye so that it falls upon the blind half of the retina. If when this is done, the pupil contracts, the indication is that the reflex arc referred to is perfect, by which is meant that the optic nerve-fibers from the retinal expansion to the center, the center itself, and the third nerve are uninvolved. In such a case the conclusion would be justified that the cause of the hemianopsia was central; that is, situated behind the geniculate bodies, either in the fibers of the optic radiation or in the visual cortical centers. If, on the other hand, when the light is carefully thrown on the hemiopic half of the retina, the pupil remains inactive, the conclusions are justifiable that there is interruption in the path between the retina and the geniculate bodies, and that the hemianopsia is not central, but is dependent upon a lesion situated in the tract. See Hemianopsia.

WET PACK.—See Pack.

WHEY.—The liquid part of milk separating from the curd in coagulation. **Alum whey** is separated by stirring milk with a lump of alum; a popular remedy for sore eyes.

Wine whey is prepared by adding Rhine wine, 1 part, to hot milk, 4 parts, and straining. See Infant Feeding. **Whey cure**, a cure for chronic catarrh of the respiratory organs. This consists in drinking warm whey, either alone or mixed with a mineral water, in definite quantities at set times. About 20 ounces are taken daily. This is regarded by many as in all respects similar to the use of skimmed milk. Sometimes the method is combined with baths of whey.

WHISKY.—See Alcohol; Spirits.

WHITE SWELLING.—See Joints (Diseases) (Tubercular Arthritis).

WHITES.—See Leukorrhea.

WHITLOW.—See Paronychia.

WHOOPING-COUGH (Pertussis).—A highly contagious disease, characterized by inflammation of the respiratory tract, associated with a peculiar spasmodic cough ending in a whooping inspiration.

Etiology.—A bacillus described by Bordet and Gengou, similar to that of influenza, is the cause of whooping cough; this bacillus is discharged in the sputum and nasal secretions. This disease is directly very contagious, next to measles probably the most so of any of the infectious diseases, and it is possible for it to be carried by a third person. One attack usually protects from a second. It is most likely to occur before the tenth year; and although infants are not so susceptible as older children, it frequently does occur at that period of life, and is then a fatal disease.

Pathology.—There are no characteristic pathologic lesions due to whooping-cough, but post-

mortem there are found—besides the catarrhal condition, which is always present to some extent —lesions due to complications.

Symptoms.—The period of incubation is from 4 to 14 days, during which time there are no symptoms to indicate the onset of the disease. In the clinical course three stages are usually noticed: viz., the catarrhal stage, the paroxysmal stage, and the stage of decline. The first symptoms are those of a slight bronchial catarrh, which is worse at night. The cough is of a laryngeal type, and has a peculiar ring.

The child at this time has some fever, the appetite is poor, and the sleep is restless. The cough gradually increases, and after a few days is out of proportion to the physical signs, only a few dry râles being found on examining the chest. The physiognomy changes, the face becomes swollen, the eyes are suffused and the under lids are swollen and pink in color. This characteristic of the under lids may be recognized before the whoop appears, and is a valuable diagnostic sign. During the paroxysmal stage, which begins about the second week, the cough becomes spasmodic. The child often has a premonition of the onset of a spasm, and will run to its mother or nurse or grasp a chair in its efforts to be relieved.

The paroxysm consists of a number of short, spasmodic expiratory coughs, succeeded by a long-drawn inspiration and the peculiar whoop. Drinking, eating, crying, or any excitement will often bring on an attack. There may be 3 or 4 paroxysms in rapid succession, followed by a period of several hours when the child apparently feeds as well as usual.

The attacks of coughing are frequently followed by eructations of stringy mucus, which may be streaked with blood, and vomiting of mucus and of the food which has been eaten is quite common.

Nose-bleed is not unusual during this stage, and there may be ecchymoses, giving the skin a livid appearance. Extravasation of blood under the conjunctiva may occur, and the pink color and swollen appearance of the lower lids are more characteristic than during the catarrhal stage.

The physical signs of the chest are not characteristic. Between the attacks of coughing the child may play about and may seem as well as usual. The patients, however, as a rule, suffer more or less from malnutrition and weakness, and young infants frequently from gastrointestinal disturbances, which may prove a dangerous complication.

The number of paroxysms vary; usually, one occurs about every hour, or there may be as many as 30 or 40 in the course of the 24 hours. In young children the whoop may be absent. This is also noticed when pneumonia occurs as a complication, but the whoop appears again as the lungs clear. Long after an attack of whooping-cough is over the paroxysms may occur again and again, being brought on by a slight cold or by catarrh of the respiratory tract. The paroxysmal stage continues for a period of 3 or 4 weeks or longer.

The third stage, or stage of decline, begins when the cough grows less in intensity. The sputum is then not so tenacious, but becomes purulent. The cough is less violent, and occurs at less frequent intervals. This stage continues for 2 or 3 weeks.

Complications.—In infants convulsions are common when the cough is most severe; they are apt to be general and severe, and often prove fatal. At times vomiting becomes a serious complication, and it may reduce the child's strength to such a point as to endanger life. Severe bronchitis and bronchopneumonia occur quite frequently, and are dangerous complications. Adenoids greatly increase the dangers.

Diagnosis.—Until the whoop appears it is frequently impossible to make a diagnosis; but the troublesome cough, especially at night, and the absence of physical signs to account for it, with the peculiar puffy appearance of the face and the swollen and pink under eyelids, previously mentioned, are quite positive signs. A simple catarrhal laryngitis may sometimes simulate pertussis, but there is no distinct whoop, and the symptoms do not progressively increase and continue for a long period, as in the latter disease. Vomiting at the end of a paroxysm is a most suspicious symptom of whooping-cough.

Prognosis.—The older the child, the more favorable the prognosis. As stated, pertussis in infants is a very serious affection, the mortality being 25 percent in the first year. Children who are debilitated and poorly cared for also suffer severely from this disease. If between the paroxysms the child is well, the prognosis is very favorable; but if fever, accelerated breathing, somnolence, and persistent intestinal catarrh are present, the outlook is unfavorable. As a rule, whooping-cough is not a fatal disease, but the tendency to complications and the appearance of sequels affecting the lungs make it necessary to watch every case with care.

Treatment.—The child should be isolated during the whole course of the disease. The hygienic treatment of pertussis is very important, and all cases should receive careful treatment, as the attack may thus be shortened, and the danger of serious complications may be rendered much less.

The patient should be surrounded constantly by fresh air, to accomplish which it is of advantage to have two rooms, airing one while the others is being occupied. The room should be kept at a uniform temperature of about 65° F., and the child should be protected from drafts while sleeping by placing mosquito netting over the bed or crib. On pleasant days that are not windy it is an advantage to keep the child in the open air as much as possible.

Careful attention should be paid to feeding, especially in infants, whose nutrition is so easily interfered with. They should be nursed regularly if at the breast, and if fed by the bottle, should receive a properly modified milk diet. When vomiting follows a paroxysm of coughing and causes the food to be ejected, another feeding should be given at once. Small quantities at frequent intervals are more likely to be retained than the usual amount every 1 1/2 or 3 hours.

In the treatment of this disease it is important that it be recognized early.

During the catarrhal stage it is a local affection, and treatment locally at this time will in many cases shorten the duration. For this purpose the following formula is valuable to sterilize the throat and nose:

℞. Hydrogen dioxid, Glycerin, } each, ℥ ss
Water, ℥ iij.

Spray thoroughly through the nares every 4 hours.

When the cough is fully established and is accompanied by eructations of stringy mucus, mixture of asafetida, in 1/2 teaspoonful doses every 2 hours, should be given. Belladonna is a very useful remedy, and should be given in doses sufficient to cause flushing of the face. The tincture of belladonna may be given every 3 or 4 hours, in doses of one drop for each month of the child's age, gradually increasing the dose until toxic effects are produced. The dose of atropin may be more easily regulated, and it may be given instead of belladonna, giving from 1 to 5 drops of the following every 3 or 4 hours:

℞. Atropin sulphate, gr. j
Water, ℥ j.

In young infants a belladonna plaster placed between the scapulæ will often give good results.

