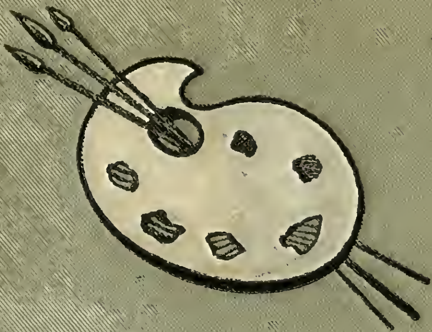
PAINTER'S CYCLOPEDIA



ILLUSTRATED

Cyclopedia of Painting

Containing Useful and Valuable Information
on the Following Subjects

Adulteration of Paint—Blistering of Paint—Brushes—Calcimining—Carriage Painting—China Painting—Colors—Color Harmony—Color Mixing—Color Testing—Exterior Painting—Gilding—Graining—House Painting—Marbling—Mildew—Oils and Driers—Oil Painting on Glass—Painting a Bath Tub—Painting in Distemper—Paperhanger's Tools—Paperhanging—Pigments—Plain Oil Painting—Primary Colors—Priming—Scenic Painting—Sign Painting—Stains—Staining—Stencilling—Turpentine—Varnishes—Varnishing—Water Color Painting—When Not to Paint—Practical Points on Painting—Useful Information

BY

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OVER 100 ILLUSTRATIONS

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INTRODUCTION.

The character of this work is indicated by its title. The topics are treated with a view to technically instruct those who desire to make a study of the art of painting as practised in the paint-shops of this country.

Every effort has been made to ensure accuracy in all the statements made. The employment of engravings, wherever it was necessary to more fully explain the text, will be found to add greatly to the value of the work, while the many extended articles will, it is believed, be interesting even to those who read only for information on general topics.

The book is one easy of consultation, virtually a Cyclopedia, and readily distinguishable from a collection of scientific treatises.

THE AUTHOR.

CYCLOPEDIA OF PAINTING.

CYCLOPEDIA OF PAINTING.

ADULTERATION OF PAINT.

To understand this subject intelligently it will be necessary to possess some slight knowledge of chemistry and of the materials used by chemists, but any intelligent person can, by careful reading of these descriptions, test substances qualitatively without the aid of expensive apparatus or external assistance of any kind. For quantitative analysis a delicate chemical balance will, of course, be required. Take paints first. White lead is now very seldom sold in the dry state, but samples are occasionally met with. Its covering power being superior to that of any other known paint, it is very largely used, and it is frequently adulterated with substances of inferior quality. The most common adulterants are sulphate of baryta and chalk.

Sulphate of Baryta. Treat a small quantity with dilute nitric acid, and heat on the sandbath. If any insoluble remains, it is either sulphate of baryta or insoluble silicates. Filter, take a portion of the insoluble on a piece of clean platinum wire moistened with hydrochloric acid, and test at the blowpipe. If the flame be colored green, the precipitate is sulphate of baryta. By moistening the wire in hydrochloric acid the green color is reproduced many times.

Insoluble Silicates. If no green color appears, the insoluble is a silicate. This may be proved by forming a bead with microcosmic salt on a loop at the end of the platinum wire, and taking some of the precipitate on this bead, fusing it again in the blowpipe flame. If small infusible particles whirl around within the bead while in the flame, the presence of silicates in the precipitate may be inferred.

Chalk. The presence of chalk can only be ascertained after separating the lead. This is best done by adding ammonia solution to the nitric acid solution until alkaline, then sulphate of ammonia in excess, and boiling for five minutes. Filter off the black precipitate which is formed, and to the filtrate, first tested with an additional drop or two of sulphate of ammonia to insure the removal of the whole of the lead, add ammoniac oxalate. If a white precipitate appear, it is calcic oxalate. Test a portion of this precipitate at the blowpipe. A brick-red color imparted to the flame verifies the presence of chalk.

White Lead. The presence of lead should be ascertained. This is indicated by the black precipitate given with sulphate of ammonia. It may be best ascertained by boiling the nitric acid solution to expel the free nitric acid, adding dilute sulphuric acid to the clear solution, dissolving the white precipitate of sulphate of lead thus formed in ammoniac acetate, and adding potassic chromate to this solution. A heavy yellow precipitate (chromate of lead) forms when lead is present.

Sulphate of Baryta and Silicates. Take 20 grains of the sample, treat with dilute nitric acid as before. The quantity taken for analysis may be weighed in a watch-glass or a small basin, but should be transferred to a beaker, and the glass or basin washed with distilled water before the acid is added. If this precaution be not taken, and the acid added directly in the watch-glass or basin, to be washed into the beaker afterwards, the violent effervescence which takes place on the addition of the acid will occasion considerable loss by spurting. If, after heating with nitric acid, an insoluble remains, a few crystals of chlorate of potash may be added to the boiling liquid to insure the solution of all soluble substances. The boiling is continued for a few minutes, then cold water is added, and the whole passed through a filter. The insoluble on the filter is washed with hot water until the water leaving the filter is no longer acid to litmus paper. It is then dried on the water-bath, ignited, and weighed. Test at blowpipe as before. Sulphate of baryta and silicates, if both present, are not usually separated.

Weighing Precipitates. This general direction applies to almost all precipitates. If strong acids or acid and chlorate of potash are used, the liquid should invariably be diluted before filtering. In washing, allow the whole of the wash water to drop from the filter before adding more water. When thoroughly washed, fold the filter paper flat in the funnel, or, better, transfer the filter paper and its contents to a large watch-glass or flat basin, and dry on a water-bath. When dry, carefully unfold the filter over a quarto sheet of stiff glazed paper, with a feather brush off every particle of the precipitate adhering to the filter paper, collect the precipitate on the glazed paper, again using the feather, and cover over the precipitate with the funnel. Fold the filter paper till it assumes the appearance of a solid cylinder about one inch in length, and ignite with the Bunsen burner over a weighed platinum or porcelain capsule. After a while the filter paper becomes a charred mass of smaller dimensions, and drops from the wire into the capsule. The wire is cleaned into the capsule, by means of the feather, of any adhering particles, the charred paper is crushed with a glass rod, and ignited over a Bunsen until the ash is no longer black. The capsule is then stood on a porcelain slab, and the precipitate carefully transferred from a glazed paper into the capsule, the feather being employed to remove the last traces. The capsule is then ignited over an Argand burner until the weight is constant. The filter paper must always be ignited before the bulk of the precipitate is transferred to the capsule.

White Lead. The nitric acid solution obtained as before is boiled nearly to dryness, and if a precipitate forms a little water is added, then dilute sulphuric acid in small quantity, and the boiling continued for some minutes to expel the last trace of nitric acid. An excess of sulphuric acid is then added to precipitate the whole of the lead and lime as sulphates, which appear as a white heavy powder. The beaker and its contents are then cooled by immersion in cold water. When cool, double the bulk of alcohol is added, and the whole allowed to stand for some time—over night if possible. It is then filtered and washed with alcohol until the washings are no longer acid, dried, ignited in a porcelain capsule, and weighed as above. From the weight obtained deduct .05 grain, the amount of ash contained in an ordinary Swedish filter paper, the remainder multiplied by five for the percentage of sulphate of lead, and (if chalk is present) this again by .852 for the percentage of white lead. If the sample contains chalk, the percentage of white lead must not be estimated until the percentage of chalk is determined. The percentage of chalk is converted into its equivalent of sulphate of lime. This latter deducted from the percentage of sulphates of lead and lime, and the remainder multiplied by .825 for the percentage of white lead.

Chalk. The readiest way to estimate chalk is to divide the nitric acid solution obtained above into two equal parts, in one estimate the lead as above (multiplying the weight found by ten instead of five), and in the other estimate the chalk. The lead is removed with ammoniac sulphide in the manner described before, to the clear filtrate, ammoniac oxalate is added, if chalk is present, a white precipitate of calcic oxalate is produced. This precipitate is assisted in its separation by boiling. Then collected on a filter, washed with hot water, dried and weighed. The ignition is complete when the contents of the capsule assume a tinge of gray color. The weight obtained after deducting .05 grain of filter ash is multiplied by ten for the percentage of chalk. In inexperienced hands it will be better to ignite strongly and weigh as lime, multiplying by ten for percentage of lime and by 1.7857 for percentage of chalk. This chalk may be converted into sulphate of lime by multiplying by 1.36, and the product deducted from the percentage of lead and lime obtained above, prior to calculating the percentage of white lead. The chalk precipitate should be tested at the blowpipe for its characteristic brick-red flame. Some analysts treat the mixed precipitate of sulphate of lead and calcium with concentrated solution of ammoniac acetate, and weigh the insoluble as chalk. This method is unreliable. The oil must first be burnt off, and the ignition continued until no black carbonaceous matter remains. It must be ignited in a porcelain basin over an Argand burner, turned low at first and gradually raised. The ignition must be completed over a Bunsen. Much time is saved and the analysis rendered more accurate by spreading the mixed paint in a thin layer over the bottom of the basin, and when the ignition is nearly complete, by crushing the scaly crust with a glass rod, carefully remove the adhering pieces on the glass rod by means of a feather. The difference in weight before and after ignition represents the oil plus loss by reductions of white lead to metallic lead. The residue is washed into a beaker with water as before, and afterwards with nitric acid. The metallic lead, which adheres strongly to the bottom of the basin, must be rubbed vigorously with the end of a glass rod until entirely removed. This requires a little patience, but it yields to persistent rubbing. The remainder of the process is the same as in the case of dry white lead.

BLISTERING OF PAINT.

In the following lines are laid down some general rules that govern this phenomenon, and from the same draw some practical conclusions, the object of which will be to set the question at rest. The blistering of paint is in a large measure traceable to the position of the surface, it is usually found on work presenting a south aspect, or exposed to the full rays of the sun. As a defect it is associated with the summer season, winters being opposed to its action. The deduction to be drawn from this is that it is the effect of heat. Paint is a body both mineral and metallic, made into a plastic condition by oil, the object of which is to keep out the moisture from exposed surfaces in buildings, and to offer on internal work a uniform and pleasing surface to the eye. The oil used is linseed, which by boiling attains setting or drying qualities and becomes better by keeping, its thick or heavy nature when loaded with mineral and metallic matters being reduced for working purposes by spirits of turpentine, a volatile spirit that is a mere aid to the spreading of paint. Paint so largely composed of oil will never fairly set or assume a dry state. However dry and brittle it may appear, it is capable of being rendered soft and plastic by the application of heat, and hence the hand stove of the painters is the most ordinary instrument for the removal of old paint. We mention this, for it is clear that, approach the subject as we will, we find heat the prime cause of the blistering of paint. Closing in with the subject, and bringing it into narrower lines, blistering, properly speaking, is wholly confined to wood as a base or groundwork. It is true it is not unknown to iron or plaster, but in these cases it is variant in form, and not blistering in the true sense of the term. The blistering of paint on iron is not traceable to the softening of the paint, and the shelling up of the same, but to water making its way to the naked iron through some crack or defect in the paint, and becoming an active agent in oxidization. The blister thus forced is clearly the separation of the film of paint from the iron by the formation of rust upon the face, which, as a foreign material, forms an effectual separation of the two bodies. The extension of these blisters is dependent upon the supply of water, and, unlike the true blister, is not dependent upon heat or a south or sunny aspect. The blistering of paint on iron occurs in any aspect or position, in the full light or in the dark,

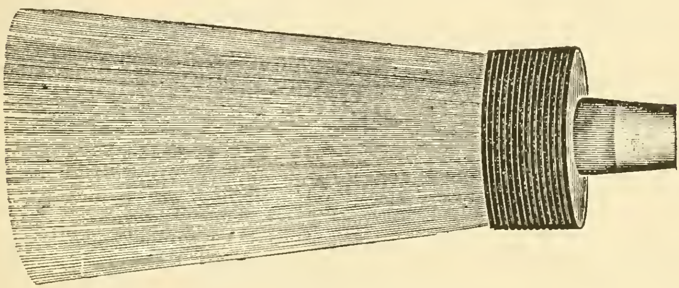


Fig. 1. Ordinary Paint Brush.

in the summer or the winter, the destructive agent being water, it is dependent upon no other conditions. The blistering of paint upon plaster is in a large degree analogous to that of iron, inasmuch as it is formed by the disintegration of the base by the action of water. Painted plaster-work, so long as water can be kept from percolating through the cracks or faults, or gaining entrance from above by filtration, or from below by capillary action, is a highly durable material, but the moment water gains a footing the lime in some degree is dissolved, and, upon being removed and redeposited, undergoes the process of recrystallization, a powdery substance is thus formed that comes as a stranger between the paint and the plaster, in which respect it bears a strong resemblance to rust, the result of the oxidization of iron. Large faces of plaster are subject to fractures from expansion under the heat of the sun, or from the lifting of the upper members of a building, consequent upon the admission of water from gutters or copings, the lifting being the result of secondary crystallization set up in the joints of mortar. This is an explanation of the fact that the blistering of paint always occurs in the neighborhood of cracks or fractures in the plaster, and is more pronounced in the cornice or upper part than in any other part of a building. In proof of its being the result of crystallization, the face of the plaster is always found to be covered over with powdered lime. The painter, finding this, takes care to saturate the disintegrated face of the framework in effecting repairs, but this, as he finds to his chagrin, is no protection against a recurrence of the evil, for so long as water or moisture is admitted at any point, so long will this abnormal blistering ensue. The blistering of paint upon plaster work, like that upon iron, is not dependent upon heat, it is a chemical action set up by water upon a body of dry lime in a partial state of crystallization, it is caused by the lime dissolving, and its removal—it may be but in an infinitesimal degree—and its recrystallization. Upon the water evaporating, the result is a dry powder that works an effectual separation between the film of paint and the groundwork of plaster, and it does not attach itself to either of the bodies, but remains a powder until the film of paint or blister is removed, when it may be dusted off with a brush. The blistering of paint upon wood is distinct in its order, and is the general blister known in the trade. It occurs on the face of woodwork exposed to the sun, and is traceable to the influence of heat. It is not pronounced in the case of new work, where the body of paint is not great; but it is a great evil and an eyesore on old work, where the coats of paint are layered one on the other. Wood, as a groundwork, is a porous body highly charged with moisture in a natural state, and never free from it in a so-called dry state when used in exposed situations. It may be taken that wood, during the winter season, or one-half of the year, is absorbing moisture. This is seen in outer doors, gates, sliding sashes, and shutters, as the carpenter is constantly being called into requisition to ease the same. This moisture, so largely present in the atmosphere, cannot be kept out of the wood by the most careful painting. In store fronts it has ready access to the back of the woodwork, the face sides being the only ones which are painted, in doors and gates it is absorbed from the sills or the ground, from the fact that the lower edges are unpainted. There is always some portion of the woodwork hidden from the eye which is unpainted, and there the system of absorption is active during the winter or rainy season. Wood in this state during the hottest days in summer will make efforts to throw off this moisture. Then the heat of the sun is applied with great force to the painted face, and the unpainted face is in the cold shade. The effect of this powerful heat is to draw the moisture to the face of the wood, where its course is arrested by the sundry impervious coats of paint, it is here generated into steam, the expansive power of which forces away the paint, and the familiar blister is formed. Paint, as a mineral or metallic body, does not incorporate with the wood, it simply adheres thereto, forcing its fronds, so to speak, in the pores of the wood, and filling up the interstices formed by the bundles of fibers. Hence we find that paint fails to adhere to highly resinous or greasy woods, and the knots themselves, from being hard and compact, must be faced with knotting composition as a ground for the paint.

BRUSHES.

Cheap goods of any kind never reflect credit on the maker. Neither do they give satisfaction to the consumer or dealer. It requires skill and art as well as quality of material to produce high grades of goods, and such must always bring their price and never fail to give satisfaction. For this reason, the intelligent, practical and thoughtful workman will always look for the best tools. Good bristle brushes cannot be made of any substitute for imported bristles, and cheaper grades are always produced by adulteration and mixtures. The cheapening of goods is generally done so that

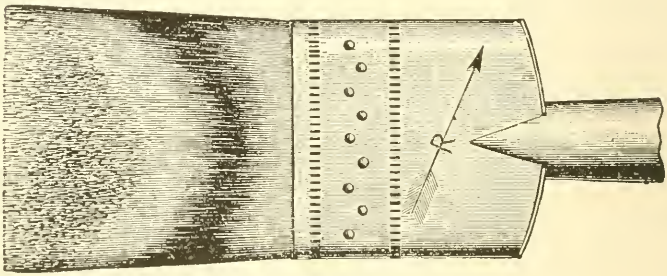


Fig. 2. Badger Hair Flowing Brush.

it shows least to the eye, in the center of the brush, and covered by good quality to make the goods as marketable as possible. Such goods cannot be expected to be durable or give satisfaction.

First-class goods can also be ruined or lose half their value if they are not properly cared for. Paint and varnish, as well as calcimine and whitewash brushes, should never be allowed to stand on the ends of bristles over night, but should always be cleaned thoroughly before quitting work, and carefully hung up, paint and varnish brushes in oil or varnish, and calcimine and whitewash to dry. It will injure any brush to let it remain in water. Should paint, varnish, leather-bound whitewash or wall brush be found that has become loose from shrinkage, take a tablespoonful or so of water, open the brush and pour the water into the center. This will swell the parts and make the brush as firm as when first made.

New brushes when first put in work are apt to shed any loose bristles that have not been fastened when made, and while such loose bristles are always cleaned out before the goods are put up for market, not all such loose bristles or hair can be cleaned out, and such are sure to come loose when the brush is first used. This defect will cure itself in one day's use.

Do not condemn the maker if one brush is brought back by a practical workman, who possibly has had one or more brushes out of the same dozen that were all right and gave perfect satisfaction, but look for the cause or defect in the user. Remember that goods are made up in large quantities, and when the bristle is prepared it is in large batches. It must naturally follow that if one brush, or one dozen, or any quantity of such a lot is good that all must be, or if one is bad all must be so.

The greatest annoyance that manufacturers have to contend with is the improper or careless use and care of good, first-class brushes.

Good goods of all kinds are a credit to the manufacturer, give satisfaction to the mechanic in use, and pleasure and profit to the dealer to sell. They are sure to bring their own reward.

Brushes are made of bristles and of hair, bound to a handle by cord, wire, metal stamped to imitate wire, tin, copper and brass. The oval and round paint and varnish brushes are generally bound with cord, wire or its imitations, and copper and brass. The flat bristle, fitch, badger, bear and camel's-hair brushes with tin. The ordinary paint brushes contain the inferior or coarser grades of bristles, the varnish brushes are selected or finer qualities. The oval and round brushes are numbered by the brush-maker to designate sizes, from No. 6 down to No. 1, thence from one 0 to 000000. For carriage painting the sizes between one and four naughts are considered best, the smaller ones may be used, but it is advantageous to use as large a brush as possible on most of the work. Small brushes called tools are numbered from 1 up to 10, the latter being the largest. Brushes are generally used in sets, as, for example, in painting a body or gear, a large brush for laying the paint would be used, and a small tool for cleaning up around the moldings, nuts and bolt-heads. It would be an almost endless task to illustrate and describe all of the many varieties of paint and varnish brushes, and a few of the principal ones only will receive attention here. Russia is the great bristle growing country, and her exports reach as high as 5,000 tons of this commodity every year. Hogs in countless herds roam the deep Muscovite forests, where the oak, the pine, the beech, larch and other nut bearing trees cover the ground with acorns and nuts to the depth of a foot or more. But these swine are not all of value for their bristles. The perfect bristle is found only on a special race, and that race fattened in a certain way. On the frontiers of civilization all over the Muscovite territory are the government tallow factories, where animals reared too far from the habitation of men to be consumed for human food are boiled down for the sake of their fat. The swine are fed on the refuse of these tallow factories at certain seasons, and become in prime condition after a few months' feeding. It is from these animals that the bristles of commerce mainly come. When the swine are fattened, and their bristles in fine color, they are driven in kraals so thickly that they can scarcely stand—irritated and goaded by the herdsmen till they are sullen with rage—

kicking, striving, struggling and scrambling together in feverish rage, they are seized one by one, by the kak koffs, a class of laborers educated to plucking swine, and their bristles pulled out by the roots. The perspiration into which the poor creatures are thrown by their exercise causes their bristles to yield easily. The process is pleasant neither to the eye nor the ear. The hog strenuously resists with loud outcries, and vehement opposition. It does no good. Once seized, he is instantly divested of

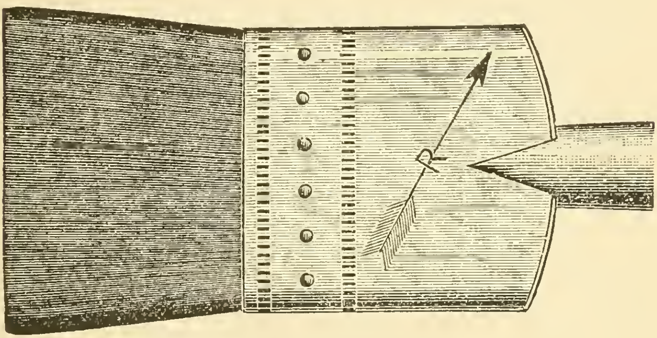


Fig. 3. Fitch Varnish Brush.

his clothing and then immediately released, goes grunting off to the woods.