Antipyrin combined with belladonna seems to have a more favorable action than either drug alone:

℞. Antipyrin, ℥ j
Tincture of belladonna, ℥ iv
Brandy, ℥ iv
Water, ℥ iij.

Give 1/2 to 1 teaspoonful every 4 hours to a child 3 or 4 years of age.

Bromoform may be given to quiet the cough:

℞. Bromoform, gr. x
Alcohol, ℥ j
Simple syrup, ℥ iv
Water, ℥ ijss.

To a child 2 or 3 years old give 1 teaspoonful every hour until quiet.

Inhalations of quinin solution or of oxygen or of ethyl iodid are recommended.

During convalescence, if the indications seem to demand tonics, cod-liver oil, syrup of iodid of iron, syrup of hydriodic acid, etc., should be given, and the child should be as much as possible in the open air, preferably at the seashore.

Serum or vaccine therapy has proved valuable in the hands of several observers.

WIDAL REACTION.—See Typhoid Fever.

WILD CHERRY.—See Prunus Virginiana.

WINE.—The fermented juice of various species of *Vitis*. A sweet wine is one in which a notable portion of the original grape-sugar of the must has escaped fermentation, or to which an addition of sugar has been made subsequent to the main fermentation. A dry wine is one in which the sugar, whether originally present or subsequently added, has almost all undergone change in the processes of fermentation. A sparkling wine is one in which a supplementary fermentation is purposely developed subsequent to the bottling, whereby quantities of carbon dioxid are developed and held dissolved under pressure. See Vinum. **W., Barley,** beer. **W.-blue,** the coloring-matter of red wines, a blue substance similar to litmus, possessing the property of turning red in the presence of acids. **W., Burgundy,** a heavy red or white wine from Burgundy, France. **W., High,** commercial ethyl-alcohol. **W., Low,** the products of the first distillation. **W., Maderia,** a heavy wine from the island of Maderia, having a nutty flavor. **W., Malaga,** a sweet wine from Malaga, in Spain; it contains between 13 and 14 percent of alcohol. **W., Milk,** fermented milk. **W., Moselle,** a light wine from the valley of the Moselle, in Germany. **W., Mulled,** a preparation made by adding eggs and spices to wine and then heating it. **W., Oil of.** See **W., Heavy Oil of.** **W., Heavy Oil of,** ethereal oil. **W., Light Oil of,** etherol, a yellowish liquid of a peculiar odor obtained from ethereal oil. **W., Port,** a heavy wine from Oporto, Portugal. **W., Raisin,** wine consisting mainly of a fermented infusion of raisins; it contains also the fermented juice of fresh grapes, sugar, and tartaric acid. **W., Red.** See Vinum Rubrum. **W., Sherry,** a heavy wine from the region of Xeres, in Spain; it is white or brown in color. The sherry wine often marketed seldom contains any wine, but consists of alcohol, water, and flavoring ingredients. **W., Spirit of,** ethyl-alcohol. **W., Whey,** a nutritious and slightly stimulating preparation used in adynamic states. It is made of white wine and milk, from 2 to 8 ounces of the former being added to a pint of the latter at the boiling temperature; the whey is then strained off and sweetened. **W., White.** See Vinum Album.

Heavy wines are wines containing more than 12 percent by weight of alcohol. **Light wines** are wines containing less than 12 percent by weight of alcohol, as claret, Sauterne, or Moselle.

WINGED SCAPULA.—See Sprengel's Shoulder.

WINKING.—See Nictitation.

WINTERGREEN.—See Gaultheria.

WITCH-HAZEL.—See Hamamelis.

WITNESSES, MEDICAL.—See Expert Testimony.

WOLF'S-BANE.—See Aconite.

WOMB.—See Uterus.

WOOL-SORTER'S DISEASE.—See Anthrax.

WORD-BLINDNESS.—See Aphasia.

WORMS.—The worms that are parasitic in man are the *flat worms*, and the *round worms*.

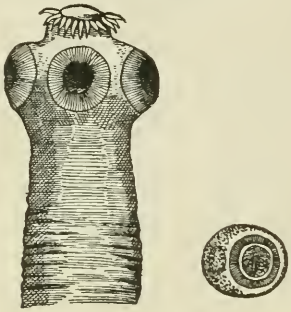
Flat worms (plathelminthes) are subdivided into the fluke-worms (trematodes) and the tape-worms (cestodes).

Fluke-worms (trematodes).—The chief worms of this order are: (1) The distomum hepaticum (liver fluke). See Distomiasis. (2) The distomum heterophyes (Egyptian intestinal fluke). (3) The Schistosomum hematobium (African blood fluke). (4) The schistosomum Japonicum (Asiatic blood fluke). See Schistosomiasis.

Tape-worms or Cestodes

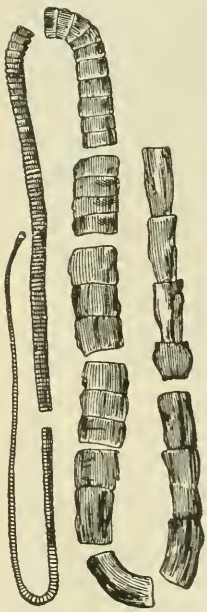
To this order belong (1) the tænia solium; (2) the tænia saginata; (3) the bothriocephalus latus; (4) the tænia echinococcus, the larval stage of which forms the hydatid cyst. See Liver; Hydatid Cyst; (5) the tænia nana (dwarf tape-worm) of southern Europe.

The tænia solium, the "armed tape-worm," is the most common in this country. It is derived from the embryos contained in pork, known as the cysticercus cellulosæ. It is from 6 to 30 feet in length, and has a globular head, or scolex, and

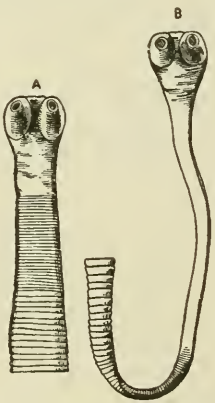


Head and Egg of Tænia Solium.

a slender neck, connecting its numerous flat segments or joints. The head, or scolex, measures about 1/40 inch, has a double circle of hooklets—whence the term "armed tape-worm"—and is provided with from 2 to 4 suckers. The segments or joints (strobila) are flat, and vary from 1/8 to 1/2 of an inch in length. Each segment contains both male and female sexual organs, the uterus being a long, numerously branched tube, in which the ova develop. The ovum measures about



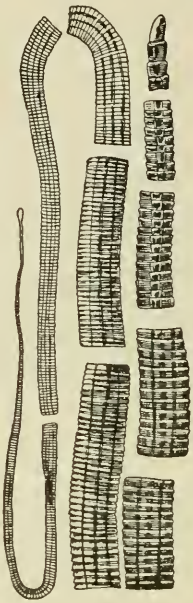
Tænia Saginata.



Cephalic End of Tænia Saginata; A. Retracted head. B. Extended head.

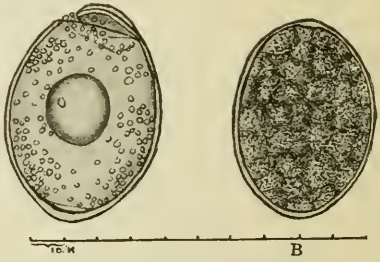
1/1700 inch in diameter. An ordinary tape-worm contains some 5, 000,000 ova. The parasite is firmly embedded in the mucous membrane of the upper third of the small intestines by its hooklets and suckers. The lower or terminal segments represent the adult and complete animal, and are termed the proglottides; these separate from the parasite and are discharged either alone or with the feces.

The tænia saginata, the "unarmed tape-worm"—a not uncommon variety—is derived from the embryos contained in beef, known as cysticercus bovis. This worm is from 10 to 40 feet in length, has a rounded or oval-shaped head that measures about 1/10 of an inch, and has 4 strong and prominent suckers, but no hooklets—whence the term "unarmed tape-worm;" the neck is short and thick and the segments are larger, stronger, and thicker than those of the tænia solium.



Bothriocephalus Latus.—(*Leuckart.*)

The bothriocephalus latus (fish tape-worm, tænia lata), also an "unarmed tape-worm," the largest parasite infesting man, is supposed to be derived from an embryo found in fish. The embryo, or ovum, is introduced into the intestinal canal with the food and drink. The parasite reaches its final growth after its entrance into the intestines. Those handling fresh meats or those eating uncooked animal food are most liable to be affected. Uncleanliness is also an important factor. This worm is larger than the tænia solium and the tænia saginata, the length ranging from 15 to 60 feet; the head is oval, measuring about 1/10 inch; the neck is short, and the segments or joints are nearly three times as broad as they are long. Its color is a dull, bluish-gray. Zoologically considered, this variety is not a true tape-worm.



Ova of Bothriocephalus Latus.

A, after treatment with sulphuric acid so as to render lid apparent; B, natural appearance in fecal matter.

Symptoms.—Not infrequently a tænia produces no symptoms whatever. Usually, however, there are colicky pains throughout the abdomen, inordinate appetite, disorders of digestion, emaciation, constipation, attacks of cardiac palpitation, faint-

ness, disorders of the special senses, and pruritus of the anus and nose. Any or all of these symptoms may be present. A large meal will often remove the majority of the symptoms. In a great many cases the discovery of the segments is the first intimation of the presence of the parasite.

Treatment.—Many remedies have been suggested for the tape-worm. Pomegranate, pepo, male-fern, creosote, glycerin (2 drams to 1 ounce), pelletierin tannate (10 to 20 grains), have all been used. The following is often successful:

℞. Chloroform, Fluidextract of male-fern, } each, ʒ j
Emulsion of castor oil, ʒ iij.

To be taken in the early morning with no food to follow until there has been thorough action of the bowels.

Another successful plan is to boil pomegranate seeds (2 ounces) in 1 pint of water down to 7 ounces; add pumpkin seeds (1 ounce), deprived of their outer coats and beaten to a paste with finely powdered sugar; to this add oleoresin of male-fern (30 grains) made into an emulsion with acacia, and flavored with syrup enough to make 9 ounces. One-third of this mixture is to be taken after a light diet in the morning, a laxative having preceded it the previous day. A second and a third portion are to be taken at intervals of 3 hours, if not previously successful. The worm should be passed while sitting in a warm sitz-bath, in order that the weight of the expelled portion may not break off before the expulsion of the head. It is important to remove the head. See ANTHELMINTICS.

Round-worms or Nematodes

1. Angiostomidæ to which species belong the tropical *strongyloides intestinalis*. This worm has been encountered in the Southern States. The presence of large numbers of this species may induce enteritis and anemia. They may be expelled by ethereal extract of male fern.

2. Filariidæ. See FILARIASIS, GUINEA-WORM DISEASE.

3. Trichotrachelidæ, which includes the *trichiuris trichiura* (trichocephalus dispar, whip-worm) one of the most common and least harmful of intestinal parasites, and the *trichina spiralis* the encysted larvæ of which lodge in the muscles. See TRICHINIASIS.

4. Strongylidæ, to which belong the *Uncinaria*, U. duodenalis (European hook-worm), U. Americana (American hook-worm). See HOOK-WORM DISEASE.

5. Ascaridæ, which includes the *ascaris lumbricodes* (the common round-worm of children) and the *oxyuris vermicularis* (pin-worm, thread-worm, seat-worm).

The ascaris lumbricoides is one of the most common parasites affecting the human body, and develops in the intestines, either after the entrance of the ova of the same or from the so-called "intermediate parasites." Their entrance is effected by means of food and drink. The ascaris is of a brown color, and has a cylindric body from 10 to 20 inches in length and 1/8 to 1/4 inch in circumference; the head terminates in 3 semilunar lips, each having about 200 teeth. The ova are oval-shaped, are produced in immense numbers—some 60,000,000 in a mature female—and have wonderful vitality, resisting extreme heat or cold. Round-worms inhabit principally the small intestines, although they often migrate to other parts. From one to several hundred worms may be found.

Symptoms.—The ascaris lumbricoides may be present in great numbers and yet produce no characteristic symptoms other than those of gastric and intestinal irritation, such as picking the nose, foul breath, colicky pains, nausea and vomiting, diarrhea, and disturbed sleep—tossing from side to side of the bed and grinding the teeth. Any or all of these symptoms may be present or absent; a positive diagnosis may be based upon the passage of the parasite, which is often the first thing to call attention to the condition. The presence of 1 or 2 round-worms may cause no symptoms *per se*. Round-worms have been discharged from abscesses in the abdominal wall, and have obstructed the bile-duct and found their way into the peritoneal cavity.

ASCARIS LUMBRICOIDES AND EGGS.—(*Coplin and Bevan.*)

Treatment.—The fluidextract of spigelia, the fluidextracts of spigelia and senna combined, the oil of chenopodium, the infusion of brayera or kousso, and santonin are the drugs usually employed against the ascaris. One dram of spigelia and from 2 or 3 drams of spigelia and senna, in divided doses, may be given to a child of 3 years. From 5 to 20 drops of the oil of chenopodium may be given on lumps of sugar.

℞. Powdered leaves of brayera, ʒ ss
Mucilage of acacia, Water, } each, ʒ viij.

To be taken at one dose, for an adult.

The fluidextract of brayera may be given in a dose of 1/2 ounce to an adult. Koussin may be given in 40-grain doses in capsule to adults, save to pregnant women.

When used alone, vermifuges should be followed by a full dose of castor oil, or by a saline purge.

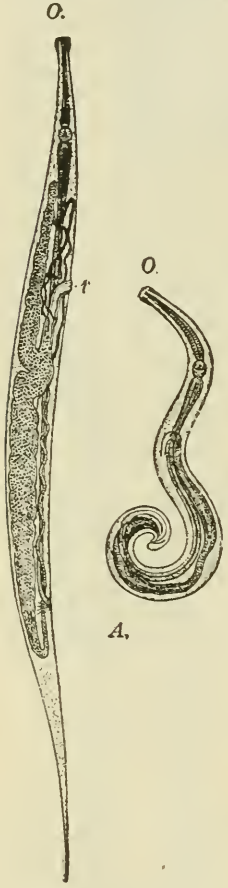
The usual remedy is santonin combined with calomel. The following prescription may be given overnight, and castor oil or citrate of magnesia or some saline purgative may be given the next morning before breakfast:

℞. Santonin, gr. j to iij
Calomel, gr. ss to j.

The santonin may be dissolved in 2 or 3 teaspoonfuls of castor oil and given before breakfast. It should not be repeated more than twice, until the physiologic effects have passed off. Smaller doses should be tried if ordinary santonin administration causes poisoning, or compound scammony powder may be substituted.

Whenever a round-worm is to be attacked, the patient should not be given solid food for from 12 to 24 hours before, so that no residue in the intestinal canal may protect the worm. A small quantity of milk may be taken, and the anthelmintic should be given in the morning, after a night of fasting. See ANTHELMINTICS.

The oxyuris vermicularis develops in the large intestines, either from its peculiar ova or from the so-called "intermediate parasites," these latter finding their way into the bowel with the food and drink or by direct contact. The oxyuris resembles an ordinary piece of white thread, measuring from 1/6 to 1/2 of an inch in length, the head terminating in a mouth with three lips, the tail terminating as a sharp point. The ova are oval, are produced in large numbers —each female containing about 10,000—and are surrounded by a stout envelope, which increases their vitality. The seat-worm, as its name indicates, inhabits the large intestines, especially the rectum, although it frequently migrates to the sexual organs. The worms vary in number, sometimes the parts infested being entirely covered.



OXYURIS VERMICULARIS, to the left, female: to right, male (considerably enlarged). *A*, anus: *O*, mouth: *V*, vulva.—(*Braun, after Claus.*)

Symptoms.—The oxyuris produces intense itching about the anus, with a desire for stool, the passages often containing much mucus, the result of the irritation produced by its presence. Should the worms migrate to the sexual organs, intense itching of these parts results, which in children, unless speedily corrected, leads to masturbation.

OVUM OF OXYURIS VERMICULARIS.

Treatment.—Santonin and calomel, with the use of enemata of quassia, alum, sodium chlorid, or phenol (5 grains to 1 pint of water) according to the age, the injection not to be retained; or an enema of a weak solution of mercuric chlorid (1:10,000). All medicated enemata should be preceded by a large injection of water to unload and clear the rectum. Washing the anus and external genitals with a solution of carbolic acid should also be employed. For the pruritus ani a mercurial ointment is useful. See ANTHELMINTICS.