The so-called French bristles are principally from Russia stock, cleaned and bleached to render them white and exceedingly elastic, yet soft as an infant's hair. From these are made the fine pencils of the artist. Length, elasticity, firmness and color are elements that constitute their excellence, and the bristle expert can readily assort them for their special uses.

The ordinary paint brush for general work is made either from selected Russia bristles, or with an inferior gray center, inclosed by fine white bristles. Carriage and wagon painters usually select the best Russia bristles, and the size known as 0000 is used for rough-stuff and foundation coats, while the house painter would choose a larger one possibly. A new brush of this description will not work well unless bridled, that is having an extra binding added, and this may be done in several ways.

By winding a strong cord around the bristles to about the middle of the same, or, as far from the original binding as desired. By covering a portion of the bristles with leather stitched on tightly. By wrapping a piece of muslin around the brush, then tying a cord at the center of the bristles turn the muslin back and tie it securely to the handle. By using a patent metallic band or binder, and by other means, the object being to shorten the exposed bristles until the brush is partly worn down, when the extra binding may be removed.

Badger-Hair Varnish Brush. The badger-hair brush is next in importance. It is well bound in tin, hair set in glue, handle nicely japanned, and chisel-pointed. For varnishing small panels or parts of a body it has no equal. The best badger-hair is imported on the skin from Germany and Russia.

Camel's-Hair Brush. For laying fine color no better brush can be had than the camel's-hair brush, called by some mottlers, by others blenders, and again by others spalters, each term, however, is foreign to the American painter, and the camel's-hair brush is by far the most appropriate, and most commonly used. The hair used in these brushes, however, is not all taken from the camel, much of it being from the tail of the Russian brown squirrel. The hair is first cut from the tail with scissors, the wool or under fur combed out, and then tied in bunches ready to be straightened. This requires skill and practice. The hair is placed in metal cups having a thick, loaded bottom, and by quick motion of the hand, drummed on the bench for a considerable time, until the pointed or fine ends are all even with each other. In the process of cutting and cupping the lengths are kept separate as far as possible. The hair is now ready for the brush-maker, who cups and combs it out, weighs the quantity required, and places it into the ferrules or tin bands. It requires skill to handle the short, slippery hair and keep it in shape. It is not many years since work of this kind was all done abroad. Now, it is claimed by experts that the American manufacture of most kinds of brushes excels the foreign goods. The chiseled camel's-hair brush is something entirely new, and is certainly a very fine brush and well calculated to do smooth, particular work. Another class of these goods are made extra thick and from picked camel's-hair, the binding of brass having its edge turned under, which gives additional security to the hair and prevents cutting the hair on the edge of the binding, which too frequently happens.

Camel's-Hair Tool. Small brushes, called tools, made of camel's-hair are used for blacking irons, lacquering, and other work of like nature. The next brush to be considered is the camel's-hair duster, a tool used mostly by gilders in removing the loose gold leaf from their work when gilding. These are bound in split quill and fastened with wire. The next to claim attention is the gilder's camel's-hair tip. This is made by laying a thin layer between two pieces of card-board and gluing the whole firmly together; it is used to lift and carry to the work the pieces of gold leaf. A slight moisture or stickiness is given the hairs by simply passing them over the face or hair of the head, and then the gold leaf can be easily lifted from the cushion on which it has been cut and dexterously laid upon the gilding size.

For painting walls a large flat bristle brush is used, made of all white bristles, bound in copper, brass or galvanized iron. It has always been a difficult task to make a wall brush to stand the hard usage it generally receives, but now that machinery of the most approved pattern has been introduced in the brush factory these brushes are made under warranty.

Flat Bristle Varnish Brush. These are made of the best white bristles, set with glue, doubled nailed, soft yet very elastic, with chiseled points. They are considered the best brush made by many of the best varnishers. They are put up in sets from one inch in width to three inches. These brushes, if used with care, will wear a long time.

Flat Chiseled Brush. Flat paint brushes are preferred by some. These are chiseled or ground off on the sides to form a thin edge. They are bound in tin or rubber and are graded in size by their width.

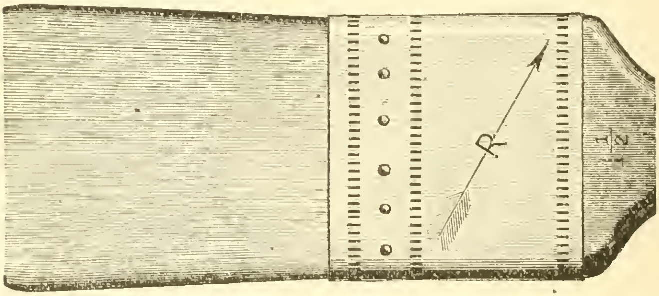


Fig. 4. Flat Varnish Brush.

Flattened Round Tool. This is superior to the sash tool for cleaning between the spokes, and for finishing around the various parts of the gear. This brush is tin-bound, well riveted, and the bristles are set in glue, which is insoluble in turpentine and oil, and therefore superior to the cement used by some brush-makers. The size best suited for the carriage painter is about one and a quarter inches in width. This is also an excellent tool for varnishing, in trimming up around moldings.

Fitch-Hair Brush. This brush was formerly in extensive demand as a varnish brush but of late years the badger has supplanted it, owing, in a degree, to the numerous imitations in the market, and also to the liability of the rotting away or breaking of the hairs when in use. The hair is mostly from the tail of the skunk.

Sash-Tool. A sash tool, or small brush, is necessary as an auxiliary to the large brush, for cleaning up in corners, etc.

Oval Varnish or Paint Brush. As the under parts of a carriage are not rubbed with lump pumice-stone, the same as the body, the paint must be applied with greater care, and the 000 oval brush will work best, laying the paint smoothly and leaving but few, if any, brush marks. The chiseled brush should always have preference over a partly worn one, as the bristles are as a rule softer upon their extreme ends.

The Care of Brushes. However good a brush may be it will soon be ruined unless it is properly treated when out of use. The following hints will suffice as a guide in this respect:

Writing Pencils. Wash in turpentine until quite clean, and if they are not to be used for some time, dip in olive oil and smooth from heel to point.

Stipplers. Wash thoroughly in pure soap and hot water, rinsing with cold water. Place point downwards to dry.

Varnish Brushes. The best method of keeping varnish brushes is to suspend them in the same description of varnish as that they are used for. As this is not always possible, boiled oil may be used instead.

Brushes made for Use in Color should first be soaked well in water to swell the bristle in the binding. This applies also to whitewash brushes which are bound either by wire or leather.

A Brush after use should be thoroughly cleansed out in turps or soap and water. If left in water any length of time they are liable to twist, and the bristles lose their elasticity.

A Brush made for Paint should not be used in varnish, the spirit of which dissolves the cement with which it is set, and loosens the bristles. When a ground brush has been well worn down in color, it may be used in varnish.

Varnish Brushes when not in use should be suspended in either varnish or oil, the brush not resting on the bristles. No brushes should on any account be kept in turpentine.

Stippling Brushes should be well cleaned and dried after use, the bristle being carefully kept from crushing; a box in which they can be slid, allowing the bristle to hang downwards is recommended.

Should a Brush become quite hard with Paint it should be soaked for twenty-four hours in raw linseed oil, after which time in hot turpentine.

Cleaning Paint Brushes. All brushes, after being used, should be carefully cleaned. This is best effected by immersing the hair of the brushes in a little raw linseed oil, the oil should afterwards be washed out with soap and warm water, till the froth which is made by rubbing the brushes on the palm of the hand is perfectly colorless. The brushes should next be rinsed in clean water, and the water pressed out by a clean towel. The hair should then be laid straight and smooth, and each brush restored to its proper shape, by passing it between the finger and thumb, before it is left to dry. Care should be taken not to break the hair by too violent rubbing, as that would render the brushes useless. Many painters use turpentine instead of linseed oil in the cleaning of brushes, it effects the object more quickly, but the only use of turpentine that should be permitted is to rinse the brushes in it slightly when it is required to clean them quickly, but on no account should they be permitted to remain soaking in turpentine, as this practice is certain to injure the brushes, rendering the hair harsh and intractable, and frequently dissolving the cement by which the hair is held in the socket of the handle.

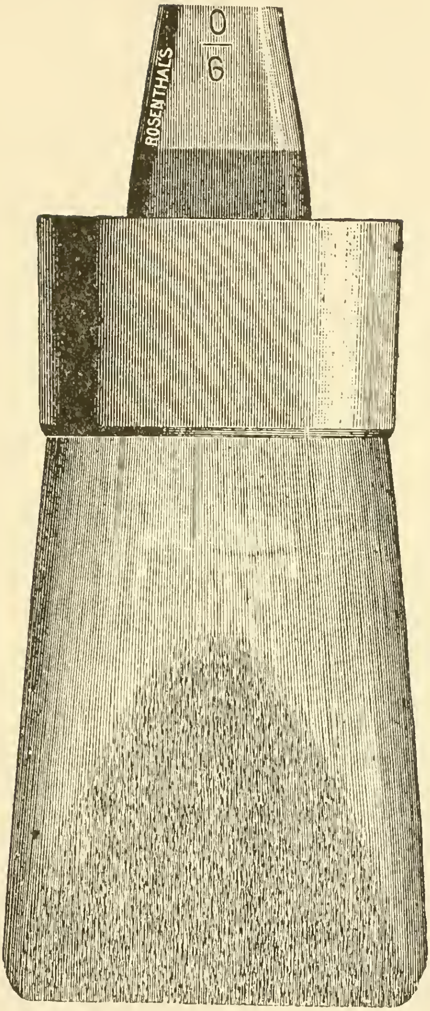


Fig. 5. Oval Chiselled Varnish Brush.

CALCIMINING.

Plaster ceilings are usually finished with calcimine, which, besides the advantages of cheapness and of covering in one coat, where with oil paint three would be required, shows superiority in many other respects.

In places where people congregate, the moisture in the atmosphere, unless the ventilation of the apartment is exceptionally good, will condense upon a painted surface and run down the walls. When calcimine is used in such situations, no unpleasant effect is seen, the distempered surface will absorb the moisture for the time being, and ultimately give it forth again without any detriment to its color.

This property of distemper also indicates the necessity of removing, with brushes and water, all old coloring and calcimine from the ceiling, instead of which, the dirty unhealthy coating is in many cases coated over with size. The size binds the dirt, and the opacity of the distemper does not show the dirt through, nevertheless, it is a practice to be condemned by all who desire sanitary homes. This labor-saving plan would be used to a greater extent but for the fact that continuous coats of distemper and size soon discover the bad worker by the surface cracking and peeling off, owing to excess of size.

When about to calcimine a ceiling, the first thing is to have the room as clear as possible, and to protect the wall-paper.

Next with hot water thoroughly wash off from the ceiling the old calcimine, being careful to wash only the ceiling, and not to let the dirty water run down the wall-paper nor splash about.

It is important to have the board at such a height from the floor that the ceiling can be comfortably reached. Have at each end of the board a pair of steps. Now, with a pail of clean hot water, a distemper brush, a large piece of sponge, and a piece of coarse canvas on a board or table, start at one corner of the room to lay or soak in a patch with water, gently stirring the old distemper with the brush. Get the old distemper thoroughly soaked, then wash it off with the canvas, finishing with the sponge, frequently rinsed in water. This is to get rid of every trace of the old distemper. This is a most important process, which cannot be too strongly insisted upon. Neglect in this part of the work will result in a dirty or uneven appearance in the finished ceiling. If only the loose portions are removed, even the most skilful application of calcimine cannot hide the patches. They will be either of a different color or else will show the shade from a different level of surface. Do not wet the surface more than necessary, and frequently change the water as it gets dirty. Sometimes the calcimine is especially difficult to get off on account of the original coat having been bound down, as it is called, instead of having been washed off before it was last calcimined, which is very often done for the sake of cheapness. Liquid ammonia in a separate pail half full of water will greatly assist when soaking bound distemper. Avoid touching the wall-paper with the brush, but finish the last inch or so of margin with the sponge or canvas.

When the surface of the ceiling has dried, any rough patches there may be should be scraped or rubbed smooth.

If there are any cracks in the ceiling, run the point of a small trowel along them, to clear out any loose bits; with a sash-tool wet the parts of the ceiling where the cracks are, and then, using a stopping-knife, fill them in with plaster of Paris mixed with water in which a little alum has been dissolved. A little whiting mixed with the plaster will keep it from setting too quickly.

Or mix fine plaster of Paris with glue size, and fill up holes and cracks, and when dry level with a knife or coarse glass-paper. Whiting mixed with glue water is also suitable. Use a square piece of wood to mix the cement upon, and nail a handle to the other side.

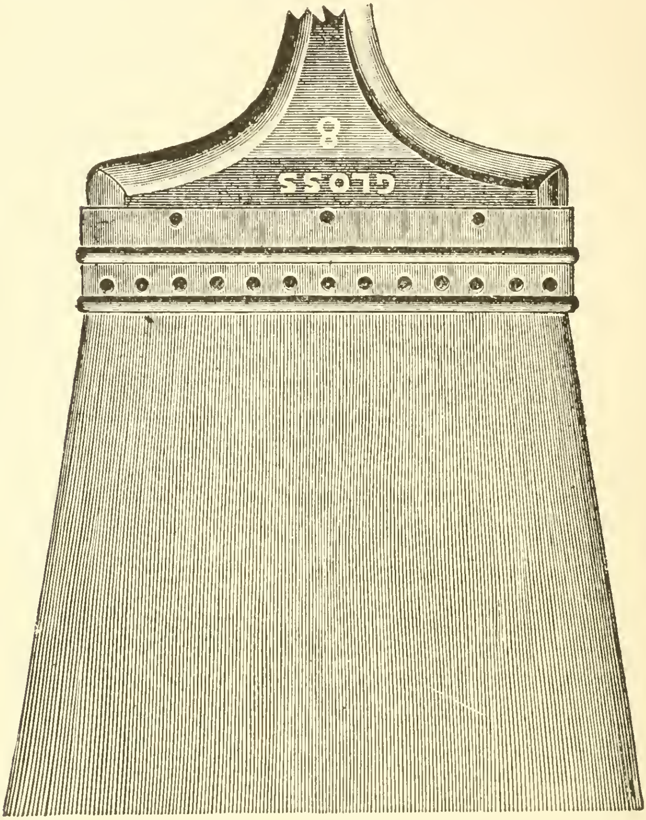


Fig. 6. Wall Brush.

If the cracks are bad, they should be cut out, the face of the plaster on each side cut away for half an inch, and the gap then finished to a level surface with plaster laid on with a small trowel. A broad thin strip of wood with a bevelled edge is very useful when stopping plaster walls, for in trying to stop a crack or hole with a sharp steel stopping knife, the surrounding face of the plaster may be badly scratched, which is only seen when the job is finished.

Repairing should be done to new ceilings before the finish is applied, and to old ceilings at the time they are washed off, that is, when the old coating of dirty distemper is removed with water and brushes.

If necessary, when dry, the ceiling can be rubbed quite smooth with glass-paper, and is then ready for re-calcimining, after which, if carefully done, the repaired cracks will be invisible.

If there are stains in the ceiling that cannot be removed by washing, the stain should be painted white, in flat color or paint mixed with turpentine. If this has to be done, it will be well to paint also the filling with which the cracks have been stopped.

Finally, the ceiling should be rubbed down with a cloth previous to applying the calcimine.

To prepare the calcimine, break into large pieces about four balls of whiting, and put them into a pail, and just cover the material with water, let it stand all night. In the morning pour off all water that will run away, and thoroughly mix the wet whiting by hand until it becomes a thick even paste. Add about half an egg-cupful of dry ultramarine blue, stirring it well in with the whiting. Next put 2 pounds of patent size in a saucepan over the fire, with only just sufficient water to keep it from burning, and stirring it all the time, taking great care that it neither boils nor burns. When it is thoroughly dissolved, pour it on the whiting, and mix the whole well together. The proportion of size is about one teacupful to two gallons of the mixture. Now set it aside in a cool place until it turns to a jelly. When it is quite cold, with a distemper brush rub it through a coarse piece of canvas stretched over the top of a clean pail, and it will then be ready for use.

Before commencing the actual calcimining, lightly rub over the whole of the ceiling with a piece of fine glass-paper, to take off any little knots or brush-hairs left on the finishing coat. Then dust the ceiling before proceeding to whiten it.

In laying on the wash, a large flat brush should be employed, and if this is not over-charged a ceiling or wall may, with a certain amount of care, be white or color-washed with little or no splashing. The way to lay the distemper on is not to take up too much in the brush, and not to flick the brush at the end of each stroke, or you will splash everything. Work the brush in any direction, but be sure that every part of the ceiling is covered with the calcimine taking care to keep the edges of the patches going, that is, do not let any edge get dry before coming to it again. To do this, it is essential to have a scaffold that is easily movable from one end of the room to the other. The calcimining must be done very expeditiously, and any ceiling over 14 feet square should not be attempted single-handed without some previous practice.

Ceilings should always be calcimined by working away from the light. Two men are required to do a good-sized ceiling-flat; they should start at the window end, and, keeping their work in one general line, spread the distemper from the end as far towards the center as they can both conveniently reach. The scaffold is then brought forward and another shift covered, and so on until the whole ceiling is finished. The solvent used for distemper work being water, it will be seen that extreme heat or a draught of air, such as will evaporate the water, is to be avoided during the process, but so soon as a ceiling is completed, the object is to dry it off as quickly as possible, and hence it is well to open every door and window to create a draught.

Properly executed distempering should have a level, but

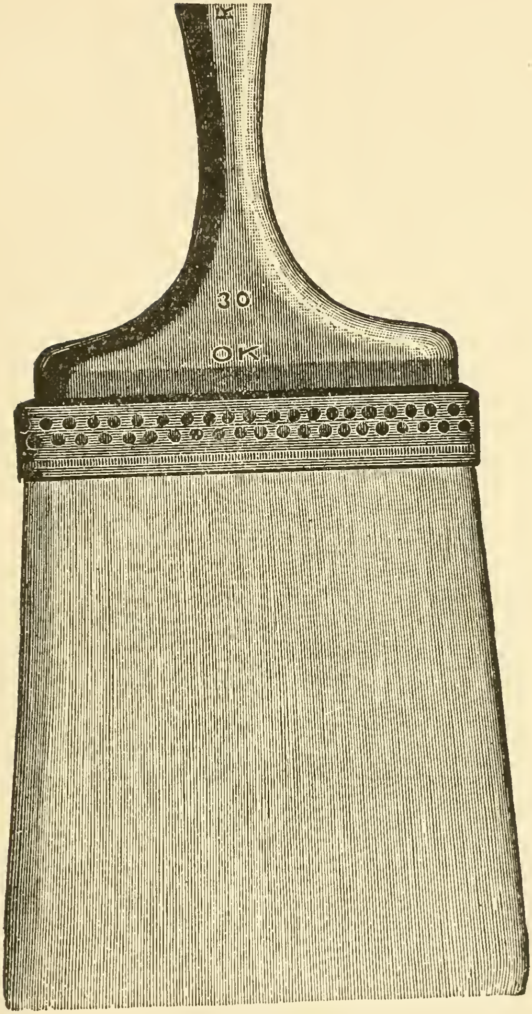


Fig. 7. Wall Brush.

not perfectly smooth, surface, which should show no joints or coarse brush-markings, and should have a perfectly dead appearance, be solid and uniform throughout, and should not rub off by ordinary wear or leaning against.