WOUNDS.—**An incised wound** is a division of the parts, more or less extensive according to the extent of the injury. The fibers have only been simply divided; there is no contusion or laceration; hence they are not likely to take on severe inflammation, nor are they likely to slough or suppurate. By the extent and color of the hemorrhage the surgeon is enabled to judge of the kind of vessel injured: if an artery is wounded, the blood flows rapidly in jets and is of a florid color; if a vein, the bleeding is slow and the blood is of a purple color.

Treatment.—In a recent incised wound the indications are to check the bleeding, to remove all extraneous matter, and to bring the parts in perfect apposition. To check the hemorrhage, steady, and continued pressure upon the surface with a sponge wet with hot corrosive sublimate solution will be sufficient, as a general rule. Should the hemorrhage proceed from a vessel of some size, a ligature should be applied. As soon as the bleeding ceases all clots are to be completely sponged away and all foreign bodies must be carefully removed; the edges are then to be brought together in their entire extent and retained in contact by means of sutures. The wound being dressed, the parts must be placed at rest, in a relaxed position.

The wound must not be entirely closed, lest the secretions be retained; if this is allowed to take place, erysipelas may follow, and there will be risk of septicemia. Drainage must be provided for by means of drainage-tubes; they should be placed in the wound before it is closed, care being taken not to let them remain in too long. When the bloody serum ceases to flow, the tube must be removed, unless there is prolonged suppuration. The ligatures may be cut off short. The wound must be dressed antiseptically.

Lacerated wounds are those in which the fibers, instead of being divided by a cutting instrument, have been torn asunder by violence. The edges of the wound are ragged and irregular; there is little pain or hemorrhage, and the surrounding parts, frequently bruised and discolored, are cold and numb. A lacerated wound differs from an incised one in the mildness of the pain and hemorrhage; in its tendency to suppurate and slough; and in its liability to be followed by erysipelas, septicemia, pyemia, tetanus, and various nervous symptoms. When the lesion is very extensive, the attendant shock being necessarily severe, local sensation is obliterated; but when reaction takes place, the pain is frequently intense.

The treatment of lacerated wounds does not differ greatly from that of incised wounds. All

foreign bodies must be removed, the torn vessels tied, and the edges of the wound gently approximated. Guard against secondary hemorrhage by applying, if possible, a provisional tourniquet to the part, to be tightened on the slightest appearance of blood. Great care must be taken to select a sound portion of the artery when the ligature is applied. Venous hemorrhage may generally be controlled by a compress and roller. All tension is to be carefully avoided, and the edges are to be trimmed with scissors and the wound closed with sutures, using drainage-tubes if necessary.

To moderate the inflammation, bichlorid irrigation is to be used, either warm or cold. Should suppuration present itself, spray the wound with peroxid of hydrogen, wash with corrosive sublimate solution, and dress antiseptically; and when the granulating process is established, apply a solution of 3 drops of nitric acid to 1 ounce of water; opium cerate or dilute ointment of nitrate of mercury may be employed. Should the inflammation run high and gangrene threaten, purgatives should be used and antiphlogistic regimen observed. Anodynes, to allay pain and produce sleep, must be freely given. Secondary hemorrhage may arise as soon as reaction takes place, or it may occur when the sloughs begin to separate; this will probably take place in 5 or 6 days from the date of the injury, and should be carefully guarded against, especially if a large artery is involved. Should tetanus set in, it should be promptly treated with anodynes, using opium, hyoscin, bromid of sodium, and chloral freely; blister the part, or paint it with tincture of iodin, or use cold bichlorid irrigation. See GANGRENE, SEPSIS, SUPPURATION, TETANUS, etc.

Contused wounds are usually produced by greater violence than produces lacerated wounds, and are accompanied by greater disorganization; blood is extravasated, cellular tissue is broken down, muscles are bruised, and the surrounding parts are apt to be disorganized. They bleed but little in consequence of the organization of the parts being destroyed. The pain that accompanies a wound of this kind is in inverse ratio to the extent of the injury. When there is a moderate contusion, the pain is generally severe; and when there is a violent degree of contusion, the patient scarcely suffers any pain until reaction sets in.

Treatment.—If there is hemorrhage, it is to be controlled in the usual manner—by compression, hot water, and ligatures. When an artery lies exposed in contused wounds, ligatures should be applied both above and below the point of lesion. The edges of the wound must be brought together gently, allowance being made for swelling and drainage. If it is necessary, sutures to bring the parts together may be used. The usual antiseptic dressings should be applied. When the inflammation is very active, leeches may be necessary. Pain and nervous symptoms are controlled by anodynes and antispasmodics. After the lapse of a few days, if the wound has healed, the part may be bathed with tincture of camphor, soap liniment, or dilute tincture of iodin.

Contusions producing subcutaneous injuries are caused by blows from a hard, blunt object or by violence applied to the injured part. The surface is not broken, but, as a rule, blood is extravasated under the skin. The injury is to the soft parts under the skin; the connective tissue with its delicate vessels primarily; then the muscles may be crushed or torn; next the lymphatics and arteries; the nerves show the most resistance, though they may be violently stretched.

Contusions vary in degree from a trivial bruise to absolute crushing of the part. In the slightest cases there is no perceptible bruise—mere redness and swelling, with local pain, which soon subsides; in those that are more severe there is ecchymosis, some of the capillaries being ruptured, and blood is effused into the skin or subcutaneous tissues, when swelling and discoloration make their appearance. In the worst cases the amount of extravasation may be enormous, as when a large vessel has been ruptured, or in persons in whom the tissue is easily torn. The scrotum or the loose cellular tissue of the female genitals may be swollen to an enormous size. The case may prove fatal almost at once from hemorrhage alone.

The changes that take place in the part depend upon the amount of extravasation, the tension, the nutrition of the surrounding tissues, and the treatment that the injured part has received. Absorption is the rule; but if the tension is great, as when a large artery is severed, or if the part is not kept at rest, or if the surrounding tissues are not sufficiently nourished, inflammation may ensue when suppuration is very likely to follow. The degree of swelling varies with the amount and situation of the extravasation and with the looseness of the tissues. As a rule, the pain depends upon the amount of tension. In some instances the shock is very severe, as when the testis is squeezed or the abdomen is struck. If a large vessel is torn, the loss of blood may at once prove fatal. When the bruise is superficial, the staining of the skin will soon show itself; when deep, it may not appear for weeks. Traumatic fever is a usual accompaniment, and in cases of large extravasations may be very severe, lasting for several days.

Treatment.—Slight contusions are best treated with cold or evaporating lotions. Lead-water and laudanum and acetate of lead in a decoction of powdered opium are especially useful. When the extravasation is considerable, uniform, gentle compression with many layers of cotton-wool checks the increase, limits the hyperemia, and promotes absorption. This treatment will be found efficacious even when bullæ are forming upon the skin. The fluid should be drawn off through a minute puncture, and absorbed with cotton-wool or thick blotting paper; the epidermis should then be carefully replaced and a little iodoform dusted on or collodion painted over, and then cotton-wool carefully applied. In very severe cases when there is risk of suppuration, the tension may be relieved by the aid of the aspirator. Only a small portion of the fluid need be removed—sufficient to relieve the tension; this will at once diminish the hyperemia, when absorption will proceed unchecked.

The contusion is sometimes so severe as to destroy the skin. If the injury is small, and the deep structures are not badly implicated, the slough should be allowed to separate itself; but when the skin has been stripped off from the subcutaneous tissue to some distance above the apparent seat of injury, and it is thought advisable to amputate, the line of incision must be carried well above, or the flaps will be sure to slough.

A punctured wound is one made with a narrow-pointed instrument, such as needles, nails, splinters, swords, bayonets, scissors, hooks, etc. These wounds are much more dangerous than cuts or incised wounds, from the effects they produce on the injured part.

A slight punctured wound through the skin into the cellular tissue will sometimes be followed by red lines along the course of the absorbent vessels, from the wound to the absorbent glands. If a tendinous structure is punctured, alarming symptoms will frequently follow. In punctured wounds their depth is usually much greater than their width, making it frequently difficult to determine the amount of injury inflicted. The pain is often very great, depending upon the injury sustained by the nerves. Punctured wounds are rarely attended with much hemorrhage, and sometimes with practically none. They are very liable to be followed by erysipelas, lymphangitis, abscess, and wasting of the muscles.

The treatment consists in the extraction of foreign substances, in checking hemorrhage, in moderating inflammation, and in preventing the development of nervous symptoms. All such articles as fish-hooks and similar barbed substances must be extracted by counter-openings or by pushing them through the part in which they may be embedded. If bleeding arises by reason of an artery having been laid open, it must be exposed and tied at both ends. An anodyne should be administered and the parts should be dressed antiseptically. Great care must be exerted to see that full and sufficient drainage is established. It is always safe, and frequently absolutely necessary, to change a punctured wound into an incised wound by free incisions.

Gunshot wounds are injuries caused by substances discharged from firearms, by fragments of stone or wood struck thereby, and by the bursting of firearms and shells. See Gunshot Wounds.

Dissection wounds are those contracted in the examination of dead human bodies. The first symptom that attracts attention is a stinging or burning sensation; upon examining the part a little whitish vesicle is observed, extremely sensitive on pressure. When the vesicle breaks, a small ulcer is exposed. The pain by this time is very great, the sore enlarges, the swelling increases, and the part is hot, tense, and numb. A red line is usually seen, extending from the point of inoculation along the arm to the axilla. As the disease spreads the whole limb becomes enormously enlarged, pitting on pressure and looking dusky and erysipelatous. Cases occur in which the symptoms begin at the axilla and extend thence up the neck and down the side. In the worst forms the disease soon reaches a crisis, the system rapidly falling into a typhoid state.

Treatment.—As soon as a wound of this kind is received, it should be thoroughly washed with warm water and soap; this should be followed by suction by the mouth. If the wound is small, it should be dilated; if it has bled, it should be thoroughly cauterized with acid nitrate of mercury, nitrate of silver or hydrochloric, nitric, or sulphuric acid. If a vesicle forms, it should be freely opened, and then thoroughly cauterized; antiseptic dressings should be applied, and, if necessary, a purgative should be administered. To relieve the severe pain and the restlessness, anodynes should be freely employed, and if the skin is hot and dry, aconite or veratrum viride should be administered. To meet the typhoid symptoms, milk-punch, quinin, iron, and such other treatment should be resorted to as will support and sustain the patient.

Wounds of the various members, regions, and organs are considered under their respective headings. See Abdomen (Injuries), Neck (Injuries), Kidney (Injuries), etc.

Listerian Methods of Dressing Wounds.—Carbolic acid was the first antiseptic, but from its volatility and slowness of action as a germicide it was replaced by corrosive sublimate. But this proved irritating, and was precipitated by the albumin of the blood-serum.

What might be called the **third method** was the antiseptic dressing called **serosublimate gauze**, consisting of a gauze charged wth a solution of corrosive sublimate in the serum of horses' blood. This was found difficult to manufacture, and was harsh and nonabsorbent.

The fourth method consisted in a combination of chlorid of ammonium and bichlorid of mercury, called **sal alembroth.** This was likewise objectionable because of its ready solubility in the blood-serum.

Fifth method, a gauze containing 3 or 4 percent by weight of the biniodid of mercury. This proved irritating to the skin.

A sixth method consists in the employment of gauze impregnated with a solution of a double cyanid of zinc and mercury colored with a dye. This is said to be nonvolatile, unirritating, insoluble in water, and only soluble in 3000 parts of blood-serum. It possesses but little germicidal power, while but 1 : 1200 keeps animal fluids free from putrefaction.

Lister's antiseptic dressing has a base solution of bichlorid of mercury, 1 : 4000, with small quantities of potassium cyanid, mercuric cyanid, and zinc sulphate added.

Dissolve the two cyanids in 2 ounces of distilled water and add the zinc sulphate dissolved in 6 ounces of distilled water; collect the precipitate (which will be thrown down) upon a filter, and wash thoroughly by pouring over it (while still in the filter) distilled water. While the precipitate is still moist, diffuse it in 8 ounces of distilled water Dissolve the hematoxylin in 1 1/2 drams of dis-

ing, in some forms of mental or emotional disturbance such as fear, and when much fluid has left the body as in case of excessive diarrhea. It often occurs in women over 50 years of age. The lips are dry and scaly, the tongue fissured like crocodile's skin, the cheeks and gums glazed and covered with crusts. The teeth are carious and slowly crumble away. The parotid glands become swollen and painful, and the skin dry and harsh. Frequently a similar condition is met with in the nose and conjunctiva. The patient, in addition to dryness of the mouth, may complain of loss of taste, only a strong solution of quinin being perceived, or of subjective sensations as a salt flavor in the mouth.

Treatment.—Tonics and mouth-washes with removal of carious stumps, and the fitting in of suitable dentures. Sialogogs, such as pilocarpin, are useless, perhaps harmful.

X-RAYS.—See ROENTGEN RAYS.

Y

YAWS.—Frambesia; pian; polypapilloma tropicum; amboyna button; parangi; coco; endemic verrugas. A tropical contagious disease of the skin, of long duration, characterized by dirty or bright red raspberry-like papules and nodules, tubercles, which undergo ulceration, appearing usually on the face, toes, and genital organs. It is most frequent in young colored people. It is believed to be caused by a slender spirochete, the *Spirochæta pallidula*. Treatment does not differ materially from that of other tubercles of the skin. Very satisfactory results are reported from the use of intramuscular injections of salvarsan.

YEASTS.—Blastomycetes or saccharomycetes are responsible for fermentation in many forms and are the cause of blastomycosis (*q. v.*) Cerevisin, the spores of the saccharomyces cerevisiæ, is claimed to be beneficial in furunculosis.

YELLOW FEVER.—An acute, specific infectious disease, remarkably limited in its geographic distribution. It is prevalent chiefly in tropical and semitropical regions. Upon the western hemisphere it occurs along the shores of the Gulf of Mexico and of the Caribbean Sea and in adjacent islands, and along the Southern Atlantic coast of the United States, extending into the interior of the Southern States along railway lines and navigable rivers. In South America it appears on the Atlantic coast as far south as Montevideo and on the Pacific coast in Peru. In Africa it is limited to the west coast and contiguous islands; in Europe, almost exclusively to the Iberian peninsula. So far, the continents of Asia, Australia, and Polynesia have been exempt. Endemic foci exist now principally upon the island of Cuba, at Rio de Janeiro, and upon the Senegambian coast.

Yellow fever is characterized by a fever of sudden onset, of short duration (3 to 5 days), and of one paroxysm.

Etiology.—Recent experiments carried on in Cuba under the auspices of the medical department of the United States army demonstrate the rôle of the mosquito in disseminating yellow fever infection.

The specific organism that is the cause of this disease has not yet been demonstrated. The bacillus icteroides of Sanarelli, and the bacillus of Sternberg, have both been rejected. The *Stegomyia fasciata* serves as the intermediate host for the unknown parasite. See Mosquitos. The disease is not conveyed by fomites. About 12 days or more must elapse before the contaminated mosquito is capable of infecting. In the absence of the *Stegomyia fasciata*, as has been demonstrated, yellow fever is not contagious. The disease can also be transmitted by the injection of blood taken from a yellow fever patient.

Classification and Symptomatology.—Like most other acute infectious diseases, yellow fever occurs in different grades of severity. It is sufficient to mention the following forms: viz., mild, moderate, grave, and fulminating. Conditions of the individual likely to aggravate the attack are those having a similar effect in other fevers: viz., loss of sleep, severe and prolonged physical exertion, excessive sexual indulgence, mental depression—as from fear, anxiety, melancholy, excesses in eating and drinking, and complications from preexisting or intercurrent diseases. Conditions favoring severity of epidemics are not fully understood, but unhygienic influences—as overcrowding, filth from decomposing vegetable and animal products, imperfect drainage and sewerage, inadequate ventilation, lack of sunlight, excessive heat and humidity—undoubtedly play an important rôle. An epidemic moderate in the beginning may increase in virulence as it progresses.

The period of incubation is usually short: most frequently from 1 to 5 days, and rarely exceeding a week.