Distemper of any kind should never be spread over old or dirty stuff, these should be first washed off. An expert will not flap his brush in working well-made distemper, but will use the tip of the brush only, and make very little noise. Calcimine or any distemper can be laid on in any direction from the outer or working edge. Splashes result from the use of watery wash and want of experience in working.

A distemper brush should be worn off a trifle before being used to whiten a ceiling. The work of washing off a ceiling will be sufficient to wear down a new brush to a fit condition. After the brush is done with, wash it out thoroughly and lay it by, before attempting to use it, soak it in water, or the hairs may fall out, through it being too dry. This last caution applies to nearly all brushes used in house decorating.

If there is a delicate ornamental cornice in the room that cannot be got at with the ordinary distemper brush, a smaller brush, called a distemper tool, is used both for the washing off and whitening. In the whitening, push this brush up into the ornamented parts. It does not much matter how the distemper is laid so long as it is put on evenly, and all the surface covered.

There appears to be an idea that a new ceiling requires some special treatment before it is calcimined, but this is not so. Providing that the ceiling has been left by the plasterer in a proper condition, it is a more simple job than whitening an old one, on account of there being no washing-off or making-good to do. The most ordinary cause of failure is that the ceilings are not thoroughly dry before the whitewash is put on. If there is the least sign of sweating or moisture on the ceiling, it may be taken to indicate that the ceiling is not dry, and if this is so, no amount of care in making or putting on the calcimine will make the ceiling white. Another cause of failure may be due to the fact that some people do not consider it necessary to finish a new ceiling. This is also a mistake, for the finish stops absorption, and if there is a little whiting in it, it helps to cover, and, moreover, makes the distempering a much easier job, as it prevents it dragging, and, to use a painter's term, the distemper spreads like butter. The addition of a little alum is also an improvement to the finish.

The following is a brief list of tints that are most usually required on ceilings and the method of producing them:

Cream. A variety of cream colors of different shades and hues are produced by mixing ochre, which gives a yellowish cast. A little umber or Venetian red may also be added.

Gray. A nice effect is produced by a gray ceiling, especially when the walls are highly colored. Blue black is the best for the purpose.

Green. Very light greens look very pretty, but if they are too dark the effect is wholly spoiled. A variety of lime greens are made suitable for mixing with lime, and a very small quantity will be required. A touch of blue black may also be added when a neutral green is required.

Pink. A little Venetian red gives a nice pink, but if something more pronounced is required lake may be used.

Blue. A large variety of blue tints can be obtained by using the color sold under the name of "lime blue." These blues are really a variety of ultramarine.

Browns. Very light browns may be obtained by using sienna or umber or a mixture of both.

Almost as great a variety of colors in distemper may be obtained as in oil colors, but certain colors cannot be used with whiting at all. The following is a list of them: Prussian blue, Antwerp blue, Naples yellow, vermilion, lakes and chrome yellows. White lead and red lead are also unsuitable for the purpose.

For all ordinary distemper work one of the many sanitary distempers which are to be obtained in a wide range of colors is recommended. They are sold in dry form, and require but the addition of water to render them ready for use.

The secret of success in applying distemper is to get as much on the surface as possible without making a mess

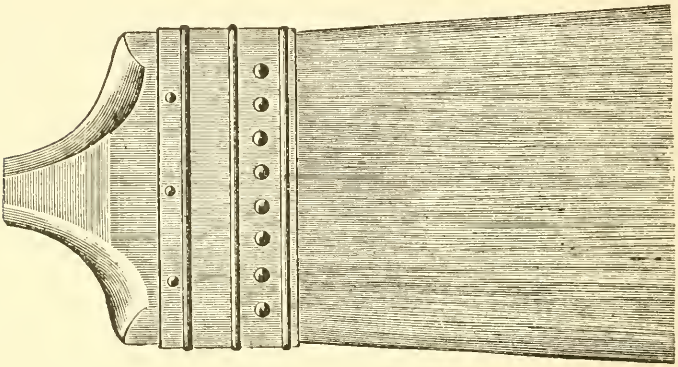


Fig. 8. Wall Brush.

or splashing any of it on the walls and floor. The brush must be used smoothly, and not slapped against the work. Dip fairly deeply and squeeze out some of the calcimine. Then apply all around as far as the brush will reach. Be very careful not to go over the work a second time. Distemper is unlike oil paint. If it does not look satisfactory when applied, the only thing to be done is to wash off and commence again. It is usually necessary to have a stick in the pail with which to occasionally stir up the mixture.

CARRIAGE PAINTING.

After the body is completed by the wood-worker, the painter gives it a thorough dusting inside and out, and proceeds to prime it. Pouring from the can a small quantity of filler with an ordinary paint brush, perfectly clean, or one kept for the purpose, and not used for paint, he coats over a portion of the body, the back, or one side, taking no great pains to spread it evenly, he may daub it on, then immediately wipe over and rub in every part with rags. This rubbing with rags spreads the priming evenly, and forces it into the pores. Go on in this manner until the whole is done, over wood and iron alike, leaving no surface coat as of paint or varnish, the hand should scarcely be soiled or greased if passed over a finished portion of the work. The canvased parts inside, if any, may be painted with slush paint, for they would absorb a great amount of filler with no corresponding benefit. It cannot be too strongly impressed upon the mind of the painter desiring to make a successful use of the filler, that it must be put on sparingly and be well wiped or rubbed into all parts of the work, and that only one coat should be applied.

The body should now be set aside to dry, and forty-eight hours should be given, unless the weather is favorable, when the time may be shortened to 36, and even to 24 hours without detriment. There will be a thin film covering the hard parts of the wood, and the iron work, and the filler being composed principally of oil and a gummy or filling substance will have entered the pores and sealed them against the entrance of dampness or the liquids from subsequent coats of paint.

Priming the Wheels and Under Parts. When the wheels, beds and bars are finished by the wheelwright, and before the grain of the wood is raised by the atmosphere, a coat of filler is put on every part in the same manner as the body, wiping it well with rags, being careful to coat the bottom of bars and tread of wheels, for this material is a bar to all dampness, and will thus render the work more durable. This preliminary coat is not properly the priming, for it is put on to prevent the grain of the wood from absorbing oil and dirt from the smith's hands, and to prevent the rims or felloes from swelling with the water used in putting on the tires. When the ironing is completed, every part of the wood is sandpapered and filed down until nothing but clean wood and iron are seen, and every trace of filler is removed from the surface—for the preliminary coat has fulfilled its mission.

The preparation of the gears at this stage is the main operation, for if they are well done, but little labor remains to be accomplished. The priming is now in order, and going over every part with the filler in the same manner as at first, this is soon ready for standing aside to dry. The wood pores are sealed up, the surface of the wood has a thin film covering it as also the ironwork, and a more tenacious coating is not easily found. The time employed so far upon the gears has been trifling, compared to the old-fashioned method of filling up with white lead and oil.

White Lead Priming. White lead, the base or foundation, should be pure, but dealers have many means of adulterating it with sulphate of baryta, or barytes, gypsum, or plaster of paris and carbonate of lime, or common chalk, all of which are detrimental. Linseed oil, the purest raw oil, should be used, but this is often adulterated with fish oil or cotton-seed oil. The next requisite is pure black, in order to form a gray or lead color. With these ingredients the priming is formed. The white lead is beat up with the raw oil until of paint-like consistency, then a little of the black is added to form a clean lead color. Some add driers, such as brown japan or japan gold size, but many

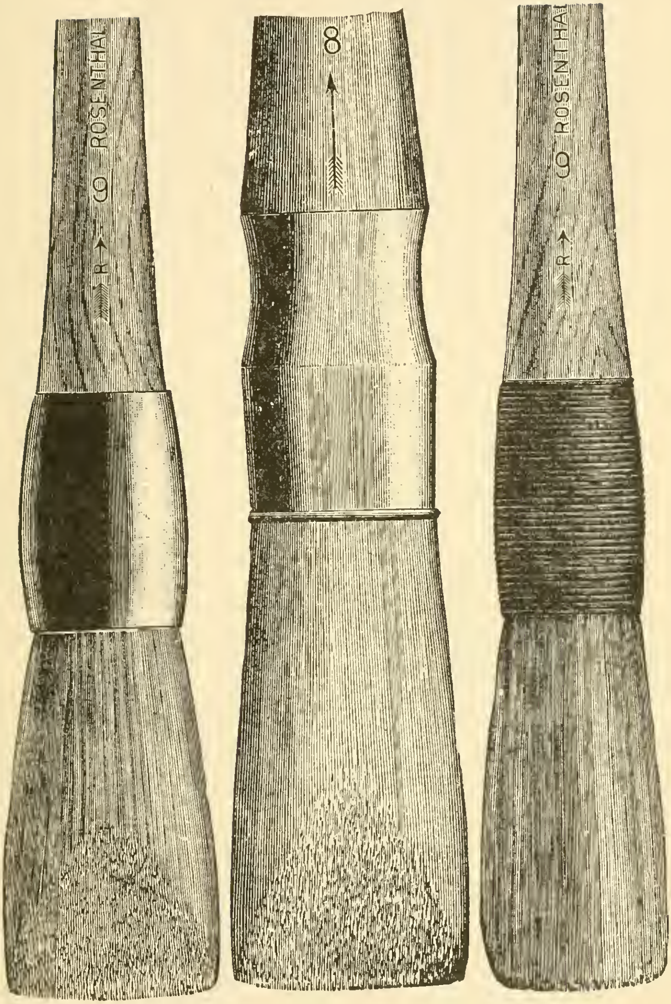


Fig. 9. Sash Brushes.

prefer to use none whatever. The priming thus made is now spread on the wood, and the painter runs the job out in the drying shed or other convenient place to dry. The oil of the priming gradually leaves the pigments, white lead and black, and seeks the interior of the wood, sucked in, as it were, by capillary attraction, and the pigments are thus virtually strained and left upon the surface in a semi-dry porous state, while the oil that entered the wood, not being a gummy or filling substance, stains the interior of each little pore only. Next, a coat of white lead and oil of similar consistency is put over it. The oil from this coat is absorbed in by the porous pigments, through which it passes and spreads itself over the stain which the first coat gave to the pores, and the second coat pigments are strained and left porous, so on until possibly five coats of lead color are given, by which time the pores may have become filled by the successive layers of oil, and the pigment on the surface too, is finally cemented together or partially so. This is called the foundation, and it was the only known way to paint a carriage for many years.

Rough-Stuff. The leveling or rough-stuff coats consist of a coarse mineral paint, designed to level down or fill up all imperfections in the surface of the carriage body, such as plane and file marks or brad holes.

The pigment is mixed with oil, japan varnish and turpentine, and although the painter may have a good recipe for this paint, and may mix it himself, he cannot rely upon getting exactly the same amount of elasticity at one time as at another time, if mixed in small quantities. Therefore the ready-prepared paint, mixed from a formula, which experience and careful tests have proved best, and mixed in large quantities by weight and measure is by far the surest and safest to use. The filler priming on the body being dry, it only requires a good dusting when it is ready for the rough-stuff. This for the first coat should have a very little raw oil added to make it more in keeping with the elastic priming, and it must not be spread too thick, thick coats are apt to show brush marks, and brush marks in the rough-stuff will show in the finishing varnish. Put the rough-stuff on smoothly and set the body away for 48 hours to harden, or, if preferred, when 24 hours have passed the largest holes may be puttied part full, then give the other 24 hours for drying.

The second, third and fourth coats of rough-stuff may be put on one day apart, then a thin coat of stain, to guide the workman while rubbing, some yellow ochre or other cheap pigment mixed in japan and turpentine, may be added.

Rough-stuff will always give better satisfaction when applied in a medium thin coat. It is entirely against common sense to plaster on a great mass of this paint, with the desire to level the work quickly.

When the work of rubbing is completed, the body should be washed clean, and well dried off with a chamois skin, then set aside for the evaporation of moisture from the porous paint.

This drying out is of vital importance, and should never be neglected.

Rough-stuff, providing it is good-rubbing rough-stuff, is necessarily porous, no matter what pigment or vehicle is used, and a portion of the water used in rubbing is absorbed by it, therefore it is essential, after the moisture has all been evaporated, that the pores be closed, in order that the oil of subsequent coats may not be absorbed by them.

It is the aim in this system of painting to form a non-absorptive surface, and it will be seen that if the filler closed up the pores of the wood it will assuredly close up the pores of the leveling paint, therefore, a coating is applied to the rubbed surface of paint in the same manner as in priming the wood, wiping off all that will readily leave the surface, thus rendering the paint elastic, yet proof against the entrance of oil from all subsequent coats of color or of varnish.

Coloring the Body. The filler put on over the rough-stuff having been allowed from 24 to 48 hours for drying, the coloring is now in order. The surface must not be disturbed by sandpaper, but a simple dusting off may be necessary. It is customary with some painters to lay on a ground coat of some color corresponding with the color they intend to make the job, but this is more to economize time in making a solid job and to save expensive color, and with the exception of a few extra fine or transparent colors, which are intensified or made more brilliant by application over par-

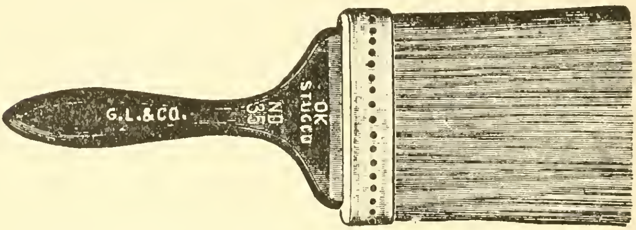


Fig. 10. Stucco Wall Paint Brush.

ticular grounds, the color proper may be laid directly on the prepared surface.

For black, either lamp black or coach black may be used for the first coat, having sufficient oil in the mixture to cause an egg-shell gloss, lay it on with a camel's hair brush and give 12 hours for drying.

To better illustrate the painting of a body, take, for example, a job to be painted a dark green, which is a standard color and one of the most durable colors used in carriage work, and carry it through to the finish. The panels only are to be put in color, the remainder to be black. The first duty is to prepare a ground or preparation coat, and the following will be found a good formula:

To produce a dark green ground, mix lamp black and chrome yellow, with coach japan and turpentine to a proper consistency for grinding in the mill, approximating as nearly as possible the desired shade of green. When ground add a tablespoonful of raw oil to a pint of paint, and when well stirred together test its drying qualities by spreading a little on the thumb-nail and blowing upon it to hasten evaporation, if it dries dead add a few drops of oil or rubbing varnish, or if too glossy add turpentine until an egg-shell gloss is obtained.

This ground work or preparation coat should be put on with a camel's-hair brush as smoothly as can be, allowing no laps or brush marks to remain visible.

The black portions are next to be done, and this paint may be mixed in the same manner as the green, of lamp black or ivory black. When all is coated set the job aside to dry until the next day, at which time it should be well inspected and if any scratches or indentations are found, soft dark putty must be used to fill them, then rub over gently with No. 1 sandpaper, partly worn, to prepare it for the color proper, dark green and ivory black. The dark green may be made as follows:

Pulverize, on the stone, some Dutch pink, and mix it with half and half japan gold size and turpentine and grind it fine. Then mix in the same manner some Prussian blue and grind it into another cup. Now, little by little, add the blue to the Dutch pink, stirring it constantly, until the desired shade of green is obtained, and temper the mixture with raw oil in the same manner as explained for the ground coat. Apply with camel's-hair brush. The back parts may now receive another coat of ivory or drop black. If ready-mixed colors are used, instead of mixing them as above, take royal green for the green parts, and jet black for the black portions, tempering them as described with oil.

It is the usual custom to make color-and-varnish by adding to a partly filled cup of varnish a little color, but it is considered best by some of the first-class painters to grind the dry pigment directly in varnish, and thus overcome the objection to the oil and turpentine in the color-and-varnish. However, in the work in hand it is desired to produce a rich or deep shade of green, and to carry out the plan, the color is glazed, instead of putting on color-and-varnish, in its ordinary mixture. Yellow lake possesses the power, when used for a glazing over green, to increase the intensity or depth of the color, and many handsome shades are made in that way. It may be mixed as follows:

Pulverize the lumps and mix it in hard-drying body varnish, grind fine, then add a very little of the Dutch pink

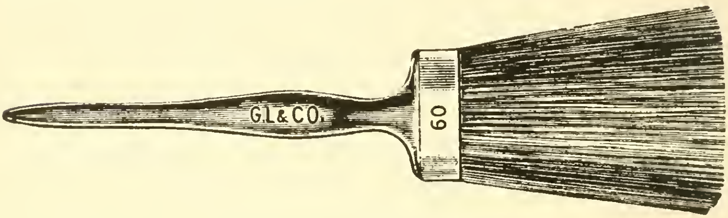


Fig. 11. Painter's Duster.

color. Stir well and apply with badger-hair varnish brushes.

The black parts are now ready for color-and-varnish and as in the case of the panels, a first-class black is desired, so, instead of using ordinary color-and-varnish, black japan is used. Three coats of this well rubbed with pulverized pumice between each coat, will give a good, jet-black surface for finishing over.

The glazed panels having been rubbed lightly with pumice-stone, and a coat of hard drying body varnish given, at the time the black japan was applied, the whole is now ready for a final rubbing down and finishing coat of wearing body varnish.

The Gears. After 24 hours apply either a thin coat of lamp black color, or a thin lead color, the object of which is to see the open grain and imperfection so that putty may be used to plaster over and fill them. The surface of the filler must not be rubbed, the paint should be applied as smoothly as possible, for no great amount of sandpapering is to be done. Putty all imperfections after the paint has dried, which will be about 48 hours, for this first coat over the filler should be a little more oily than is necessary in any other coatings.

When the putty is dry, gently rub over with fine sandpaper, but do not cut through the paint. When done, dust off, apply the color and color-and-varnish, as usual, moss down, give a second coat of color-and-varnish, rub this latter with pumice-powder, wash off, stripe, and give a coat of clear elastic leveling varnish, let dry, rub again and finish with elastic gear varnish.

Mediums. These are requisites, and upon the kind used and upon their quality depends, to an extent greater than is generally supposed, the appearance of the finished work. The mediums are, as their other general name of vehicles indicates, the carriers of the paint, the means by which it may be spread. The mediums in general use and which give every satisfaction are of two kinds, a spirit and an oil, the latter being the vehicle proper, the former, the thinning agent to render practicable the spreading of the mixed oil and paint in a coat of any desired depth or thickness. The spirit and the oil are both either of turpentine or of tar, spirit and oil of turpentine being used together, and spirit and oil of tar.

Turpentine. The ordinary turpentine of the house-painter will answer the purpose, but it will be found best to procure rectified spirits of turpentine as sold by the druggist, which is as clear as the proverbial crystal, and as limpid as the purest water. The common turpentine may be used for washing brushes. The oil of turpentine is also known as fat oil. It is viscid, much of the consistency of golden syrup, and has something of the color of clouded amber. This may be purchased for a few cents a small bottle, but it may be prepared from spirits of turpentine by any one, thus: Into a flat saucer pour a little spirits of turpentine, say a tablespoonful, according to the size of the saucer, and over the saucer place a layer of muslin, sufficiently close in texture to prevent dust getting to the turpentine, and yet not so close as to prevent evaporation. The saucer with the muslin drawn tight over it should now be put in a place where evaporation will be free, but not over the fire or stove so as to hasten evaporation, or the heat might dissipate the whole. When the spirituous part of the liquid has passed off there will be found left the oil at the bottom of the saucer. Fresh spirit may be added, and the process repeated until there is enough oil to pour off.

Tar. The spirit of tar is in two shades, one a rich amber, the other a dark brown, but both are alike in nature. The oil of tar corresponds to it in the same way as the oil of turpentine does to the spirit of turpentine. The spirits of oil of tar are of similar use to the other spirit and oil, and are employed principally by those who object to the vapor of the turpentine as causing headache or affecting the throat. The spirits of turpentine and of tar are extremely volatile, the former being somewhat more so than the latter; and

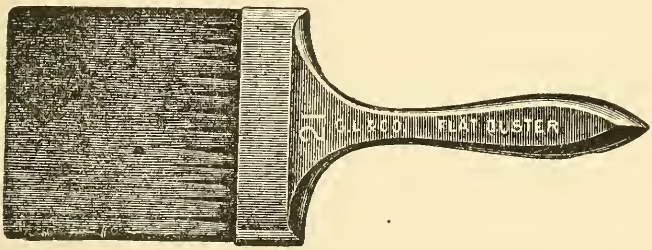


Fig. 12. Painter's Flat Duster.

during the working, sufficient may pass off to render the paint somewhat troublesome to deal with. This difficulty is, however, only a slight one, and is easily overcome by the use of a little

Oil of Lavender. Oil of spike, as it is sometimes called, is a perfectly volatile and fluid oil, but very much less volatile than either of the above mentioned spirits, and a small quantity is added to the other mediums used when it is desired to keep the work open, to counteract its drying or fattening through loss of spirit.