The onset is commonly sudden, the patient generally being able to state definitely the hour of the attack. Less frequently, the invasion is preceded by anorexia, malaise, headache, and mental and muscular debility. A well-pronounced rigor is mentioned as an initial symptom by many authors, but most patients will mention only a sense of chilliness and discomfort.

The fever rises rapidly, and often reaches its acme within a few hours from the onset. There are cutting pains through the forehead; the eyes ache; the muscles of the back, loins, thighs and calves are sore, and often ache severely even in mild cases. These symptoms continue during the febrile stage. It should be noted that the pains, except those in the head, involve the muscles rather than the joints. The face is turgid, not infrequently a dusky red; the upper lip is often swollen. The appearance resembles that of the early stages of typhus or the stage of measles before the eruption, with an addition of slight or well-marked jaundice. The conjunctivæ are congested and shiny, with a yellow tinge; the eyes are sometimes intensely red and sensitive to light. The jaundice becomes more distinct after the first or second day, the skin showing the same combination of capillary stasis with an icteroid hue as the eyes. Yellowness may be demonstrated by pressure or pinching when otherwise it would be unnoticed. As the case progresses jaundice may be intense and unmistakable.

The surface of the body may be hot and dry, but more frequently there is a tendency to diaphoresis, which is especially marked at the end of the febrile stage. In some fatal cases the skin remains dry until death; in others, with the stage of depression there is a cold, clammy sweat. Great significance has been attached to a peculiar musty odor given off from the body; this symptom is un-

doubtedly present in some instances, but more frequently it is absent. The mental condition is one of alertness and anxiety.

Gastrointestinal Symptoms.—The appetite is lost from the beginning, but returns at the expiration of the fever. The patient is likely to be thirsty throughout the attack. The tongue is whitish in the center, with red tip and edges, and is pointed. The gums are swollen and are disposed to bleed easily. There is marked tenderness and pain in the region of the stomach; nausea and vomiting are very common, the vomitus in the first stage being chiefly the ingested fluids with mucus. In the stage of depression the tendency to passive hemorrhages is manifested by vomiting of blood more or less discolored and disintegrated by the gastric secretions; this is the black or coffee-ground vomit to which such grave significance is attached. It is often ejected with great force and in large quantity; at other times it may be small in amount and mixed with mucus, or there may be an active hemorrhage and vomiting of pure blood. The bowels are nearly always constipated; hemorrhage from the intestines is not infrequent, and is also likely to occur from the nose, gums, kidneys, and uterus.

The urine is scanty; there is a decided diminution in the excretion of solids, and albumin is found so constantly as to be generally regarded as one of the pathognomonic symptoms. It usually appears within 72 hours; there may be only a trace found by careful testing of the evening urine. In the second stage, or stage of depression, the amount of albumin may be large, granular and other casts are found, and there is a decided tendency to suppression, with the consequent uremia. The early occurrence of an acute parenchymatous nephritis in a large proportion of cases is of the utmost importance, both from a diagnostic and a prognostic standpoint. This aspect of the subject will receive further notice under the heading of differential diagnosis.

Course of the Fever.—As previously observed, yellow fever is a disease of one short paroxysm, lasting usually from 2 to 5 days, but sometimes continuing longer and assuming an irregular or typhoid aspect. The temperature curve is characterized by a sudden sharp ascent, reaching the highest point most frequently on the first day; from this time the line ordinarily descends rapidly until the normal point is reached, which is the termination of the first stage. In mild cases the patient may rapidly become convalescent; in moderate or severe cases the second stage, or stage of depression, supervenes, when the temperature may be normal, slightly above normal, subnormal, or elevated, and the fever may run an irregular course. It is in this stage that the serious effects of the toxins upon the blood and upon the various organs are manifested by passive hemorrhages and uremia. Sternberg states that, out of 192 cases recorded by Faget, Jones, and himself, the highest temperature was reached on the first day in 102, on the second in 54, and on the third in 33. The initial temperature ranges from 101.6° to 104.5° F. The height of the fever is an index to the gravity of the case. Out of 10 cases approximating a temperature of 105° F., only 1 recovered. The typical febrile course is likely to be disturbed by complications of various kinds.

The Pulse-rate.—The pulse of yellow fever is characterized by its abnormal slowness and by its want of correlation with the temperature. This latter phenomenon—known as Faget's law—possesses great diagnostic significance. It is exhibited best during the first 3 days. In other fevers the rule is that the rapidity of the pulse-rate increases with the temperature, while in yellow fever, though the thermometer may show a rise of from 1 to 4 degrees, the pulse continues to fall.

Diagnosis.—In order to aid physicians in the prompt recognition of yellow fever, and to assist in its prevention as far as possible, the following excellent presentation of the subject, made by Dr. Samuel L. Bemis, and adopted by the State Board of Health of Louisiana, is quoted.

The following group of symptoms is considered to be indicative of yellow fever:

Group First.—A person after (1) a sudden attack has (2) a fever of one paroxysm, attended with (3) marked congestion or blood stasis of capillaries of the surface, conjunctivæ, and gums, with (4) a history of probable exposure to infection and (5) no history of a previous attack of yellow fever.

Group Second.—A person after (1) a sudden attack has (2) fever of one paroxysm, followed by (3) unusual prostration, (4) albuminous urine, and (5) yellowness of the conjunctivæ or skin, and having (6) no positively authenticated history of a previous attack of yellow fever.

Group Third.—A person has (1) a fever of one paroxysm, (2) albuminous urine, (3) black vomit, (4) suppression of urine, or (5) general hemorrhagic tendency under (6) circumstances when exposure to infection is a possibility.

The following symptoms are held to be suspicious of yellow fever when associated with a fever of one paroxysm in a person who has never had the disease:

1. Suddenness of attack, either with violent pains in the back and head and injected eyes and face, or with marked congestion of the superficial capillaries.
2. Want of that correlation between pulse and temperature usual to other forms of fever.
3. Albuminous urine.
4. Black vomit.
5. General hemorrhagic tendency.
6. Yellowness of skin.
7. Any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not yellow fever.
8. Any case respecting which efforts are made to conceal its existence, full history, and true nature, in violation of ordinances requiring a report of the same.

Differential Diagnosis.—The disease with which yellow fever is most likely to be confounded is dengue, not only from the remarkable resemblance of these fevers, but on account of a similar geographic distribution and because of their frequent concurrent prevalence. "In time of appearance,

and generally in geographic distribution, they seem related to each other. Dengue has, however, prevailed in Asia and Egypt, where yellow fever is unknown. Both diseases are arrested by severe frosts. Both dengue and yellow fever are diseases characterized by one febrile paroxysm," (Foster).

In view of the possibility of dengue and yellow fever coexisting, the following table (from Jackson) is appended:

	Yellow Fever.	Dengue.	Malarial Fevers.
Temperature	Fever of one paroxysm, as a rule. High temperature for 3 days.	Fever of two paroxysms and a remission, as a rule. Fever high in first period; low in second.	Fever of several paroxysms with remissions or intermissions. Moderate temperature, as a rule.
Duration of fever	3 to 7 days	5 to 8 days	Variable duration. May last weeks.
Incubation	Human incubation, 1 to 6 days. Mosquito incubation about 12 days.	Short incubation, 1 to 5 days; average less than 3 days.	Human incubation, 1 to several days. Mosquito incubation, about 10 days.
Vomiting	Very common symptom—both bilious and hemorrhagic (black vomit).	Not common. Bilious vomiting in some cases.	May or may not be present. Bilious in character.
Pulse	At first, rapid and bounding; later, abnormally slow and soft. Does not correspond with temperature.	Corresponds with febrile temperature.	Corresponds with febrile temperature.
Jaundice	Characteristic and constant	Rare	Subicteric jaundice rather common.
Eruptions	Rare and not characteristic	Common and distinctive	Rare and not characteristic.
Urine	Scanty; often completely suppressed, and albuminous from early stages.	Quantity ample. Rarely albuminous.	Not usually albuminous nor suppressed.
Mentality	Apathy common. Consciousness preserved as a rule.	Preserved	Delirium not uncommon.
Hemorrhagic symptoms.	Frequent and often fatal. (Gastric and intestinal chiefly.)	Of rare occurrence and of slight consequence.	Rare except in pernicious cases and in malarial hemoglobinuria.
Fatality	Average mortality 25 per cent	Non-fatal	Rarely fatal if treated properly.
Convalescence	Rapid and without sequels	Rather prompt but with arthralgic and myalgic sequels.	Slow, succeeded by anemia; and is apt to recur.
Immunity	One attack confers subsequent immunity.	Doubtful immunity	No immunity.
Response to treatment.	Abortive or curative treatment negative.	Symptomatic treatment alleviates.	Satisfactory, specific (quinine) treatment cures.
Blood condition	Incomplete coagulation and free hemoglobin in serum. Red cells not greatly altered. White corpuscles either increased or decreased.	Leukocytosis common. Decreased leukocytes claimed by some observers.	Malaria parasites and pigment present. Leukopenia with a relative increase of large mononuclear leukocytes, the rule.