The mediums should be kept in bottles with closely fitting stoppers, especially the spirits, as otherwise these would quickly become "fat" by evaporation.

Paint. The colors used in painting upon china or earthenware are, for the most part, oxides of certain metals. A few colors, however, such as the deep transparent blues, and yellows from one source, are really, to a certain extent, stained glass, the glass having more or less completely dissolved the coloring matter. China or enamel colors then, from their containing, as an essential constituent, a glass or flux of vitrifiable composition, are called vitrifiable pigments.

The following list of colors in dry powder will serve all purposes:

Black.
- Soft.
- Deep.

Blue.
- Azure.
- Old Tile.
- Turquoise Outremer.
- Schwartzenburgh.

Brown.
- Austrian.
- Brunswick.
- Chestnut.
- Chocolate.
- Fawn.
- German.
- Golden.
- Olive.
- Sepia.
- Vandyke.

Carmine.
- Carmine.
- Pink.
- Rose Coral.

Gray.
- Black.
- Pearl.
- White Shadow.

Green.
- Celadon.
- Deep.
- Dover.
- Emerald.
- Gordon.
- Rose-leaf.
- Sevres.

Orange.
- Dark.
- Light.
- Opaque.
- Strong Deep.

Purple.
- Ordinary.
- Royal.
- Ruby d'Or.

Red.
- Flesh.
- Ordinary.
- Salmon.
- Scarlet.

Silver.
- Prepared.

Violet.
- Lilac.
- Mauve.
- Violet.

White.
- Hard.
- Medium.
- Soft.

Yellow.
- Buff.
- Ivory.
- Light.
- Opaque.
- Persian.

Moist Oil-Colors. These, as well as moist water-colors prepared expressly for this kind of painting, can be purchased at any large paint dealer's store.

Having all the general requisites at hand we are ready to begin work. Before, however, we bring out the brushes and mix the colors, we must decide where the color is to go when it is mixed. The first concern is the design, and this whether we intend to have a background or not. Therefore, the first operations will be directed toward producing the outline.

According to the method which may be adopted for sketching the outline, there will be required a black lead pencil, HB or B, lithographic crayon, a tracing point, tracing paper, transfer paper, a pounce, Indian ink, rose pink, or lamp black, and gummed paper or modelling wax.

Lithographic crayon may be made by mixing 32 parts bees-wax, 4 parts purified tallow, 24 parts soap, 1 part nitrate of potassium, dissolved in 8 parts water, 6 parts lamp black.

The surface of the china having been thoroughly cleaned by washing and dried, the design may be marked on by either of the following plans: By marking with lithographic crayon, black lead pencil, pricked stencil pattern and pounce-bag, copying or transfer paper. The design being drawn on the ware proceed to mix the color with the mediums. Different pigments require different proportions of medium, and the same pigment requires varying proportions, according to the end sought. It may be said generally that the ordinary blues, rose, and purple take most fat and the yellows the least. More fat, again, is required when it is desired to lay color flat, as in backgrounds, either with the brush, or when the use of the dabber is contemplated, or to have the color flow to a very slight extent as in delicate shading, or to lay a very thin tint.

Powder Color. In mixing powder color, the orthodox direction is to lay a little powder on the slab, and add to it just so much oil as will make it into a thick paste, to be subsequently reduced to the requisite thinness by spirit. The grinding is done on the slab with the muller, and when ground to a thick cream consistency it is called prepared color.

Moist Oil-Color. Those who adopt moist oil-color in tubes will find that the color when fresh contains exactly the right quantity of oil. The color only requires thinning to be fit for use.

Moist Water-Colors. Require no grinding, simply dilution, but it must be remembered water-colors cannot be used where the outlines are made with lithographic crayons.

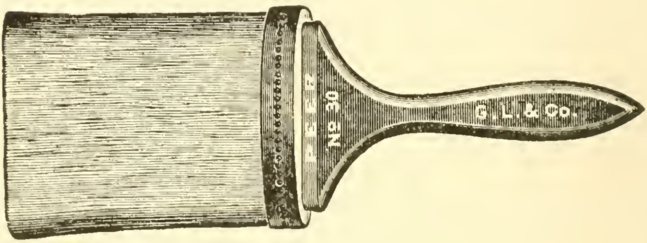


Fig. 13. Stucco Wall Paint Brush.

for these being greasy would grease the brush, and the water-color instead of laying flat, would ridge and spot.

Firing. The ware being painted the next step is to make the work imperishable by fire; this part of the process need not be done by the painter, for the maintenance to a nicety of different definite degrees of heat in furnaces of special adaptation are not to be found united except in factories devoted to the business. If the painting has gone to the kiln with too much oil in it, it is certain that the color will blister. If it comes back with a dry powdery look, with the color scarcely adhering, it shows that the color was over-diluted with turpentine.

The remedy for dryness is simply repainting, using more oil. The remedy for blistering is simply chipping off the blisters, and then rubbing down the irregularities.

COLORS.

Blacks. Lamp black is the soot produced by burning oil, resin, small coal, resinous woods, coal tar or tallow. It is in the state of very fine powder, works smoothly, is of a dense black color and durable, but dries very slowly in oil.

Vegetable black is a better kind of lamp black made from oil. It is very light, free from grit and of a good color. It should be used with boiled oil, driers and a little varnish. Raw linseed oil or spirits of turpentine keeps it from drying.

Ivory-black is obtained by calcining waste ivory in close vessels and then grinding. It is intensely black when properly burned. Bone-black is inferior to ivory-black, and prepared in a similar manner from bones. In Europe some other blacks are used, but are seldom met with in this country.

When camphor gum is burned and the soot collected by means of a paper funnel or a saucer inverted over it, the result mixed with gum-arabic will be found far superior to the best ivory-black.

Black japan is a composition of asphaltum and oil, and is a liquid of about the same consistency as varnish, of a jet-black color, although of a brownish tint when applied over a light color, or on tin or glass. While ordinary blacks have a greenish hue when varnished, this article will retain its jet color. It has no grains as a mixture of pigment and varnish, and its flowing qualities are good. Many err in supposing that it will cover at once, and thus take the place of color, and furnish with two or three applications a perfect surface over any ground, but this is not the case. It was never intended for such a purpose, it is semi-transparent, and when put upon a white ground produces a brownish tint or glaze.

Besides the black pigments described above, there are several other substances known as Prussian black, black lake and tannin black, which have been proposed as black pigments, but their use is so limited that it is not necessary to give a description of them.

Frankfort black is made of the lees of wine, from which the tartar has been washed, by burning in the manner of ivory black. Similar blacks are prepared from vine twigs and tendrils which contain tartar, also from peach-stones, etc., whence almond black and peach black, and the Indians employ for the same purpose the shell of the cocoanut.

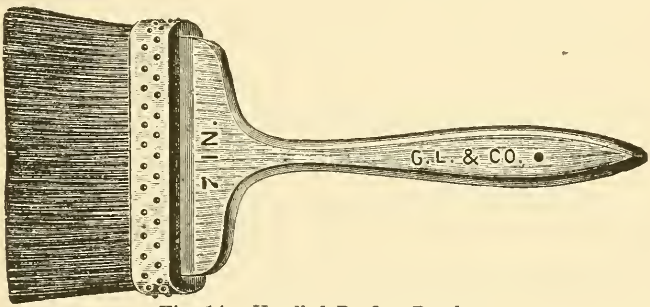


Fig. 14. Handled Roofing Brush.

Inferior Frankfort black is, in fact, merely the levigated charcoal of woods, of which the hardest, such as box and ebony, afford the best. Fine Frankfort black, though almost confined to copper-plate printers, is one of the best black pigments we possess, being of a fine neutral color, next in intensity to lamp black and more powerful than that of ivory. Strong light has the effect of deepening its color, yet the blacks employed in the printing of engravings have proved of very variable durability. It is probable that this black was used by some of the Flemish painters, and that the pureness of the grays is attributable to the property of charred substances to prevent discolorment.

Blue black is a well-burnt and levigated charcoal, of a cool neutral color, and not differing in other respects from the common Frankfort black. Blue black was formerly much employed in painting, and, in common with all carbonaceous blacks, has, when duly mixed with white, a preserving influence upon that color in two respects, which it owes chemically to the bleaching power of carbon, and chromatically to the neutralizing and contrasting power of black with white. A superior blue black may be made by calcining Prussian blue in a close crucible, in the manner of ivory black, and it has the important property of drying well in oil. Innumerable black pigments may be made in this way by charring.

Vegetable black is a pigment now very extensively employed, superseding to a great extent the use of lamp black, to which it is in every way superior. The best way to procure it is to buy it in a dry state, in which it resembles soot, and is so exceedingly light that an ounce or two will fill a gallon measure. It is free from grit, and only requires to be rubbed up with a palette knife on a marble slab, instead of grinding. It should never be diluted with linseed oil, because, if it were, it would never dry, and it is not advisable to employ turpentine, but always the best boiled oil, and a little varnish will improve it. A small quantity of driers should be added, to ensure its drying with a uniformity of surface.

Blues. Prussian blue is made by mixing prussiate of potash with a salt of iron. The prussiate of potash is obtained by calcining and digesting old leather, blood, hoofs or other animal matter with carbonate of potash and iron filings. This color is much used, especially for dark blues, making purples and intensifying black. It dries well with oil. Slight differences in the manufacture cause considerable variation in tint and color, which leads to the material being known by different names, such as Antwerp blue, Berlin blue, Harlem blue and Chinese blue. Indigo is produced by steeping certain plants in water and allowing them to ferment. It is a transparent color, works well in oil or water, but is not durable, especially when mixed with white lead.

Ultramarine was originally made by grinding the valuable mineral lapis lazuli. Genuine ultramarine so made is very expensive, but artificial French or German ultramarines are made of better color, and cheaply, by fusing and washing and reheating a mixture of soda, silica, alum and sulphur. This blue is chiefly used for coloring wall papers.

Cobalt blue is an oxide of cobalt made by roasting cobalt ore. It makes a beautiful color and works well in water or oil.

Smalt, Saxon blue and royal blue are colored by oxides of cobalt.

There are a few other blues, such as celestial or Brunswick blue, damp blue and verditer, that are chemical compounds, compounds of alum, copper, lime and other substances.

Brunswick blue is essentially a mixture of Prussian blue and barytes. It is prepared by thoroughly mixing barytes with water, adding a solution of copperas, then a solution of red or yellow prussiate of potash, stirring constantly so as to ensure the thorough incorporation of the barytes with the blue. After filtering, washing and drying, the blue is ready for use.

As a pigment it is quite permanent and resists exposure to the air, light and most of the other influences which act on pigments. It has the curious property of fading a little on exposure to light and of recovering its original intensity of color in the absence of light.

Prussian blue can be mixed with nearly all other pigments without being affected or changed by them or affecting them in any way.

Indigo, or Indian blue, is a pigment manufactured in the East and West Indies from several plants, but principally from the Anil, or Indigofera. It is of various qualities, and has been long known and of great use in dyeing.

In painting it is not so bright as Prussian blue, but is extremely powerful and transparent, hence it may be substituted for some of the uses of Prussian blue, as the latter now is for indigo.

It is of great body and works well both in water and oil. Its relative permanence as a dye has obtained it a false character of extreme durability in painting, a quality in which it is very inferior even to Prussian blue.

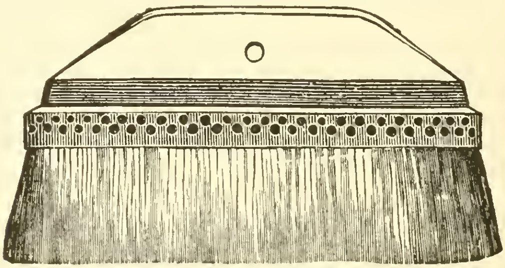


Fig. 15. Roofing Brush.

Indigo is injured by impure air, and, in glazing, some specimens are firmer than others, but not durable, in tint with white lead they are all fugitive; when used, however, in considerable body in shadow it is more permanent, but in all respects inferior to Prussian blue in painting. Intense blue is indigo refined by solution and precipitation, in which state it is equal in color to Antwerp blue. By this process indigo becomes more durable and much more powerful, transparent and deep. It washes and works admirably in water; in other respects it has the common properties of indigo.

The indigo plant, in its general appearance, is not unlike the lucerne of our fields. The seed is sown in drills, about 18 inches apart, and soon makes its appearance above the ground, when it requires incessant care to keep the weeds down, which would otherwise soon choke so tender a crop. In about two months the plants begin to flower, and are then cut down, but shoot up again and give two or three more crops in the same year. Formerly indigo was carefully dried after being cut, and even fire heat was sometimes used for the purpose; but now, at least in India, the practice is abandoned, and it is found in every respect better to use the plant whilst fresh and green. The first process is to place in a shallow wooden vat as much as will loosely cover the bottom of it; water is then let in so as to cover the plants about three inches, and heavy wooden frames are put on the top to prevent them from floating. Being left in this state for from fifteen to twenty hours, fermentation is set up, and much gas is disengaged, the water becoming a light green color. The green liquor is then run off into the second vat, which is placed below the level of the first, in which, whilst the fermentation process is being repeated upon a fresh supply in the first vat, it is violently agitated by being beaten with poles; this causes the grain, as it is called, to separate, and the green matter suspended in the liquor becomes blue and granular, and this change is promoted by the addition of a little lime-water from time to time. When this operation is sufficiently advanced the contents of the vat are allowed to settle, and in a short time the now intensely blue granular matter has sunk to the bottom, leaving the supernatant liquor almost as clear as water; this is then run off nearly to the bottom, and the sediment is run into the third vat, which is below the level of the second; here it awaits several other additions from successive operations, and, a sufficient quantity being accumulated in the third vat, it is suffered to subside and when thoroughly settled the clear liquor is drawn off, and the granular matter is removed and filled into coarse bags, which are hung up to drain. When sufficiently drained the blue paste is filled into very small boxes, about three inches square, and set to dry in the sun, which soon renders it fit for packing.

There are, of course, other blues, but the above will be sufficient for all purposes, and the painter is urged not to adopt others until he knows their qualities from actual trial, and from having watched the effect which time and exposure to atmospheric action have had upon them.

Browns. Browns generally owe their color to oxide of iron. Raw umber is a clay similar to ochre colored by oxide of iron. The best comes from Turkey; it is very durable both in water and in oil; does not injure other colors when mixed with them.

Burnt Umber is the last mentioned material burnt to give it a darker color. It is useful as a drier, and in mixing with white lead to make a stone color.

Vandyke Brown is an earthy dark brown mineral; it is durable both in oil and water, and is frequently employed in graining.

Purple Brown is of a reddish-brown color. It should be used with boiled oil and a little varnish and driers for outside work.

Burnt Sienna is produced by burning raw sienna. It is the best color for shading gold.

Brown Pink is a vegetable color often of a greenish hue. It works well in water and oil, but dries badly, and will not keep its color when mixed with white lead. Spanish brown and brown ochre are clays colored naturally by various oxides.

Sepia is a brown pigment, of slightly varying hue, and is obtained from various species of cephalopodous animals. It is a blackish-brown pigment of a very fine texture, mixing well with both oil and water. It is much used by artists, especially for monochrome work. It is a fairly per-

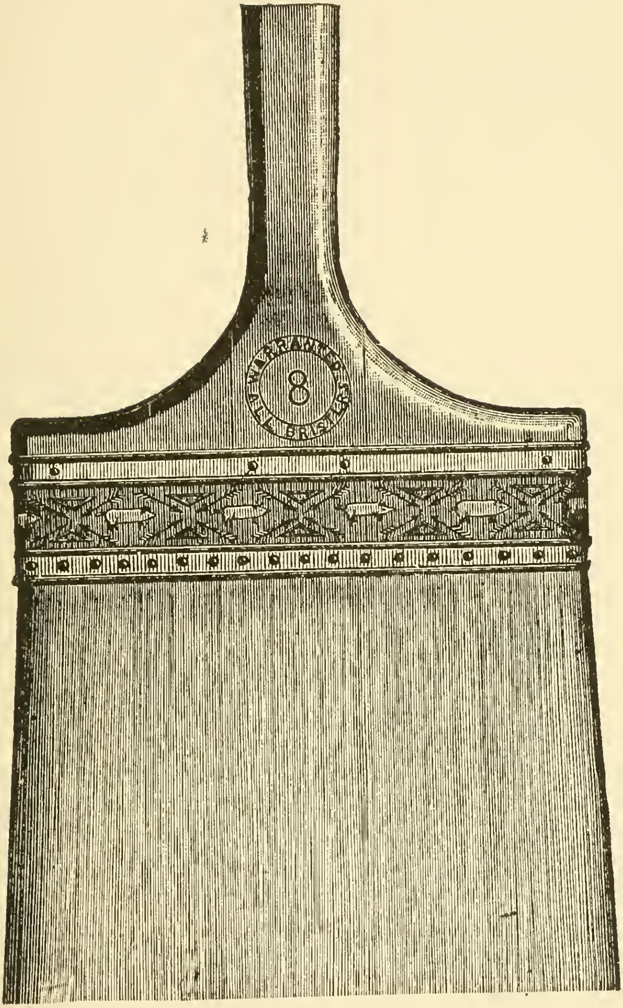


Fig. 16. Kalsomine Brush.

manent pigment, being but little affected by exposure to light and air.

Manganese brown is an oxide of manganese, of a fine, deep, semi-opaque brown, of a good body, and dries well in oil. It is artificially prepared from the waste still-liquors of the chlorine manufacturer by precipitating the liquors with sodium carbonate, collecting the precipitate and calcining in a furnace to a low red heat, until samples taken out and allowed to cool show the desired shade. It is a good and permanent pigment, but it is difficult to use on account of its excessively strong drying properties.

Greens. These, of course, may be made by mixing blue and yellow together, but such mixtures are less durable than those produced direct from copper, arsenic, etc. The latter are, however, objectionable for use in distemper or on wall papers, as they are very injurious to health. Brunswick green of the best kind is made by treating copper with sal-ammoniac. Chalk, lead and alum are sometimes added. It has rather a bluish tinge, dries well in oil, is durable, and not poisonous. Common Brunswick green is made by mixing chromate of lead and Prussian blue with sulphate of baryta. It is not as durable as real Brunswick green. Mineral green is made from bi-basic carbonate of copper; it weathers well. Verdigris is acetate of copper. It furnishes a bluish-green color, durable in oil or varnish, but not in water; it dries rapidly, but requires great care in using owing to its poisonous qualities. Green verditer is a carbonate of copper and lime; is not very durable. Prussian green is made by mixing different substances with Prussian blue. There are a number of other greens made from copper, but they all possess in a greater or less degree the same qualities as the foregoing. Emerald or Paris green is made of verdigris mixed with a solution of arsenious acid. It is of a very brilliant color, but is very poisonous; is difficult to grind, and dries badly in oil. It should be purchased ready ground in oil, as in that case the poisonous particles do not fly about, and the difficulty of grinding is avoided. Scheele's green and Vienna green are also arseniates of copper, and highly poisonous. Chrome green should be made from the oxide of chromium, and is very durable. An inferior chrome green is made by mixing chromate of lead and Prussian blue, as above mentioned, and is called Brunswick green. The chrome should be free from acid or the color will fade; it may be tested by placing it for several days in strong sunlight.

Bremen green is essentially copper hydrate, and forms an extremely loose and pale blue mass, the color of which has, however, a somewhat greenish tinge. When used as a water color it gives a pale blue, but when employed as an oil paint the original blue color turns green in 24 hours, owing to the copper oxide combining with the fatty acids of the oil to a green copper soap.

Reds. Carmine, made from the cochineal insect, is the most brilliant red color known. It is, however, too expensive for ordinary house painting and is not durable. It is sometimes used for inside decoration.

Red lead is produced by raising massicot, which is the commercial name for oxide of lead, to a high temperature, short of fusion, during which it absorbs oxygen from the air and is converted into red lead or minium, also an oxide of lead. The color is lasting, and is unaffected by light when it is pure and used alone, but any preparation containing lead or acids mixed with it deprives it of color, and impure air makes it black. It may be used for a drier, as it possesses many of the properties of litharge; it is also often employed in painting wrought iron work, to which it adheres with a tenacity not equaled by any other paints; it is sometimes objected to for this purpose, on the ground that galvanic action is set up between the lead and iron.

Vermilion is a sulphide of mercury in a natural state as cinnabar. The best comes from China. Artificial vermilion is also made, both in China and in this country, from a mixture of sulphur and mercury. Genuine vermilion is very durable, but when mixed with red lead, as it is sometimes, it will not stand the weather. It can be tested by heating in a test tube; if genuine it will entirely volatilize. German vermilion is the tersulphide of antimony, and is of an orange-red color.

Indian red is a ground hematite ore brought from Bengal; it is sometimes made artificially by calcining sulphate of iron. The tints vary, but a rosy hue is considered the best. It may be used with turpentine and a little varnish to produce a dull surface, drying rapidly, or with boiled oil and a little drier to produce a glossy surface.

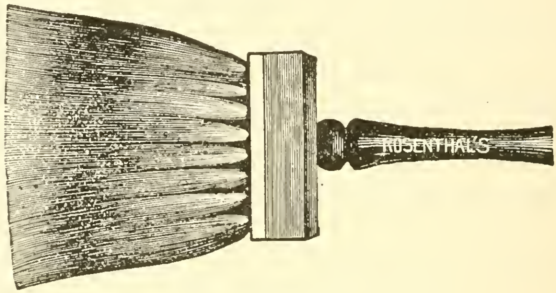


Fig. 17. Flat Knotted Badger Blender.

Tuscan red is essentially a mixture of Indian red with some sort of lake color. The cheapest article is made from a reduced Indian red and rose pink. The richness of such article is very fleeting, particularly if the rose pink be simply whiting colored with a coal tar dye. It is apparent that the real value of a Tuscan red lies in the permanency of the lake coloring material employed to give it richness.

Orange is a chromate of lead, brighter than vermilion, but less durable. Orange ochre is a bright yellow ochre burnt to give it warmth of tint; it dries and works well in water or oil, and is very durable. It is known also as Spanish ochre. Orange red is produced by a further oxidation than is required for red lead. It is a brighter and better color.

Chinese red and Persian red are chromates of lead, produced by boiling white lead with a solution of bichromate of potash. The tint of Persian red is obtained by the employment of sulphuric acid.

Venetian red is obtained by heating sulphate of iron produced as a waste product at tin and copper works. It is often adulterated by mixing sulphate of lime with it during the manufacture. When pure, it is called bright red. Special tints of purple and brown are frequently required, which greatly enhance the value of the material. These tints should be obtained in the process of manufacture, and not produced by mixing together a variety of different shades of color. When the tint desired is attempted to be obtained by this latter course it is never so good, and the materials produced are known to the trade as faced colors, and are of inferior value.

Venetian red originally consisted of a native ferric oxide or red hematite. But of recent years the name appears to have been transferred to a particular quality of artificial ferric oxide made by calcining green vitriol. When this salt is heated in a crucible the upper portion of the product, which has been less strongly heated than the lower, is of a brighter red than the remainder, and after washing and grinding is sold as Venetian red.

Rose pink is made of a sort of chalk or whiting stained with a tincture of Brazil wood. It fades very quickly, but is used for paper-hangings, common distemper and for staining cheap furniture.

Lakes are made by precipitating colored vegetable tinctures by means of alum and carbonate of potash. The alumina combines with the organic coloring matter and separates it from the solution. The tincture used varies in the different descriptions of lake. The best, made from cochineal or madder, is used for internal work. Drop lake is made by dropping a mixture of Brazil wood through a funnel onto a slab. The drops are dried and mixed into a paste with gum water. It is sometimes called Brazil wood lake. Scarlet lake is made from cochineal, so also are Florentine lake, Hamburg lake, Chinese lake, Roman lake, Venetian lake and Carminated lake.

Whites. The most important group of painters' colors are the white pigments. White is the basis of nearly all opaque painting designed for the laying and covering of grounds, whether they be of woodwork, metal, stone, plaster or other substances. It should be as pure and neutral in color as possible, for the better mixing and compounding with other colors without changing their hues, while it renders them of lighter shades, and of the tints required; it also gives solid body to all colors. It is the most advancing color; that is, it comes forward and catches the eye before all other colors, and it assists in giving this quality to other colors, with which it may be mixed, by rendering their tints lighter and more vivid.

White is the nearest among colors in relation to yellow, and is in itself a pleasing and cheerful color, which takes every tint, hue and shade, and harmonizes with all other colors, and is the contrast of black, added to which it gives solidity in mixture, and a small quantity of black added to white preserves it from its tendency to turn yellow.

The most important of the white pigments is

White lead, which may be obtained either pure or mixed with various substances, such as sulphate of baryta, sulphate of lead, whiting, chalk, zinc white, etc. These substances do not combine with oil as well as does white lead, nor do they so well protect any surface to which they are applied. Sulphate of baryta, the most common adulterant, is a dense, heavy, white substance, very like white lead in appearance. It absorbs very little oil, and may frequently be detected by the gritty feeling it produces when the paint is rubbed between the finger and thumb.

Oxide of zinc, or zinc white, is durable in water or oil; it dissolves in hydrochloric acid; it does not blacken in the presence of sulphuretted hydrogen, and it is not injurious to the men who make it, or to the painters who use it; but on the other hand, it does not combine with oil well, and is wanting in body and covering power, and is difficult to work. It is easily acted upon by the carbonic acid in rain water, which dissolves the oxide, and it therefore is unfit for outside work. The acids contained in unseasoned wood also have a great effect upon it. When pure and used for inside work, it retains its color well, and will stand washing

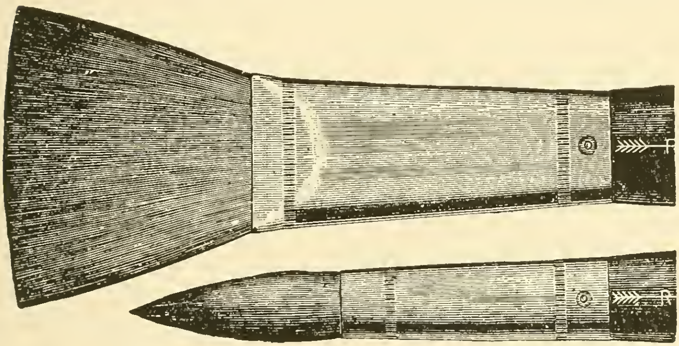


Fig. 18. Camel's-Hair Lacquering Brushes.

for many years without losing any of its freshness. When dry it becomes very hard, and will take a fine polish. This paint is suitable for any place that is subjected to vapors containing sulphur, or in places where foul air is emanated from decaying animal matter.

The purity of white lead is ascertained by dissolving a sample of it in pure dilute nitric acid, 1 part of acid to two parts of water. On adding dilute sulphuric acid to the solution, after diluting it with water and filtering off the precipitate of lead sulphate thus obtained, no further precipitate should be formed on successively adding ammonia, ammonium sulphide and ammonium oxalate to the filtrate.

The purity of zinc white in oil may be tested by burning out the oil by means of a blast lamp, on an iron spoon or ladle. Take of the zinc white a piece about the size of a pea, place it in the center of the spoon and direct the blast on it until it is burned white and perfectly dry. Crush the white cinder which is left to a fine powder and drop this into a glass of diluted sulphuric acid, 1 part of acid to 10 parts of water. If the powder be fine and very little dropped in at a time, it will, if pure, dissolve completely before reaching the bottom and without effervescence. If there be any effervescence it indicates the presence of whiting, which will precipitate as sulphate of lime, which is, however, sparingly soluble, barytes is insoluble, and a considerable adulteration of terra alba is not readily soluble; clay is insoluble.

Gypsum mixes well with either water or oil, and, being neutral in its properties, it can be mixed with all other pigments without affecting them or being affected by them. It is used very largely by paper stainers and makers of wall paper, who prefer it to barytes on account of its having more body when used for that class of work. It is used in finishing of cotton goods, in paper making, and for a variety of other purposes where a cheap white pigment is required.

Whiting is sold under a variety of names, such as Spanish white, Paris white, English white. Whiting is the carbonate of calcium, purified by washing. It is prepared by grinding chalk under water to a very fine powder by passing it through several mills. The powder is run into tanks in which the coarser and heavier particles settle, while the finer chalk passes on to other tanks in which it settles. When the settling tanks are full, the chalk or whiting is dug out and dried. When partially dry it is cut into masses of a cubical shape and dried. When dry it is ground.

Paris white is a finer quality of whiting, but the grinding is more thoroughly done. Spanish white is a name given to Paris white sold in a cylindrical form prepared by moulding the wet material into that form, and allowing it to dry in the open air.

Whiting is a dull white powder of an amorphous character, and soft to the feel. It is quite insoluble in pure water, but is soluble in water containing carbonic acid gas.

Kaolin or China clay is essentially a hydrated silicate of alumina. It is a natural product and only requires levigating and drying to prepare it for use as a pigment. It occurs in large deposits along with other constituents of undecomposed granite, the china clay usually forming from 15 to 20 per cent of the whole deposit.

Kaolin is a fine, white amorphous powder, having slight adhesive properties and adhering to the fingers when moist. The best qualities have a very soft unctuous feel and a pure white tint, while the common qualities are rather rougher and of a more or less yellowish hue.

As a pigment kaolin is quite permanent, resisting exposure to the atmosphere and to light for any length of time. It is, however, not much used as a pigment. In oil it loses its body and becomes more or less transparent. It can be used in water colors and in distemper work with good results, and is employed in paper-making and paper-staining.

Yellows. Chrome yellows are chromates of lead, produced by mixing dilute solutions of acetate or nitrate of lead and bichromate of potash. This makes a medium tint known as middle chrome. The addition of sulphate of lead makes this paler, when it is known as lemon chrome, whereas the addition of caustic lime makes an orange chrome of a darker color. The chromes mix well with oil and with white lead either in oil or water. They stand the sun well, but like other lead salts, become dark in bad air. Chrome yellow is frequently adulterated with gypsum.

Naples yellow is a salt of lead and antimony, supposed to have been originally made from a natural volcanic product at Naples. It is not so brilliant as chrome, but has the same characteristics. King's yellow is made from arsenic, and is therefore a dangerous color to handle, or use for internal work. It is not durable, and it injures several other colors when mixed with them. Chinese yellow, arsenic yellow and yellow orpiment are other names for this yellow.

Yellow ochre is a natural clay colored by oxide of iron, and found abundantly in many parts of the world. It is not very brilliant, but is well suited for distemper work, as it is not affected by light or air. It does not lose its

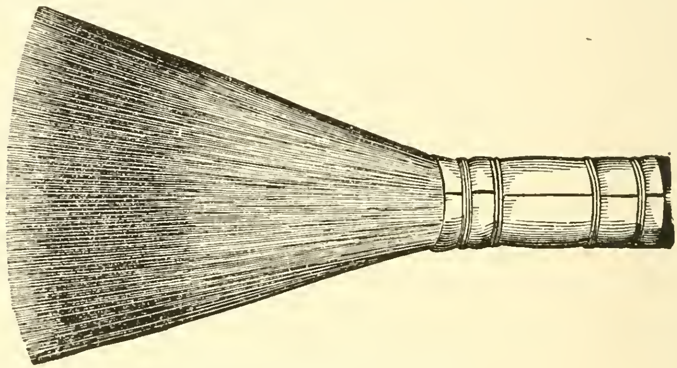


Fig. 19. Round Badger Blender.

color when mixed with lime washes as many other colors do. There are several varieties of ochres, all having the same characteristics differing only in color which varies from a golden to a dark brown.

All the hues and tints, from the palest lemon cadmium to the orange red, are due to one compound only of cadmium, namely the sulphide, which contains 112 parts by weight of cadmium to 32 parts of sulphur. As commonly prepared cadmium yellow is of an orange hue; when this compound separates slowly from a solution, or is made in any way to take a dense or aggregated form, it becomes of a decided reddish orange. The orange-yellow variety, when very finely ground, becomes less red and more inclined to yellow. Some of the palest cadmium yellows contain white pigments or flour of sulphur, added to reduce their depth of color. Yellow cadmium is prepared in several ways. A slightly acid solution of any cadmium salt is prepared and through it is passed a current of sulphuretted hydrogen gas. The product thus obtained has a pure chrome yellow shade. A lemon yellow shade may be obtained by dissolving 1 pound of cadmium sulphate in 4 gallons of water and adding 1¼ gallons of the ordinary yellow ammonium sulphide.

Cobalt yellow is a compound of the nitrates of cobalt and potassium. It is prepared by precipitating cobalt nitrate with sodium carbonate, dissolving the precipitate in acetic acid and adding a strong solution of potassium nitrate. On allowing the mixture to stand for some time the color is gradually precipitated, and is collected, washed and dried, when it is ready for use.

Cobalt yellow is a pure yellow color, and is almost transparent whether used in water or oil painting.

Orange ochre also called Spanish ochre is a very bright yellow ochre, burnt, by which operation it acquires warmth, color, transparency and depth.

Mars orange is an artificial ochre similar to the above. It is made by taking equal weights of ferrous sulphate and alum, and adding a solution of carbonate of soda, thereby precipitating the iron and alumina. The precipitate, which forms a yellow pigment, the so-called Mars yellow, is collected, washed well with water, dried and converted into orange, by slightly calcining.

Oxford ochre is a native of the neighborhood of Oxford, England; it is semi-opaque, of a warm yellow color, and of a soft argillaceous texture, absorbent of water and oil, in both of which it may be used with safety, according to the general character of yellow ochres, of which it is one of the best.

Stone ochre has been confounded with the preceding, which it frequently resembles, as does also Roman ochre. True stone ochres are found in balls or globular masses of various sizes in the solid body of stones lying near the surface of rocks among the quarries in Gloucestershire, England, and elsewhere. These balls are of a smooth compact texture, in general free from grit, and of a powdery fracture; they vary exceedingly in color, from yellow to brown murrey and gray, but do not differ in other respects from the preceding, and may be safely used in oil or water in the several modes of painting. Varieties of ochreous colors are produced by burning and compounding with lighter, brighter and darker colors, but often very injuriously and adversely to a certainty of operation, effect and durability.

Raw sienna is a ferruginous, or impregnated with iron, native pigment, and appears to be an iron ore which may be considered as a crude, natural yellow lake, firm in substance, of a glossy fracture, and very absorbent. It is in many respects a valuable pigment, of rather an impure yellow color, but has more body and transparency than the ochres, and being little liable to change by the action of either light, time, or impure air, it may be safely used, according to its powers, either in oil or water, and in all the modes of practice. By burning, it becomes more transparent and drying, and changes color to a red brown. Raw sienna is a valuable color in graining.

There are several pigments called yellow lake, varying in color and appearance according to the coloring substances used, and modes of preparation; they are usually in the form of drops, and their colors are in general of a bright yellow, very transparent, and not liable to change in an impure atmosphere, qualities which would render them very valuable pigments were they not soon discolored and even destroyed by the opposite influences of oxygen and light, both in water and oil, in which latter vehicle, like other lakes in general, they are bad dryers, and do not stand the action of white lead or metallic colors. If used, therefore, it should be as simple as possible.

COLOR HARMONY.

The most difficult subject with which the painter has to deal is that of color harmony. In other words, how to use different colors in decoration in such a manner as to produce a perfect harmony and a pleasing result. The subject is a difficult and comprehensive one, and it would be impossible within the limits of this book to do justice to it. A few general hints, however, will no doubt be of service.

It should first be recognized that there are distinct rules and laws regulating harmony in color. Just as some people have an ear quick to recognize the slightest discord, so some are fortunate enough to possess an inherent talent for recognizing color harmony. It is to be feared that while the musical ear, so to speak, is fairly common, the ability to harmonize colors is much rarer. Speaking generally, ladies have more natural talent in matters concerning color than men have. Possibly the reason is that they are called upon more frequently to choose and determine upon matters relating to color in connection with their dress. It is true that if one is inclined to be satirical one might suggest that some ladies, judging by the extraordinary combination of colors they wear, must be color blind. It has been proved by statistics that one person in ten is color blind, but this does not mean wholly devoid of the ability to distinguish one color from another, but simply that there are certain colors which the person who is color blind cannot distinguish from others.

In almost everyday work the painter is called upon to mix colors that shall harmonize, as, for instance, to paint the woodwork of a room in colors that will harmonize with the wallpaper.

Matching the Wallpaper. The simplest plan, and therefore the one which is usually followed, is to take the prevailing color of the wall and to use this on the woodwork and introducing other colors which may occur in the paperhanging as may be thought to be judicious. If the room is a bed-chamber and the paper has a cream ground with a floral pattern printed in green with a pink flower, the stiles and rails of the doors might be painted a light green, the panels cream, and the mouldings, or a portion of them, pink. The same plan may be followed successfully with many papers, but on the other hand much more pleasing

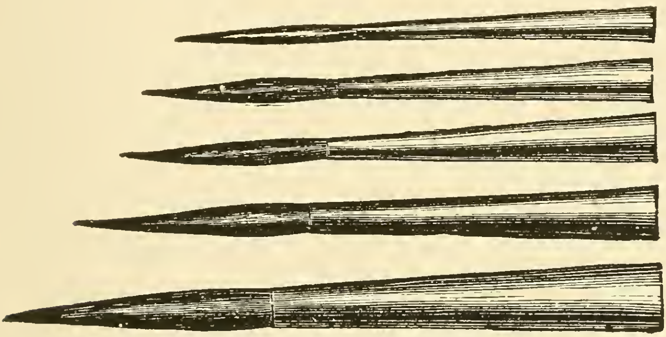


Fig. 20. Ox Hair Fresco Brushes.

and artistic results may often be obtained by using a distinct, but harmonizing contrast. A single example will suffice. A striped wallpaper, printed in brilliant red, might cause wonderment in the eyes of a novice as to how it could possibly be used successfully in an ordinary room. The excessive brilliancy might at first sight appear to be certain to produce an effect too glaring to make a comfortable living-room. Yet such a paper used in a room very soberly furnished say, with old dark oak, ebony or black walnut, would look very handsome, or in a more modern room the doors, skirting, in fact the whole of the woodwork, might be finished in white enamel, and the effect would also be very good.

Contrasting Harmonies. From this single example it can readily be seen that contrasting colors often give the very best results. A wall painted green may look very monotonous, but if a frieze, having some bright red used liberally in it, is used in conjunction there will be a vast difference in the appearance of the apartment.

RED.

A Red Wall. Red may graduate from Indian red to what would practically be a warm gray. Any color going with a selected tone or tint needs to be modified so as to harmonize with it. If a wall has a paper colored in light red and gold, and it is desirable that the woodwork should be red too, it must differ from the color of the wall in tone and in intensity.

A Crimson Wall may have amber woodwork with cream colored mouldings, or they may be heliotrope for contrast.

A Scarlet Wall may have light snuff brown, or a sage green, for the woodwork, with yellow green mouldings, or they may be white.

A Yellow Red Wall, in which scarlet has been tempered with an excess of chrome, will bear a raw umber tone of brown for the woodwork, with ivory or white mouldings.

A Pink Toned Wall. With this the woodwork may be a yellowish green, with or without straw colored mouldings, or two shades of citrine, with pearl gray for contrast in the mouldings.

For a Dark Red, inclining to purple, the woodwork may be a sage or myrtle green, with amber mouldings.

A Poppy Red. Gray green, lavender and black may be used for this.

All warm tones and shades of green or gray may be used with red, provided they get their hues by contrast with the red. Any blue associated with red must be slaty or purple in tone. If the color of a wallpaper is heliotrope, inclined to red, the woodwork may be cream. If the heliotrope inclines to yellow, straw color should be adopted.

BLUE.

A Blue Wall of a Purple Tone. With this yellowish orange, amber, salmon pink or terra cotta will harmonize according to the value of the wall color.

A Peacock Tone or Blue Wall. This calls for orange red, deep amber, warm brown, cool brown, or both.

A Sapphire Blue Wall. Chocolate woodwork in two tones, with amber mouldings. Pearl gray and cream will go with this color.