The symptoms that have heretofore been relied upon to differentiate yellow fever and dengue are the occurrence in the former of albuminuria, the characteristic facies (inclusive of jaundice), the divergent pulse and temperature, and excessive irritability of the stomach and passive hemorrhages. The absence of such symptoms in the main, the presence of an eruption, and a want of mortality in connection with the ordinary febrile phenomena are considered as characteristic of dengue. The diagnostic significance of the foregoing symptoms requires modification: that is to say, a careful examination of the urine in cases of undoubted dengue may demonstrate a mild and evanescent albuminuria. A certain proportion of these cases may have slight jaundice, severe nausea, vomiting, and a disposition to passive hemorrhages from mucous membranes.

Aside from the increased mortality of yellow fever and the characteristic postmortem findings, the differential diagnosis between these two diseases can be made by the symptom-complex of an acute nephritis in yellow fever and its absence in dengue. In the latter disease simple parenchymatous changes may occur in the kidneys, manifested by a slight and temporary albuminuria; while in the former, in a series of cases many will afford incontestable evidence of a severe nephritis: viz., scanty urine, of high color and high specific gravity, intense and persistent albuminuria, hematuria, casts, a decided tendency to suppression, and the accompanying uremia. There is no

authority who will claim that a serious kidney involvement belongs to the pathology of dengue; on the contrary, it is universally conceded that the nephritic complications dominate the clinical picture in every severe case of yellow fever.

Prognosis.—Reference has been made to the fact that yellow fever is a protean disease, with a mortality varying in the extreme degrees from 85 percent, as in the epidemic of 1853, to 4 percent, as in that of 1897. Further illustrating this fact is the experience of Touatre, who states that in the epidemic of 1867 in New Orleans he lost an average of 1 patient in 3; in 1870, 1 in 14; in 1873, 1 in 13; in 1878, 1 adult in 29, 1 child in 52; in 1897 he treated 76 patients—33 adults and 43 children—without a death.

The death-rate will be affected: (1) By the comparative virulence or attenuation of the microorganism that produces the disease; (2) by idiosyncrasies, age, race, and acclimatization of the patients; (3) by intercurrent complications. The patient may be overwhelmed by the intensity of the toxins—suddenly struck down, with vertigo, stupor, coma, or convulsions; with weak, fluttering pulse; cold, clammy skin; involuntary discharges; and profuse hemorrhages, speedily terminating in death. In these fulminating cases the temperature is likely to be subnormal and the yellow discoloration of the skin is absent.

In individual cases three important prognostic indications are afforded: (1) by the height and range of the temperature; (2) the severity of the kidney complications; (3) the disposition to hemorrhage.

Touatre makes the following observations: "When the fever reaches its maximum at the outset, and defervescence is continuously noted at each visit, the disease is mild. When the fever ranges between 103° and 104.5° F., even during the first 3 days, with remissions of at least a degree in the morning, and the exacerbations are less and less pronounced each night, the patient always recovers. When the fever ranges between 104° and 105° F., still with remissions of at least 1 degree, but with exacerbations above the previous day, the disease is grave, but recoveries are more numerous than fatal results. When the fever reaches 105° F. or above within the first 12 hours, the attack is nearly always fatal, unless by heroic treatment the temperature can be reduced at least 2 degrees. When defervescence is not maintained after the temperature has reached 105° F. or above, and the fever rises to the same point again, death is almost certain. A temperature above 105° F. during the first 24 hours in adults gives slight hopes of recovery.

The extent of kidney involvement, and of consequent functional incapacity, is an important prognostic guide. The severe symptoms of the stage of depression, the vital prostration and the nausea, vomiting, headache, stupor, coma, and convulsions are chiefly of uremic origin.

If the urine is abundant in spite of a decided albuminuria, the chances for recovery are good. Scanty urine, with much albumin on the second day, indicates danger. Recovery rarely, if ever, ensues after complete suppression has lasted as long as 12 hours. The disposition to passive hemorrhages, as manifested by black vomit, and by bleeding from the gums, intestines, uterus, nose, and other mucous surfaces, is of serious import, but is not necessarily attended by a fatal result.

Prophylactic Treatment.—Yellow fever patients should be isolated and screened against the mosquito. Nonimmunes should be guarded against infection by the mosquito by screening houses, etc. Prophylaxis consists essentially in the destruction of the mosquito. The stegomyia fasciata is a house mosquito, biting mostly by day, disliking both sunlight and darkness. It is often carried long distances by railway or ship. The mosquitos should be destroyed by drainage and insecticides. Breeding places should be covered with petroleum, etc. Disinfection of their lurking places is best accomplished in the house or aboard ship by means of fumigation with sulphur or formaldehyd. See DISINFECTION.

Medicinal Treatment.—The important fact to be remembered in the treatment of yellow fever is that it is a self-limited disease of short duration, and one likely to be complicated by serious lesions of vital organs. There is no specific. Treatment should begin promptly, and while it should be energetic and careful, all doubtful, useless, and harmful medication should be avoided.

1. The first indication is absolute **rest** in the recumbent posture from the onset until convalescence is well advanced. There is no disease in which this rule is more imperative, or in which its disregard is so fraught with serious consequences. The action of the toxins upon the heart, kidneys, stomach, intestines, liver, brain, and muscular structures is aggravated by physical exertion. Hence the patient should be put to bed at once, should not be allowed any imprudent movements in bed, and should be rigidly kept there until well on the road to recovery.

2. The second indication is **ventilation, cleanliness, and disinfection** of the sick-room and of all its appurtenances. The popular idea that fresh air should be excluded by closure of windows and doors must be combated by the physician. In the intensification of the infection by overcrowding and inadequate ventilation, yellow fever resembles typhus. While drafts should be avoided and chills from uncovering should be prevented, there should be an abundant admission of fresh air, and, if possible, of sunlight. Scrupulous cleanliness of bedding and clothing and of the body of the patient should be maintained. All excretions should be disinfected and speedily removed.

3. The third indication is **prompt evacuation of the gastrointestinal canal.** If the stomach should contain food at the onset, a mild emetic, such as a dose of ipecac or a glass of warm water with mustard and common salt, should be given. The bowels should be emptied quickly. Castor oil, on account of the rapidity, mildness, and certainty of its action, is used by many; but its nauseous odor and taste are objectionable to most persons, hence the effervescent salines are to be preferred.

Calomel is excellent, not only for its purgative, but also for its antiseptic effect: from 3 to 4 grains in divided doses for adults, and proportionately smaller doses for children, is usually sufficient; it should be given during the first 24 hours. Afterward, 1 to 2 daily movements should be obtained by enemata of warm solutions of common salt, sulphate of magnesium, or sodium, to which glycerin, for its osmotic effect, is a useful addition. Purgatives are useful, not only to empty the intestines of irritant and undigested contents, but to prevent autoinfection, to relieve congested blood-vessels, to allay nausea, and to act vicariously on the kidneys.

4. The hot mustard foot-bath, for its diaphoretic and revulsive effect. It should be given under blankets, and as hot as the patient can bear, hot water being added from time to time. Properly given, the foot-bath produces free action upon the skin, attracts the blood from the upper to the lower parts of the body, relieves internal congestion, and allays pain.