A Wall of an Ultramarine Tone. Light warm gray and cool yellow brown go happily with this.

A Neutral Blue Wall will unite with citron and chocolate, or a warm gray green, or a blue green gray and salmon.

A Slate Colored Wall of a Blue Tone. For this there is plum color and lavender, puce and orange to choose from.

YELLOW.

This color ranges from a rich sienna to a lemon tone, from citrine to a cream.

A Yellow Wall. Plum color, slate, brown or citrine may be used with this.

A Gold Colored Wall. The woodwork may be in two tones of lavender, with citrine mouldings.

An Orange Colored Wall. The color for the wood may be purple tone of red, with maroon mouldings, or if light mouldings be required, citrine would serve.

A Canary Colored Wall. Vellum color, with deep ivory mouldings, may be adopted for the woodwork.

A Deep Terra Cotta Wall. A selection from buff, sage green, Indian red, vermilion, white and black either or any, may be selected, the strong colors in the small parts.

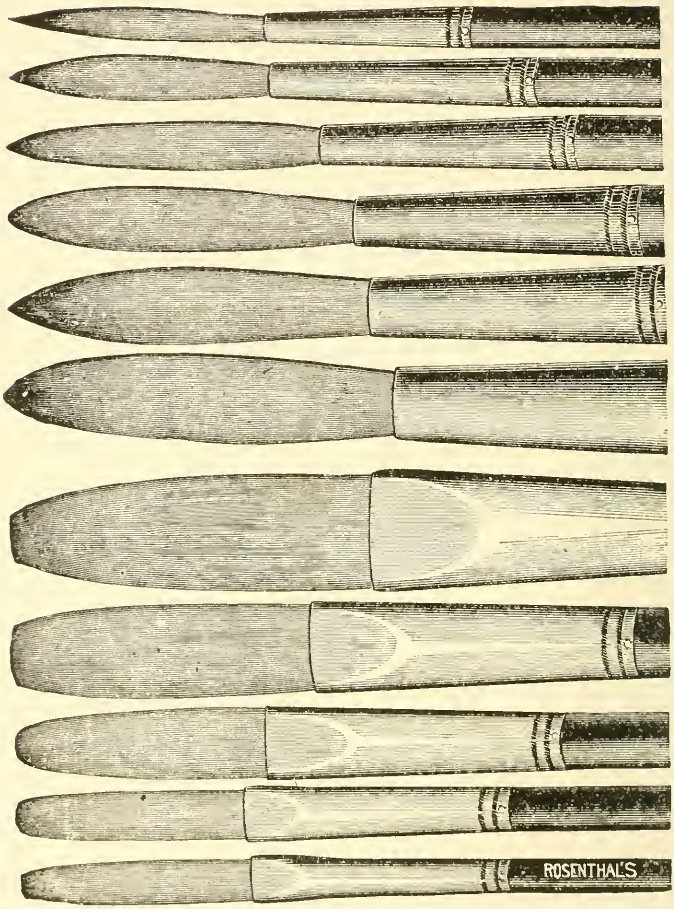


Fig. 21. Fresco Bristle Brushes.

A Primrose Tone of Wall. Tones of snuff brown, medium yellow green, and lavender may be selected.

A Neutral or Drab Wall. Shades of olive green, Venetian red, and lilac go well together.

BROWN.

This color is perhaps the best wearing color for woodwork. There are infinite tints and shades, from sober to rich, from cool to warm. Blue agrees especially with brown.

Deep brown, light blue, and gold go well together.

Light Purple Tone of Brown Wall. The woodwork may be yellow red, with cream mouldings.

A Brown Ingrain Wall. The woodwork may be in two tones, made from indigo blue, with amber mouldings.

A Gold Colored Brown Wall would unite with woodwork of a red tone of purple, with plum colored mouldings, or a warm gray may be used.

Burnt Sienna Brown Tone of Wall. With this, salmon and myrtle harmonize.

GREEN.

This color, so extensive in nature, will agree with all colors, provided they are toned to suit each other, warm or cold, neutral or bright.

An Olive Green Wall will agree with maroon woodwork with a crimson lake, straw or pink tone for the mouldings.

A Medium Green Colored Wall. If two tones of red, a crimson tone and a yellow tone be adopted, the mouldings, if desired, may be a salmon buff.

A Gray Green Wall may have a primrose tone of woodwork, with a scarlet tone for mouldings.

A Moss Green Tone of Wall will associate well with citrine woodwork, and salmon colored panels or mouldings.

A Pea or Leaf Green Wall goes well with a chocolate and a lavender.

GRAY.

This neutral color agrees with and helps every other color.

A Warm Gray Wall. With this the woodwork may well be a tawny leather color, with either buff or cream in the mouldings. A quiet red would also suit.

A Silver Gray Wall sympathizes with a salmon color, as well as with a deep blue. Should there be blue and red in the pattern on the paper, the styles of the woodwork could then be a delicate raw umber tone of brown. The mouldings the same brown, with burnt sienna added to it. The panel may be a cameo pink. A snuff colored brown would also do well.

A Drab Tone of Wall, having an ornament upon it, low in tone, a citrine for instance, would need some force in the woodwork. A rich burnt sienna brown suggests itself for this, with a reddish brown for the mouldings.

These schemes of color can be reversed. Should the general tone of the wallpaper be that tone suggested here for the woodwork, it takes then the color of the paper.

Color Combinations. The following list is based upon Chevreul, Brücke, Rood and other experimenters:

Normal red with violet..............Bad.
" blue ....Excellent.
" blue green ....Good, but strong.
" green ....Good, but hard.
" green yellow ....Fair.
" yellow ....Unpleasing.

Scarlet with violet ....Bad.
" turquoise ....Good.
" blue ....Good.
" yellow ....Unpleasing.

Orange red with violet..............Good.
" purple ....Fair.
" blue ....Excellent.
" turquoise ....Good.
" blue green ....Unpleasing.
" yellow green ....Fair.

Orange with purple ....Bad.
" violet ....Good.
" blue ....Good, but strong.
" turquoise ....Good.
" blue green ....Good.
" green ....Fair.

Orange yellow with purple..........Good.
" violet ....Excellent.
" blue ....Good.
" turquoise ......Fair.
" blue green .....Moderate.
" green ....Bad.

Yellow with violet ....Excellent.
" purple ....Good.
" normal red ....Poor.
" turquoise ....Moderate.
" blue green............... Bad.
" green ....Bad.

Greenish yellow with purple..........Good.
" violet ....Excellent.
" scarlet ....Strong and hard.
" orange red ....Fair.
" turquoise ....Bad.
" normal blue ......Good.

Yellowish green with normal red.....Good, but hard.
" purple ....Difficult.
" blue green ....Bad.
" blue ....Good.

Normal green with	purple	Strong, but hard.
"	scarlet	Difficult.
"	orange red	Hard.
"	turquoise	Bad.
Blue green with	purple	Fair.
"	violet	Good.
"	blue	Bad.
"	green	Bad.
"	yellowish green	Bad.
"	turquoise	Bad.

COLOR MIXING.

The following compound colors or tints can be made by mixing the colors as given herewith. The exact shades required can be made to suit by the exercise of a little judgment in proportioning the colors.

BLUES.

When it is desired to tone a blue down, a little burnt sienna and white should be added.

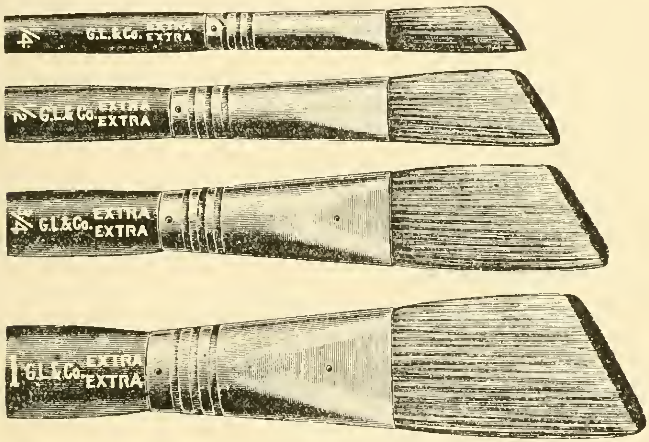


Fig. 22. Angular Bristle Fresco Brushes.

Antwerp Blue. This color should always be bought ready made. If necessary to imitate it, mix one part of bright green with two parts of ultramarine, add a very little zinc or other white, but not lead. Brunswick blue is frequently used in the place of Antwerp blue.

Azure Blue. One part of ultramarine blue and forty parts of zinc white. Another shade may be obtained by mixing forty-four parts of white, twenty-nine of green and twenty-seven of blue. Or celestial blue and a little red on a base of white will give an azure shade.

Berlin Blue. This is another name for Prussian blue.

Blue Grass Tint. One part of Prussian blue, three parts of emerald green, seven parts of white lead.

Bremen Blue. This is a color to be bought only ready made. It is not much used, and is not suitable for an oil color.

Bronze Blue. A dark blue color, which may be made by mixing three parts of black with one of Prussian blue.

Brunswick Blue. This is sold ready made, but can be imitated by adding white lead to Prussian blue in sufficient quantity to obtain the desired tint.

Coeruleum. This is an artist's color of a light and somewhat greenish blue tone. An imitation may be made from ultramarine and white, with a little yellow, although the color is a difficult one to imitate successfully.

Celestial Blue. About equal parts of Prussian blue, chrome green and white lead will give this color, but there should be most white, and the tint should be more blue than green.

Chinese Blue. Another name for Prussian blue.

Cobalt. This color is one of the best artist's colors, and cannot be successfully imitated. It is a beautiful and most useful color, but unfortunately it is expensive, and it is therefore used only in the finest work.

Dark Blue. Obviously this is no definite color. Manufacturers often use one part of white, two of chrome green, and seven of Prussian blue. But ultramarine, or indeed any blue, may be used, and this may be first lightened with white, and black added as may be desired.

Fog Blue. Equal parts of burnt sienna and Prussian blue, lightened up with about twenty parts of white lead.

French Blue. Mix four parts of white, one of green, and four of ultramarine blue. The name is also applied to the best quality of artificial ultramarine.

Gobelin Blue. Mix together four parts of ivory black, two of white, one of chrome green, and three of Prussian blue.

Granite Blue. To produce this shade mix two parts of black with six of white and one of ultramarine blue.

Heliotrope. This color is obtained by using two parts of zinc white, three of bright red, and four of ultramarine blue.

Implement Blue. This is made simply by mixing ultramarine with white. Barytes and zinc mixed are frequently used for the white, as lead cannot be employed in the presence of ultramarine.

Indigo. This dark blue is a natural vegetable pigment. An imitation may be produced by using nine parts of black and four of Prussian blue, but this will not look like the real thing. Indigo should not be mixed with lead or lead chromates. It is a very useful color and deserves to be used to a much greater extent than it is at present.

Lavender. Three parts of ultramarine blue and one part of carmine, added to zinc as a base, give a very good lavender tint for inside work. Ivory black mixed with a little carmine and ultramarine and added to white lead may be employed for outside work.

Light Blue. This is simply an ultramarine blue tint produced by the addition of zinc white, or the color may be obtained by tinting white lead with Prussian blue.

Lime Blue. This is a color much used formerly for mixing distemper, but artificial ultramarine has to a great extent supplanted it. It must not be used in oil. The color usually sold for lime blue is a variety of ultramarine.

Marine Blue. A very dark blue, which is obtained by mixing one part of ultramarine blue with nine of ivory black.

Mascot. This is a very dark blue shade, which is got by mixing black and blue in the proportion of seven parts of the former to one of the latter with a very little green.

Mauve. Four parts of cobalt, twelve parts of oxide of zinc, and one part of carmine lake give an excellent mauve, or the color may be obtained by mixing yellow ochre, blue black, and Venetian red with a little white lead. Another shade is obtained with blue, red and white mixed in the following proportions: blue three parts; white, two parts; red, one part. Or white may be tinted with ivory black, carmine and ultramarine.

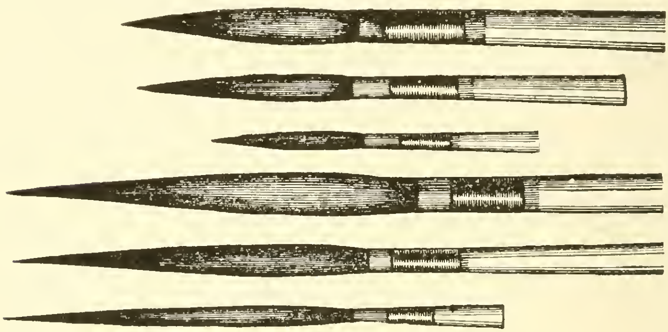


Fig. 23. Camel Hair Striping Pencils.

Methyl Blue. Mix green with twelve times its quantity of blue and a touch of red.

Mountain Blue. One part of ivory black, two parts of rose madder, three parts of cobalt blue, and four parts of white lead. This color is only intended for artists' use.

Navy Blue. Ivory or drop black mixed with one-fourth the quantity of blue will give this shade.

Neutral Blue. A series of neutral blues may be made by tinting white lead with Prussian blue and adding burnt umber, the quantity of blue and umber being varied according to the tint required. Good neutral blues may also be made by tinting white with raw umber and a little Prussian blue. Add either a little burnt sienna if a warm neutral is required, or a little black if one cool in appearance is desired.

Nile Blue. Mix a little white with Prussian blue and chrome green, using rather less of the latter than the former. The result is a pale greenish blue.

Normandy Blue. To get this greenish blue shade mix green and blue in about equal proportions with white.

Oriental Blue. One part of lemon chrome yellow, two parts of Prussian blue and twenty parts of white lead.

Peacock Blue. This color is one upon which opinion varies considerably. A splendid color is made by taking cobalt as a base and adding a little white and a little Chinese blue.

Perfect Blue. Some manufacturers produce this beautifully rich color. It is very like cobalt, but slightly darker.

Pompeian Blue. This is made by tinting white with ultramarine and adding a little vermilion and Italian ochre.

Porcelain Blue. To get this shade mix one part of zinc white and chrome green with four parts of ultramarine blue and a touch of black.

Prussian Blue. This color is certainly the most important blue the painter has. It cannot be imitated. It works well in both water and oil, and is transparent. It is very strong and care must be exercised in using it lest too great a quantity is added to a batch of paint, which might be spoilt in consequence.

Quaker Blue. Add a little black to Prussian blue, and lighten up with white.

Robin's Egg Blue. Use white for base, tint with ultramarine until a fairly strong blue is obtained, and then tinge with a little lemon chrome green.

Royal Blue. This is made by adding a little white to Prussian blue with a touch of crimson lake. Some manufacturers make a very rich blue, which they sell under the name of Royal blue.

Sapphire Blue. One part of Chinese blue mixed with double the quantity of oxide of zinc. This should not be used for outside work.

Sea Blue. Two parts of Prussian blue, three parts of raw sienna, thirty parts white.

Sky Blue. One part of Prussian blue added to one hundred and twenty parts of white lead give a sky blue, but some prefer cobalt, and this is for many purposes doubtless the best. Still another method of obtaining sky blue is to tint white lead with a little lime blue, adding a very little middle chrome, but the latter is more suitable for a distemper color than it is for an oil paint, as lime blue is not very lasting in oil.

Steel Blue. Zinc white tinted with lime blue gives this color for distemper.

Stone Blue. One part of raw umber, twice the quantity of Prussian blue on a base of white lead will give this color.

Transparent Violet. Mix together four parts of ultramarine blue and one part of crimson lake. This is suitable only for artists' use.

Turquoise Blue. Two parts of cobalt blue, one part of emerald green, twelve parts of white lead.

Ultramarine. This is one of the chief blues used by painters, and must be bought ready made. It cannot be imitated, but it can be bought in many different qualities. It must not be mixed with chromes or white lead, as it contains sulphur.

BROWNS.

The painter will probably be surprised at finding the number of browns obtainable.

Acorn Brown. This is very similar to a rich chocolate, and may be made in the same way.

Alderney. This is an orange brown in hue, and may be made by mixing fourteen parts of black, one of white, two of orange and three of yellow.

Arabian Brown. This is a dark terra-cotta, and may be made by adding white and black to Indian red.

Argus Brown. This is a very dark brown, and may be made by mixing twelve parts of black with two parts of orange and one part of yellow.

Auburn Tan. Mix together one part of burnt umber, three parts of golden ochre and twenty parts of white lead.

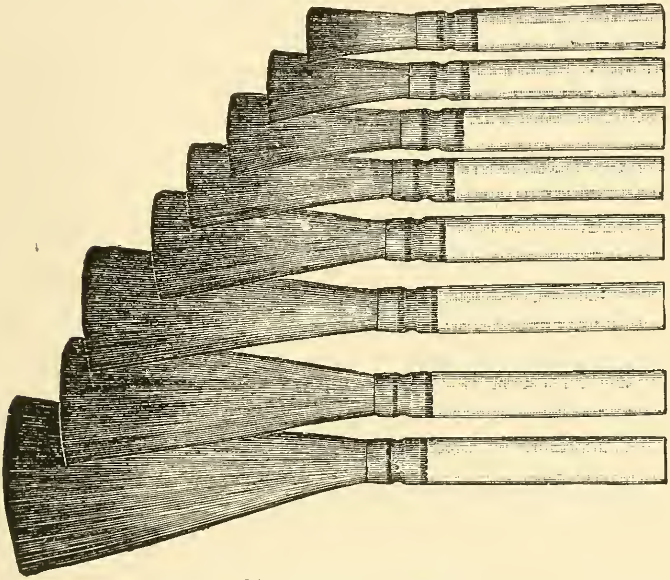


Fig. 24. Camel Hair Pencils.

Autumn Leaf. This is also called leather lake. It may be made by mixing on a base of white lead, French ochre, orange chrome yellow and Venetian red.

Bismark. A shade of this name may be produced by using two parts of black, one of red and one of orange, which mixed together form an orange brown.

Bismark Brown. This color is obtained by mixing with six parts of black, one part of orange and one of yellow.

Bistre. This color is principally used by artists. It must not be mixed with oil, and it is not always reliable for its permanency. It may be imitated by mixing together ten parts of black with two of red and a little green.

Bronze Brown. Black colored with a little orange chrome and bright green.

Brown. The methods of obtaining different browns will be found under the headings of the respective names, such as Chestnut, etc. A good average brown may be obtained by mixing together three of Indian red, two parts of lamp black and one part of yellow ochre. A lighter color is obtained by using more ochre and less black, in fact, a large variety of brown tints may be produced by varying the proportions of ochre and black.

Burnt Rose. This is a dark red brown shade. To produce it use eight parts of black, one and half parts of red, two parts of orange, and one of blue.

Burnt Sienna. This is a sienna calcined, the effect being to produce a darker shade.

Burnt Umber. This is a rich dark greenish brown, but the shade varies considerably in different qualities. Turkey umber is the richest. Umbers should always be purchased ground ready for use.

Cafe au Lait. To produce this shade mix five parts of black, three of white, one of yellow and a little orange. A little red may also be added if desired.

Cappagh Brown. This is an artist's color of a reddish brown color, being very like umber.

Chestnut. This rich brown may be obtained by mixing four parts of medium chrome yellow and two parts of Venetian red. One part of yellow ochre may be added if desired.

Chocolate. Five parts of burnt sienna and one part of carmine or lake give a rich chocolate. A less expensive color is obtained by mixing Indian red and lamp black with a little yellow ochre. A touch of vermilion will clear and brighten this mixture. Another way to produce chocolate is to mix twenty parts of black with three parts of red, but this gives a more or less muddy shade.

Cinnamon. Six parts white lead, two parts burnt sienna, and one part of golden ochre make a good cinnamon, or French ochre, English Indian red and a little lamp black will produce the same color. Another way is to mix Italian sienna and burnt umber.

Clay Drab. Mix equal parts of white lead, raw umber and raw sienna, and add a little chrome if desired. Some painters prefer to add a little medium chrome yellow.

Cocoanut Brown. This shade may be obtained by mixing one part of white lead with double the quantity of burnt umber.

Coffee. To produce this color mix together five parts of burnt umber, two parts of yellow ochre and one part of burnt sienna.

Copper. Tint zinc white with French ochre, Italian sienna and lamp black. A very good copper shade is obtained by mixing two parts of medium chrome yellow, one part of Venetian red, and one part of drop black or two parts of lamp black, three parts of medium chrome yellow and six parts of Venetian red.

Cork Color. Tint white lead with French ochre, Indian red and a little lamp black, or with raw Italian sienna and burnt umber.

Dark Drab. French gray, Indian red and lamp black added to white lead give this color.

Dark Lava. Mix French ochre, Indian red and lamp black, and lighten with white lead.

Dark Oak. Add French ochre and Venetian red to white lead as a base.

Doe Color. This may be produced by mixing raw Italian sienna and burnt umber with white lead, or French ochre and mineral brown with a little lamp black.

Dove Color. White lead, with a little Prussian blue and a touch of ivory black will produce an excellent dove color, but French ochre, Indian red, and lamp black may be employed, or a mixture of raw and burnt Turkey umber and Italian sienna.

Drab. A good drab is made by using burnt umber and white lead in the proportion of one of the former to ten of the latter, but raw umber and a little Venetian red may be used instead.

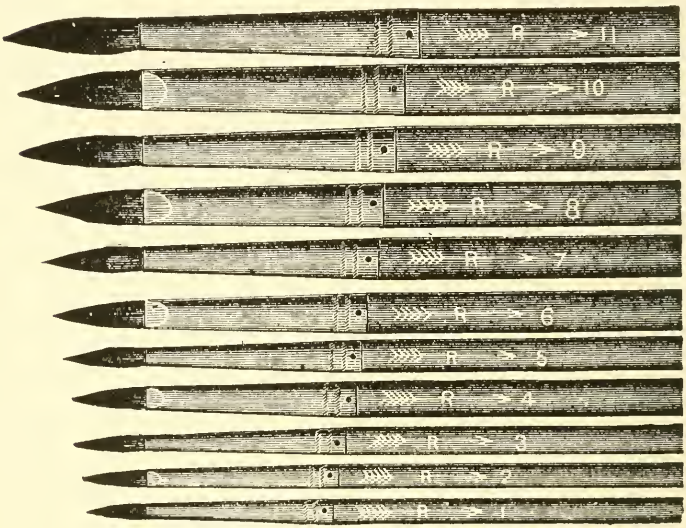


Fig. 25. Red Sable Brushes.

Fawn. This might also be called deep drab. It is produced by tinting white lead with a mixture of French ochre, Indian red and lamp black, or raw Italian sienna and raw Turkey umber. Another shade of fawn is obtained by using eight parts of white lead, one part of chrome yellow, one part of Indian red, and one part of burnt umber, or eight parts of white lead, two parts of medium chrome yellow, one part Venetian red, and one part of burnt umber.

Fawn, Light. Tint white with sienna and a touch of raw umber.

Foliage Brown. Mix burnt umber with raw and burnt sienna and lighten with white as may be necessary.

French Ochre. This color, of course, is sold ready made, and it must be observed that, in addition to the fineness, the particular tone of this color is very important, especially to grainers.

Golden Brown. Sixteen parts of white lead are mixed with one of burnt sienna and three parts of yellow ochre.

Indian Brown. Mix equal parts of Indian red, lamp black and yellow ochre.

Lava. An orange brown lava shade can be had by mixing fifteen parts of black, five parts of orange, four of yellow and a very little white.

Leather Brown. Four parts of yellow ochre, three parts of Venetian red, two parts of white lead, and one part of blue black give a rich leather brown. If a lighter tint is required less black should be used. Or the following recipe may be used: mix white with three times the quantity of red and the same amount of yellow. Some painters use French ochre for a base and tint with burnt umber or Venetian red.

Light Lava. A mixture of raw umber and raw sienna added to white will give this color.

Light Oak. Add French ochre and Venetian red to white as a base.

Lizard Bronze. Fifteen parts of black, one of orange, five of yellow, and four of green will produce this dark greenish yellow shade.

Madder Green. A reddish brown madder shade is produced with one part blue, three parts each of orange and red, and six parts black.

Mahogany. Mix orange and yellow in equal proportions with five times the quantity of black.

Mast Colored Paint. The following recipe gives good results. Mix twelve parts of genuine dry white lead with two parts of French ochre, two parts of gray barytes, and one part of genuine oxide of iron.

Nut Brown. Equal quantities of red and yellow mixed with ten times as much black will give this shade.

Old Wood. To get this shade mix one part of blue and red, two of orange and five of black.

Olive Brown may be made by mixing three parts of burnt umber and one part of lemon chrome yellow; or another shade is given by mixing equal quantities of orange and green with about twelve times as much black. Some painters add lemon chrome yellow to raw umber for a base.

Orange Brown. Two parts of orange chrome yellow mixed with three parts sienna.

Pomegranate. A golden brown shade sometimes called by this name is given by mixing three parts of red, six of orange, four of yellow with twenty parts of black.

Purple Brown. Mix four parts of dark Indian red with one part of ultramarine blue and of lamp black. The addition of white lead will usually make a more satisfactory tint, if the shade is too purple, a similar quantity of blue should be added, if too red, more black may be used, or a little yellow added, but purple brown pigment is cheap.

Raw Sienna. Siennas are valuable earth colors most useful for staining or tinting, but practically useless as body colors. The degree of transparency determines to some extent the quality.

Raw Umber. A valuable earth color.

Russet Brown. Indian red lightened with white produces a tint sometimes called by this name.

Russet. A very good russet shade is got by mixing twenty parts of black, twelve of red, ten of orange, three of yellow, and five of green. Or medium chrome green, raw umber, and a little orange chrome yellow added to white as a base will give an excellent russet.

Sandstone. A tinting color made by mixing raw and burnt umber will produce this color.

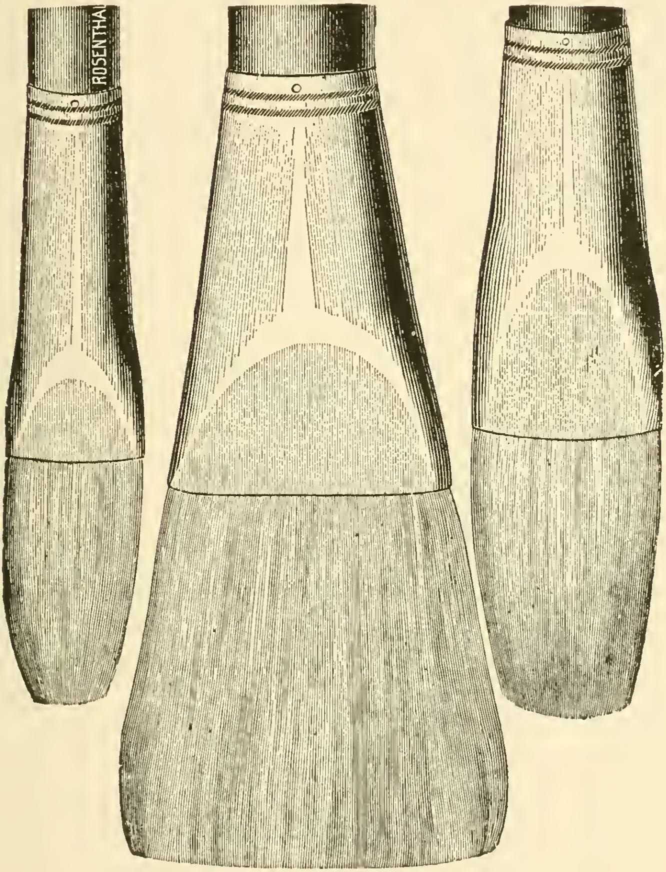


Fig. 26. Flat Bristle Fitches.

Seal Brown. Four parts burnt umber, one part golden ochre.

Sepia. This is a natural color used chiefly by artists. It cannot be imitated and it must not be used in oil.

Sienna Brown. The color is variously called sienna brown, teak brown, and other names. It is made by mixing burnt Italian sienna and French ochre with pure zinc.

Snuff Brown. French ochre and Indian red added to zinc white will produce this color. Another way to próduce a snuff color is to mix four parts of medium yellow and two parts of Vandyke brown, or burnt umber may be substituted for the Vandyke brown if desired. Another snuff color may be obtained by mixing burnt umber and yellow ochre, tinging with a little Venetian red.

Tan. Mix ten parts of burnt sienna and four parts of medium chrome yellow with three parts of raw umber. White lead and burnt sienna, to which has been added a very little lamp black, will also produce a tan color. A very rich tan color may be made from ochre, burnt Turkey umber and a little orange chrome with white lead.

Thrush Brown. One part yellow ochre, three parts burnt umber, twelve parts white lead.

Vandyke Brown. This is an important brown to the house painter. It cannot be imitated, although a little red added to umber produces a color somewhat similar to it.

Vienna Smoke. The best burnt umber should be tinted with lemon chrome yellow and a little Venetian red.

Wallflower Brown. This beautiful brown may be made by a mixture of medium chrome yellow and brown lake. Or crimson lake and burnt sienna may be mixed with medium chrome.

GRAYS.

Argent. A reddish gray tint, which can be produced by mixing together nine parts of black, sixteen of white, one of red and a little orange.

Ash Gray. Lamp black and a little French ochre added to white lead give this color. Another mixture is as follows: two parts of burnt sienna, three parts of light ultramarine blue, sixty party of zinc white.

Black Slate. Mix together black and Prussian blue in the proportion of about thirteen parts of the former to one of the latter and add a little white.

Dark Gray. Mix eight parts of black, one of white and a touch of red or blue to produce this shade; but practically any admixture of black and white in which the former predominates and to which has been added a little color will give a dark gray.

Dark Lead. This is a dark gray, being produced simply by adding lamp black to white lead.

Dark Slate. This also is black added to white. The mixture under Black Slate would answer.

Deep Lead. Black, a little bright blue, and Indian red mixed with white lead produces this color.

French Gray. This can be made by tinting white with a little ivory or drop black and adding a little carmine or crimson lake and ultramarine. This produces a very slight violet tinge. White tinted with a little ultramarine and Venetian red also gives a good French gray. Celestial blue or cobalt may be used instead of the ultramarine if desired. Another good mixture is made by tinting white lead with one part of black and two parts of orange chrome.

Granite. French ochre and lamp black added to white lead produce this color.

Graystone.—Mix five parts of black with three of white and three of blue and add a little red.

Gray Drab. Mix five parts of black with four of white and a little deep chrome yellow.

Green Slate. Same as lead, but with more black and blue.

Iron Gray. Mix eight parts of black with two of white and a little orange.

Jasper. This may be described as a pepper and salt shade.

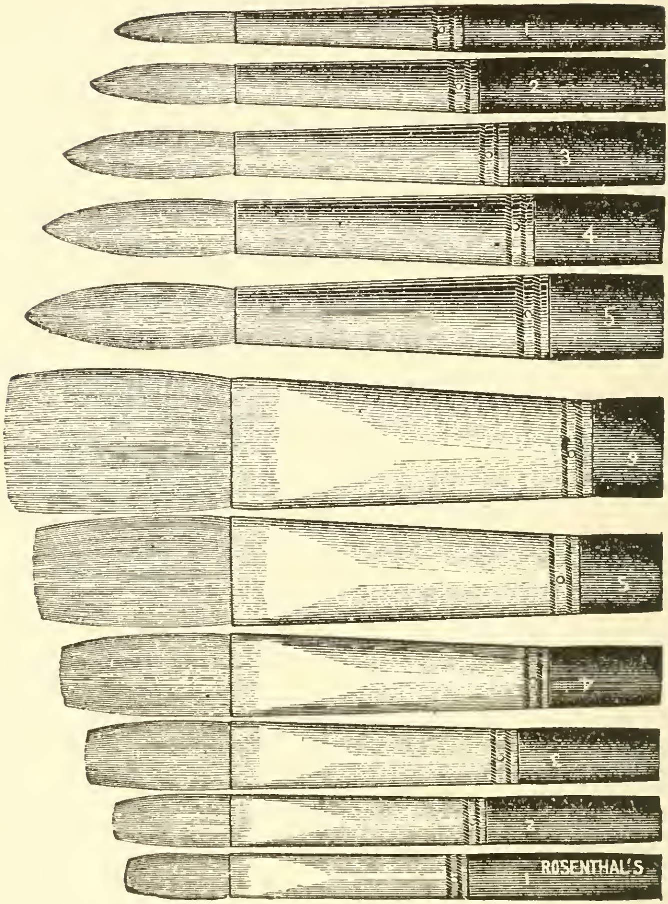


Fig. 27. Artist's Bristle Brushes.

Mix nine parts of black with two of white, with a touch of deep chrome.

Lead. This is simply a dark gray, and is made by adding lamp black to white lead with sufficient blue.

Light Gray. Mix together one part of Prussian blue, one part of lamp black, ten parts of white lead. By adding more or less white lead a darker or a lighter shade may be obtained if required. Another shade is obtained by mixing two parts of black, eight parts of white and one part of blue.

Mastic. This is a dark gray shade. To produce it mix twelve parts of black with one of white, rather less than one of yellow and just a touch of orange.

Moss Gray. Tint white lead with French ochre, a bright green and a little lamp black.

Mouse Color. Eleven parts burnt umber, to which has been added one part of Prussian blue, mixed with about twenty times the bulk of white lead, will give this tint. Another shade may be had by mixing sixteen parts of white, three of black and one of blue. Some painters tint white with lamp black and add a very little Venetian red and burnt umber.

Neutral Tint. An artist's color is sold under this name.

Olive Gray. Three parts of lamp black, one part of chrome green, with about forty times the quantity of white lead, will give this color.

Opal Gray. One part of burnt sienna, two parts of cobalt blue, and thirty parts of zinc white.

Payne's Gray. Is an artist's color, which may be described as a gray having a lilac tinge.

Pearl. This is the same as French gray, but is much lighter.

Pearl Gray. Forty parts white lead, five parts of vermilion and one part of deep chrome green. Some decorators tint white lead with lamp black and call that pearl gray. Strictly speaking, however, it should not be called pearl gray, there being no color present. Six parts of white lead, two parts of Venetian red, and one part of lamp black gives a somewhat dark pearl gray, but a lighter tint may easily be obtained by adding more lead. Ivory black answers equally as well as lamp black.

Quaker Drab. This greenish gray shade is produced by mixing two parts each of yellow and green and five parts of white.

Rustic Drab. Tint white lead with French ochre and lamp black.

Silver Gray. Tint white lead with French ochre and lamp black, or yellow may be employed instead of the ochre if preferred. White lead tinted with a little lamp black and indigo gives an excellent silver gray.

Smoke Gray. Tint white lead with French ochre and lamp black.

Steel Gray. Tint white lead with a mixture of lemon chrome and medium chrome and lamp black.

Stone Gray. Add black and chrome to white lead.

Verdant Gray. Two parts of oxide zinc and one part of terra verte.

Warm Gray. Tint white lead with French ochre and lamp black or sienna and lamp black. A better mixture is produced by taking white as a base and adding a little burnt sienna and raw umber with a very little burnt umber and a touch of Prussian blue.

GREENS.

Aloes. A pale sage green shade. To obtain it mix six parts of black, three of white, one of chrome yellow, and three of Brunswick green.

Apple Green. The simplest way to obtain this is to mix medium chrome green with about thirty times the quantity of white lead, but other greens may be employed with the addition of a little Prussian blue when necessary. Or a little orange chrome yellow may be added to the medium chrome green and white lead. A very good shade can be produced by mixing one part of white with four of yellow and nine of green.

Autumn Green. Mix one part of chrome yellow with seven of black and two of emerald green.

Blue Green. Equal proportions of deep chrome green and cobalt, or three parts of chrome green and one of Prussian blue, added to white lead in the proportion of about four times the quantity of lead to the mixture of green and blue, will give a tint which is sometimes called blue green.

Bottle Green. Mix together five parts of medium chrome green and one part of blue black. A similar color may be obtained by adding Prussian blue and blue black and lemon chrome. Another shade is made by using four parts of black and one of green.

Bronze Green. The usual method is to mix black with deep chrome yellow, but indigo may be used instead if desired. A much brighter color is obtained from a mixture of medium chrome yellow, Prussian blue and burnt sienna. Or the following recipe may be used: Medium chrome green five parts, blue black one part, burnt umber one part. A light bronze color may be obtained by adding more green or by using light instead of medium green. Other shades of bronze green may be got by adding a little lamp black to dark chrome green, or by taking medium chrome green and adding lamp black and a little râw umber.

Brunswick Green. This color is sold in three shades. It may be imitated by a mixture of Prussian blue and chrome yellow, but chrome green, toned down with black, is sometimes used.

Chartreuse. This is a light yellowish green color. Mix four of chrome yellow and five of chrome green lightening up with white.

Chrome Green. This color can be bought ready made. To produce it by admixture, add Prussian blue to lemon chrome yellow in the proportion of about one part of blue to eight parts of yellow.

Eau de Nil. Tint white lead with medium chrome yellow, emerald green and a touch of Prussian blue.

Egyptian Green. Add two parts of raw umber and one part of lemon chrome yellow to white lead. Give the green tone to it by means of a little Prussian blue.

Elephant Green. A dark green, obtained by adding a little emerald green to black.

Emerald Green. This beautiful, bright green cannot be successfully imitated. It must not be mixed with ultramarine. The pigment is a great favorite with some painters, while others never use it. In this country the pigment is known as Paris green, but it is not used to any extent by painters, although it is used as an insecticide. In the absence of the real thing, a more or less presentable imitation may be obtained by mixing eight parts of white lead and one part of medium chrome green, or a light shade of chrome green may be used without lead. Emerald green, although so bright, has very little body, but it is very useful for glazing. A thin finishing coat is given over a good green ground to brighten it.

Foliage Green. One part of blue black may be mixed with four parts of lemon chrome. Use medium chrome yellow if a darker shade is required.

French Green. This is a bright yellowish green, which may be obtained by adding to emerald or deep chrome green about one-tenth part chrome yellow. Yellow ochre is sometimes used instead.

Gage Green. This is a variety of sage green. It may be made in the same way as pea green, and when that is reached a little black should be added to bring it to the required sage color.

Genuine Green. This is usually to be had ready mixed, but it varies considerably in name as well as in the exact tint.

Grass Green. The color sold as extra light chrome green makes a splendid grass green without any addition, but if it is not available, lighten up medium or dark chrome green with chrome yellow.

Green Slate. Tint white lead with a bright green toned down with ochre and lamp black.

Green Stone. Twelve parts white lead tinted with one part medium chrome green and one part of raw umber give this tint, or the tinting colors may be French ochre and emerald green with a little lamp black.

Gray Green. Use ultramarine blue, lemon chrome yellow, blue black and white lead.

Invisible Green. A dark green made by mixing nine parts of black and one of bright green.

Ivy Green. This is produced by a mixture of French ochre, lamp black and Prussian blue.

Leaf Bud. This color is suitable for inside work. It is made by mixing orange chrome yellow, light chrome green and white lead in equal proportions.

Light Green. Equal quantities of white and blue and rather more than twice the amount of green give a very good shade.

Light Olive Green. Mix three parts of middle chrome, two parts of black, and one part of burnt sienna and lighten up with white lead until the desired color is obtained.

Lime Green. This is sold ready for use, and is only suitable for distemper. It cannot be used with oil.

Manse Green. This is produced from a mixture of a bright green, medium chrome yellow and French ochre.

Marine Green. Mix one part of middle chrome green with four of black.

Medium. A green of this name may be purchased ready made. It is very similar to middle Brunswick green.

Mignonette. This is a dark green shade, obtained by mixing one part of chrome yellow and one of Prussian blue with three parts of chrome green and fifteen parts of black.

Muscovite. This is a dark sage-yellow greenish shade. It may be obtained by mixing six parts of Prussian blue, thirteen of chrome green, three of orange chrome, eight of white, and twenty of black.

Moss Green. Tint white lead with French ochre, a bright green and a little lamp black.

Moss Rose. This pale greenish shade is obtained by mixing chrome or Brunswick green, bright yellow and white in the proportions of one part green, four of yellow and three of white.

Mountain Green. Add to medium chrome yellow sufficient cobalt to produce the desired hue, adding a little white if necessary.

Myrtle. Three parts of dark chrome green, one part of ultramarine blue, and a little white lead will give an excellent myrtle color.

Night Green. Seven parts of chrome green and three parts of yellow ochre will give this shade.

Nile Green. Five parts of white, nine of emerald green and six of Prussian blue will give this shade.