5. **Attention to Diet.**—Contrary to the rule in treating other fevers, in yellow fever the patient should be starved. During the first 3 or 4 days, and longer in severe cases, no food whatever should be allowed, and then only the blandest and most digestible liquids, in small portions, as milk with lime-water, Vichy, or barley-water; buttermilk; wine whey; or corn, oatmeal, or barley gruel. Meat, eggs, beef-tea, or nitrogenous foods of any kind should not be given until the urine is abundant and free from albumin. Only those who have treated yellow fever can appreciate the necessity for such rigid rules of diet. It should be remembered that digestion is in abeyance, that the gastrointestinal mucous membrane is intensely congested, that nausea and vomiting are present, that hemorrhage is likely to ensue, that nature warns us to give the stomach rest, and that food now is poison. Probably more patients have been killed by indiscreet eating during convalescence than by almost any other cause. The physician should preceed carefully, gradually increasing the amount and changing the character of the food as the symptoms indicate restoration of the functions of the secretory and excretory organs.

6. **Diluents, Diaphoretics, and Diuretics.**—Alkaline carbonated waters, as Vichy or Apollinaris, should be freely used, and are beneficial in various ways: they allay nausea, correct excessive acidity, cleanse the stomach, and promote action of skin and kidneys. Ice may be added or not according to taste; the quantity taken may be regulated by the tolerance of the stomach. Warm drinks, as orange-leaf and watermelon-seed tea, serve a useful purpose in the same way, and are extensively used as domestic remedies. While it is important to promote activity of skin, sweltering the patient beneath heavy blankets and exhausting him by excessive sweating should be prohibited. Pilocarpin, on account of its depressing effect, should be very carefully prescribed, if at all. Stimulating diuretics should not be given; it is better to flush the kidneys by the free use of diluents than to run the risk of increasing congestion by the effects of turpentine and the like.

7. **Regulation of the Temperature**—Hyperpyrexia is best controlled by cold spongings and baths. Ordinarily, repeated spongings, as required, with water or with a mixture of water, vinegar, and alcohol, at a temperature varying according to the height and obstinacy of the fever, are preferable to the cold bath; lifting the patient in and out of the tub, with its attendant perturbations, is objectionable. Touatre, however, is an earnest advocate of the cold bath in cases where the temperature reaches 104°–105° F. He uses the bath boldly, and claims that the mortality in such cases can be reduced in this way only. Opinion is divided as to the use of the coal-tar antipyretics; if used at all, they should be prescribed only during the first 24 hours, and then in moderate doses. The effects produced by these remedies are undoubtedly pleasant in relief of the symptoms; but in a disease where cardiac depression is so marked a feature, care should be taken not to injure the patient for the sake of mere temporary relief.

8. **Treatment of Complications.** *Nausea, Vomiting, Black Vomit.*—Direct medication to meet these symptoms is not usually required. In addition to the general measures already recommended, such as rest, abstention from food, iced carbonated drinks, purgatives, and enemata, the following simple procedures are advisable: sinapisms to the epigastrium; ice-cold cloths to head, face, and neck; cocain tablets in 1/4-grain doses; a combination of creosote and subnitrate of bismuth. Rectal injections of chloral hydrate—from 15 to 20 grains for adults, and proportionately smaller doses for children—will not only often arrest the vomiting, but will allay nervous excitement and produce sleep. It should be remembered that the severe gastric symptoms are often of uremic origin, and that black vomit is due to profound blood and tissue changes, hence rational treatment should be directed to the underlying cause rather than to the symptom.

Uremia, Albuminuria, Scanty and Suppressed Urine.—In addition to the general measures indicated which are, largely beneficial, in actual or threatened kidney trouble we must consider additional resources needful in the presence of these grave complications: viz., intravenous, intracellular injections, or high rectal enemata of normal solution of chlorid of sodium in sterilized water and wet and dry cups over the region of the kidneys. These means will sometimes succeed when others have failed in impending anuria.

Restlessness and insomnia are best relieved by hydrated chloral administered by the rectum according to the necessities of the case.

Malaria.—When the case is thus complicated, quinin should be given. The routine treatment by this agent should be condemned.

Tendency to heart failure is to be treated by the moderate use of iced champagne or whisky, and by hypodermic injections of digitalis, strychnin, or caffein.

A nurse who will carry out the physician's instructions to the letter is indispensable. Many

patients with yellow fever are frightened to death. The conduct of attendants should be such as to quiet fear and excitement, instead of contributing to them. It is only by careful attention to details that success may be attained in severe cases. If possible, there should be an attendant who has had previous experience with the disease.

Sternberg's treatment, by means of which a death rate of only 7.3 percent was secured, consists in giving 7 1/2 grains of sodium bicarbonate and 1/60 grain of bichlorid of mercury every hour with a liberal amount of water. In addition, a hot mustard foot-bath is advised during the first day, no food being given for 3 days, and then stimulants and a milk diet are ordered. Cold sponging and cold applications to the head and sinapisms over the stomach and lumbar regions are recommended.

Serum treatment has not yet proved satisfactory.

YEO'S METHOD.—A method of treating obesity, consisting of a dietary that limits the amount of farinaceous food, prohibits sugar, limits the amount of liquids taken with the meals, but encourages the drinking of large amounts of hot or warm aromatic beverages between meals.

YERBA SANTA.—See ERIODICTYON.

Z

ZEA (Corn Silk; Maize; Indian Corn).—The fresh styles and stigmas of *Zea Mays*, the maize or Indian corn. It contains *maizenic acid*, a fixed oil, resins and salts. Dose, of a fluidextract, 1 to 2 drams; of an infusion (1 to 8), 4 to 8 ounces, almost *ad libitum*. There are no official preparations.

Zea is a certain but mild diuretic when given in full doses at short intervals. It has been used with success for incontinence of urine, uric and phosphatic gravel, gout, rheumatism, urethritis, pyelitis, acute and chronic cystitis, cardiac dropsy and obstructive valvular disease of the heart.

ZINC (Zincum). Zn = 64.9; quantivalence II.—A metallic element, with a lead-like luster. It is represented in medicine by several of its salts, all of which are more or less poisonous. In small doses it is tonic and astringent; in larger quantities, a strong emetic. It is used mainly in the form of lotions in conjunctivitis, in various catarrhs, and in certain skin-diseases.

Preparations.—**Z. Acetas**, soluble in 3 of water and in 36 of alcohol at 59° F., in 1/2 of boiling water and in 3 of boiling alcohol. Used locally as an astringent in solution of 1 or 2 grains to the ounce, or internally in doses of 1/2 to 3 grains. **Z. Carbonas Præcipitatus**, insoluble in water or alcohol, but soluble in acids with copious effervescence. Used locally as a protective. **Z. Chloridum**, very soluble in water and in alcohol; very deliquescent. Is tonic and escharotic. For internal use a solution in spirit of ether is the most convenient form, strength 1 dram to the ounce, of which 4 to 8 minims may be given twice daily in water. Strength of injections and collyria, 1 to 2 grains to the ounce. **Liquor Z. Chloridi** is an aqueous solution, containing about 50 percent of the salt. A clear, colorless, odorless liquid, of a very astringent, sweetish taste and an acid reaction. A powerful disinfectant for sinks, drains, etc. Used also as an injection in gonorrhea, leukorrhea, etc., in dilute solution, 1/2 to 1 percent. *Burnett's Disinfecting Fluid* is similar to the above, but slightly stronger. **Z. Iodidum**, very soluble in water and in alcohol. Dose, 1/2 to 2 grains in syrup. **Z. Oxidum**, insoluble in water or alcohol; soluble without effervescence in dilute acids; also in ammonia water. Dose, 1 to 10 grains in pill. **Unguentum Z. Oxidi** has of zinc oxid 20, benzoinated lard 80. **Z. Phenolsulphonas** (*Zinc Sulphocarbolate*), very soluble in water and in alcohol. Dose, 1 to 5 grains. **Z. Stearas.** Used locally as a dressing powder and a vehicle for dry antiseptics. **Unguentum Z. Stearatis**, strength 50 percent, made with white petrolatum. **Z. Sulphas**, soluble in 0.6 of water, insoluble in alcohol. Dose, as emetic, 10 to 20 grains; as a tonic and astringent, 1/10 to 2 grains in pill. **Z. Valeras**, soluble in about 50 of water and in about 35 of alcohol. Dose, 1/4 to 4 grains in pill.

ZINGIBER.—See GINGER.

ZOSTER.—See HERPES ZOSTER.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