Olive. Mix together ten parts of lemon chrome yellow, one part of ultramarine blue and one part of light Indian red. Another method is to use eight parts of lemon chrome yellow, one part of blue black and one part of Prussian blue. Or the following proportions give very good shades: three parts black, four parts white, four parts red, two parts yellow, and eleven parts green. Or, fifteen parts of white, twenty of red, twelve of yellow, and fifty-three of green. Some painters add equal portions of Prussian blue and lamp black to lemon chrome yellow for a base, or the base may be ochre instead of chrome, and a little of the yellow be added.

Oriental Green. Is made by mixing equal proportions of raw umber and lemon chrome yellow.

Royal Green. This color is sold ready made.

Peacock Green. A mixture of seven parts of white, fifty parts of emerald green and forty-three of Prussian blue will give this shade. A little yellow is sometimes added. The color is best produced by giving a final transparent coat over a ground color. For the ground mix a rich green, a very deep Brunswick green and middle chrome. Over this apply a very thin coat of a deep bluish green made from Prussian blue and lemon chrome.

Pea Green. Forty-eight parts of white lead and one part of chrome green will give this color, or emerald green may be used if desired. Some makers mix medium chrome green and white lead in the proportion of five parts of the latter to one part of the former to obtain a pea green, but the proportions may be varied considerably according to the exact shade required.

Persian Green. This is only another name for emerald green, the vivid and somewhat staring hue being sometimes employed in oriental decorations and being then termed Persian green.

Pistache. This is a yellowish green shade. It may be obtained by mixing seven parts of black, one of yellow ochre and one and half of chrome green. Or chrome yellow may, if desired, be substituted for the ochre.

Prussian Green. To produce this, mix five parts black, three parts chrome yellow and twelve parts emerald or medium chrome green.

Quaker Green. Mix equal proportions of Venetian red and medium chrome yellow and add blue black. Add to this mixture a quantity of chrome green equal in bulk to the three. This will give an excellent quaker green.

Reed Green. Mix white, chrome yellow and chrome green in about equal quantities to produce this shade. The name, however, has no special significance, and an admixture of almost any yellow and green, lightened up with white, might be used instead.

Sage Green. This may be produced by tinting white lead with four parts of light chrome green and one part of ivory black, or the white lead may be tinted with a mixture of French ochre, lamp black, and Prussian blue. Another recipe is as follows: Add raw umber and chrome green in the proportion of about one part of the former to two parts of the latter added to white lead until the desired shade is obtained. A pale Brunswick green and a very little black used to tint white also gives a good sage green.

Sap Green. Mix with white lead, medium chrome yellow and a very little lamp black.

Sea Foam. Tint white lead with medium chrome yellow and emerald green, or if too bright, use medium chrome green instead of the emerald.

Sea Green. This color is obtained by adding deep chrome to white lead. Another sea green, and a very good one, is obtained by mixing light Brunswick green, raw sienna or ochre and white.

Seered Green. Tint white lead with French ochre, medium chrome yellow and a little bright green.

Starling's Egg Green. A mixture of light chrome and Prussian blue, lightened up with white, will produce this color.

Tea Green. Medium royal green, chrome yellow and lamp black added to white lead will give this color.

Velvet Green. Mix three parts of burnt sienna, five parts of light chrome green and eight parts white lead.

Venetian Green. Lighten up dark chrome green with white lead.

Water Green. Raw sienna mixed with a little deep chrome green and added to white lead gives a water green tint.

Willow Green. Tint white lead with medium chrome green, and add a little burnt umber or ivory black.

JAPANS.

Rich Dark Red. Mix Indian red with a little black Japan.

Rich Dark Brown. Mix crimson lake and black Japan, varying the amount of each according to the depth required.

Chocolate Brown. Mix orange chrome with black Japan.

Leather Color. This is obtained in exactly the same way as chocolate brown excepting that rather more chrome is used.

Bottle Green. Mix together Prussian blue, Dutch pink and black Japan.

Invisible Green. Use the same mixture as for bottle green but use less Japan.

Light and Dark Reds. A series to which there is no end, may be obtained by mixing either vermilion or vermilionette with black Japan in varying proportions.

Neutral Green. This is produced by adding lemon chrome to a little black Japan.

REDS.

Acacia. This may be described as a dark maroon. It is made by mixing five parts of black, three of Indian red and one of Prussian blue. Less of the black will give a more pleasing shade.

Amaranthine. This is a crimson which can be made by mixing three parts of vermilionette with one of Prussian blue.

Anemone. This is a reddish purple, and may be made by mixing two parts of black, one of white, six of a bright red, and six of Prussian blue.

Apricot. Mix middle chrome yellow with a little vermilion and add a very little lake.

Armenian Red. Mix one part of yellow ochre with two parts of Venetian red.

Aurore. A dull pink shade, which can be produced as follows: Mix together one part of Indian red, two of orange chrome, a little lemon chrome, and two of blue, lightening up with white.

Bay. Mix together five parts of black, three of Venetian red, and a little orange chrome.

Begonia. A dark red purple, which may be obtained by mixing six parts of lamp black, five of bright red, and four of Prussian blue.

Black Maroon. Take eight parts of black and mix them with one of a bright red and a little Prussian blue.

Blood Red. Any bright red toned down with a little black will produce a shade sometimes called by this name.

Bordeaux Red. Take nine parts of black and mix with it two parts of orange chrome and one of Prussian blue.

Brick. Use two parts of French ochre to one part of Venetian red and one part of white lead, adding more ochre if required to lighten the color. This gives a good tint, sometimes called brick red, and is suitable for outside work.

Bright Scarlet. Mix twenty parts of vermilion, seven parts of pale chrome, and one part of golden ochre. A good vermilionette slightly toned down with yellow answers the same purpose.

Bronze Red. This is a red toned down with about a fourth part of black, a little bright yellow or orange being added.

Cambridge Red. Vermilion, to which is added about one twentieth part of Prussian blue, gives a color called Cambridge red.

Carmine. This is an artist's color. Its rich red tint can hardly be imitated. A light vermilionette of good grade, to which is added a little bright yellow, may be used.

Carnation Red. Three parts of carmine lake and one part of white lead give a carnation color, but a better result is obtained by taking pure vermilion as a base and adding carmine and zinc white until the desired rich color is obtained. This color is not suitable for use outside.

Carnation Rose. White lead tinted with Indian red or vermilion, or one of the fast reds. A beautiful color can be obtained by simply tinting white with permanent crimson madder.

Cherry Red. Mix together crimson lake, burnt sienna and azure blue, or two parts of vermilion and one part of carmine.

Claret. Mix two parts of carmine with one of ultramarine blue. A little vermilion may be added if desired, and this may render a little yellow necessary to tone down the color. A less rich color may be made by mixing Venetian red and yellow ochre.

Coral Pink. This color is useful only on inside work. It is made by mixing five parts of vermilion, two parts of white lead and one part of chrome yellow. Another recipe for producing shades of coral pink is: one part of white, three of red, five of orange, and three of blue.

Dregs of Wine. This shade is produced by mixing Venetian red with a little lamp black and white lead.

Egyptian. A dull yellowish crimson made by using five parts of black, one and half of white, two of orange, and one of blue, and a very little red.

Firefly. A dull orange red produced by mixing two parts of black, three of red, one of orange, and a little yellow.

Flesh Color. One hundred and twenty parts white lead, two parts yellow ochre, and one part Venetian red will produce an excellent flesh color. Or mix eight parts of white lead, two parts of orange chrome yellow, and one part of light Venetian red. An increased proportion of red may be employed where desired. A mixture of orange and white in the proportion of one part of the former to three parts of the latter may also be used, or a mixture of medium chrome yellow, ochre, and Venetian red added to white.

French Red. Use equal parts of Indian red and vermilion, and glaze with carmine or permanent crimson madder.

Gazelle. To obtain this mix Venetian red, lamp black and Indian red, and add sufficient white lead to produce the desired shade.

Geranium. To produce this color use nine parts of bright red and one of blue. Or Indian red may be used, afterwards glazing with madder lake for good work. Most of the larger color manufacturers make geranium red which is better than can be obtained by mixing.

Indian Pink. Tint white lead with a little Indian red.

Indian Red. This is a good permanent pigment to be bought ready made, and is most useful in mixing with other colors.

Light Pink. Tint white lead with a little pure vermilion. The word pink does not bear any very definite meaning, as almost any bright red such as carmine or crimson added to plenty of white give a good pink just as vermilion does, but of another hue. A very pretty and useful pink is made by adding white to permanent crimson madder.

Light Salmon. Tint white lead with raw Italian sienna, burnt Italian sienna, and burnt Turkey umber. Or tint white with any bright red, toning down with sienna.

Lilac. A great deal of difference of opinion exists as to this tint. One part of ultramarine to one part of bright carmine, added to eighty parts white lead, give a very good lilac. A cheaper way is to use Indian red and lamp black as a tinting color, or rose pink may be added to the lead only. Yet another method for producing a lilac is to mix three parts of bright Indian red, three parts of white lead, and one part of ultramarine blue, but less white lead is preferred by some painters. A touch of yellow will help this color if too raw for the purpose.

Madder Lake. This is principally used by artists, but it is useful to the house decorator for glazing the best work where a bright red is required.

Magenta. Carmine and vermilion, with a little ultramarine blue, produce this color.

Maroon. This color is obtained by mixing carmine and blue black, and adding a small quantity of medium chrome yellow. It may also be made by mixing one part of ultramarine blue with three parts of Tuscan red. This gives a tint that is often considered a little too red, but this defect may easily be remedied by adding more blue. Some painters add ivory black and a little chrome yellow to carmine.

Mexican Red. Mix one part of red lead with four parts of Venetian red.

Mikado. Three parts of blue and seven of red, mixed with a little white, give this purplish red shade.

Moorish Red. Mix together three parts of vermilion and one part of rose pink.

Mulberry. This is a very dark purple obtained by adding a little blue and just a tinge of red to black.

Old Rose. Tint white lead with French ochre, Indian red and lamp black, or Venetian red and a very little lamp black may be used if desired.

Opaque Pink. Tint white lead with red lead.

Opera Pink. Tint white lead with a mixture of five parts of vermilion and one part of medium chrome green.

Oriental Red. Mix one part of red lead with two parts of Indian red.

Orange Scarlet. This color may be obtained by adding two parts of orange lead to one part of white lead.

Orange Vermilion. Orange lead comes nearest to this color. The tone may be made by adding chrome to vermilion.

Peach Bloom. This is a mixture of white lead and Venetian red. Or it may be produced by adding sufficient Indian red to white lead to give a warm tint and mixing it with equal proportions of white lead, lemon chrome yellow, ultramarine blue and light Indian red. Or a mixture of three parts of Indian red with seventeen parts of white is sometimes used.

Pink. White lead tinted with orange lead gives a bright pink.

Plum. Mix with equal parts of white lead. Indian red and ultramarine blue in the proportion of two parts of lead to one of each of the other colors. This makes a dark plum that is only suitable for inside work. If a light tint is desired add more white lead. A very rich plum may be obtained by mixing together ultramarine blue and carmine, and adding a little white and a little yellow.

Pompeian Red. Small quantities of bright red and orange are mixed with black to produce this shade.

Poppy. Blue and vermilion mixed in the proportion of one of the former to twenty-four of the latter give this shade. Some color mixers prefer to add a bright yellow instead of the blue.

Purple. Light Indian red, four parts; white lead, three parts; ultramarine blue, two parts; or a purple may be obtained by mixing Indian red and white. A mixture preferred by some painters is made by mixing ultramarine and vermilion with a little white. A little crimson lake gives richness to the color.

Red Ochre. This earth color is cheap, and can be readily bought in most places. It can be imitated by mixing Indian red and chrome and adding a little vermilion.

Red Terra Cotta. Use equal proportions of burnt sienna and white lead. The tone may be varied by the addition of either of the umbers and the chromes. A good bright terra cotta is also made by using Venetian red as a base and coloring up with ochre and a touch of lake.

Regal Purple. Mix together four parts of white lead, two parts of cobalt blue and one part of carmine lake.

Roan. Mix black with half its quantity of red and add a very small proportion of blue and white.

Rose. Five parts of white lead mixed with two parts of carmine give a rose color that is suitable for inside work only. An admirable rose color may be obtained by using zinc white instead of white lead, as the zinc is a much purer white than the lead, and hence gives a purer tint.

Rose Carnation. Mix together one part of rose madder and eight parts of oxide of zinc. This is a beautiful color, but the madder is too expensive for use except by artists.

A very successful color can be produced from permanent crimson madder.

Rose Wood. To produce this color, red is mixed with about twelve times the quantity of black and a very little green. The shade given is a very dark red.

Royal Pink. Mix together two parts of zinc white and carmine lake. This will only do for inside work.

Royal Purple. Mix one part of vegetable black, one and one-half of rich red, and seven of Prussian blue.

Salmon. Six parts of white lead, one part of vermilion, and a little lemon chrome yellow. This mixture produces a color somewhat bright. Another salmon color is made by a mixture of raw sienna, burnt sienna and burnt umber. A tint preferred by some is produced by adding to the white, Venetian red, burnt umber and French ochre. Another method is to add vermilion and golden ochre to white, which gives a nice bright color. Venetian red and chrome, added to white, gives a duller color. Still another mixture is Venetian red, vermilion, yellow ochre and white.

Scarlet Lake. A color very similar may be obtained in one of the many vermilionettes on the market. It will be convenient to remember that all vermilions are lightened by the use of pale chrome instead of white lead. Lead takes down the brilliancy of the color, producing a pink.

Scarlet Red. It is the name given to the brightest of the oxide paints.

Shell Pink. This color is sometimes made by adding a little good Indian red to white, but some decorators prefer to use vermilion with a little chrome yellow and burnt sienna.

Shrimp Pink. Mix Venetian red, burnt sienna and white lead, and add a little vermilion.

Signal Red. This is usually made by mixing orange lead, vermilionette and Paris white, or orange lead by itself may be tinted with vermilionette.

Salmon Pink. Tint white lead with equal parts of orange chrome and vermilion. If zinc white is used instead of lead the color will be found brighter.

Terra Cotta. Mix together two parts of white lead and one part of burnt sienna. One of the best ways to produce a good terra cotta wall is to give a good under coat of white lead, orange chrome and a little Venetian red, and when dry to apply a finished coat made from Venetian red and a little orange chrome to which has been added a little white.

Turkish Crescent Red. Mix equal proportions of Indian red, vermilionette and rose pink.

Tuscan Red. This can be bought ready made, and may be imitated by mixing ten parts of Indian red with one part rose pink. Indian red is very similar in color but somewhat darker.

Venetian Pink. Tint white lead with a little Venetian red.

Venetian Red. This color is one of the most useful that the house painter has, being cheap, and having good covering power and body. It is not very good for tinting purposes. It would not, of course, be often imitated, but Indian red—a very similar pigment—could be tinted with red. Or it may be imitated by mixing vermilion, yellow ochre, madder, carmine and a little Cappagh brown, which is an artist's color and is rarely used by house painters.

Vermilion. This bright red cannot be imitated by an admixture of ordinary pigments, but there are many excellent substitutes on the market, most of them being vermilionettes.

Wine Color. Add a little ivory black to a mixture of carmine and vermilion.

WHITES.

A very little ultramarine green added to white lead makes a white sometimes called Japan white.

Equal parts of white lead and oxide of zinc are frequently used as a white paint, although two parts of lead to one of zinc gives a better mixture.

Some painters are under the impression that inasmuch as lead and zinc are both derived from metals they will not mix together to form a good paint, there being something of the nature of a galvanic action set up between the two metals. This, however, is an error, for although lead and zinc cannot properly be mixed together by hand, yet if they are ground by the ordinary paint manufacturers' machinery the result is a most durable paint.

On the other hand, it is doubtful whether the mixture of lead and zinc is a good policy to follow. Many painters get excellent results by using white lead for the under coats and zinc white for the final coats.

Commercial White. Seventeen parts of white lead, three parts of barytes. This is intended to be mixed in oil, not water.

Permanent White. The best quality barytes or blanc fixe makes a permanent white when ground in water. In oil it lacks body. For many purposes a white which will last a considerable length of time is made by mixing two parts of zinc white with one part of barytes.

YELLOWS.

If a yellow is too bright it may be lowered by adding a small quantity of blue and red. Instructions for obtaining the various grades of yellow are given explicitly herewith.

Alabaster. This is yellowish white in color. Mix four parts of white with one of middle chrome yellow.

Amber. An imitation of amber can be produced by mixing equal portions of burnt sienna, burnt umber, blue black and orange chrome yellow, and adding a quantity of white lead until the desired tint is obtained.

Antique Bronze. Add ivory black to orange chrome yellow in the proportion of about five parts of black and one part of orange.

Asiatic Bronze. One part medium chrome yellow, two parts raw umber, and lighten with white lead.

Brass Yellow. This may be obtained by mixing forty parts of white lead, twelve parts of light chrome yellow, one part raw umber, and one part burnt umber. Or a mixture of French ochre and medium chrome yellow, added to a little umber, with a touch of blue, may be used to tint white as a base.

Bronze. Take fourteen parts of black and add one part of yellow and two of green.

Bronze Yellow. Mix together five parts of medium chrome yellow, three parts of white lead, and one part of raw umber. A mixture preferred by some painters is obtained from chrome yellow, French ochre and a little burnt umber.

Buff. Two parts of white lead and one part of yellow ochre produces a good buff, or white lead may be tinted with French ochre alone. Other shades are obtained with mixtures of two parts of black, four of white, one of red and one and one-eighth of yellow.

Buttercup. White lead tinted with lemon chrome gives a nice buttercup yellow.

Cadmium Orange. This is an artist's color of considerable value, but is, generally speaking, too expensive for house painters. It should not be mixed with chrome yellow or emerald green. It is made in three shades: pale, medium and deep, and it cannot be successfully imitated.

Canary. This is practically another name for straw tint, and it may be mixed in the same way. The proportions for an ordinary shade of canary are three parts of lemon chrome yellow to one part of white lead, but less yellow is often preferred. Another shade is obtained by mixing two parts of white, six of yellow and two of green. Some manufacturers make an extra light chrome yellow which they call by this name.

Chamois. A dull yellow made by mixing four parts of white, five of yellow ochre and one of green.

Chamoline. Mix together five parts of white lead, three parts of raw sienna and one part of lemon yellow.

Citrine. Although this is a tertiary color, and theoretically can be made from green and orange, opinions as to the exact shade somewhat differ. It may be made by mixing four parts of medium chrome yellow and one part of raw umber; or five parts of lemon chrome yellow and two parts of raw umber.

Citron. To produce this color use Venetian red as a base and add one part of Prussian blue, two of chrome yellow and two of white.

Colonial Yellow. Medium chrome yellow mixed with white lead and a little dark orange chrome yellow gives this tint.

Cream. A good shade is obtained by mixing eight parts of white lead, two parts of French yellow ochre and a touch of Venetian red. French ochre and lead alone are often employed. Equal parts of raw sienna and orange chrome used to tint white gives a nice cream. There are many other methods of obtaining this tint.

Daffodil. Lemon chrome mixed with a little Venetian red will give this color.

Deep Cream. This color is made by tinting white lead with yellow ochre and a little Venetian red.

Ecru. Tint white lead with French ochre and medium chrome yellow. A tint which is sometimes called stone color is produced in the same way. Another shade of ecru may be obtained by mixing three parts of black, eight parts of white, three of medium chrome yellow and one of Brunswick green.

Jonquil Yellow. Tint white lead with medium chrome yellow to which has been added a very little vermilion red. One of the favorite methods is to employ sixteen parts white lead, one part of indigo and two parts of light red, adding as much chrome yellow as may be desired. Another way of making jonquil yellow is by simply mixing with a little green about forty times the quantity of yellow.

Gamboge. This is an artist's color. It is a gum resin, is somewhat fugitive, and is useless for the purpose of the house painter.

Gold. To obtain the color known as gold, white lead may be tinted with five parts of golden or yellow ochre and one part of vermilion, or a mixture of light chrome yellow. French ochre and vermilion may be used instead to tint the white lead. The quantity of yellow used should be considerably more than the ochre.

Hay Color. French ochre, medium chrome yellow and lamp black used as tinting color for white lead will give a hay color, or raw Italian sienna and lamp black may be employed if desired.

Ivory. The addition of a very little medium chrome yellow to white lead produces this tint, or a very little golden ochre may be used. Another way is to tint white very slightly with middle chrome and a touch of black.

Leghorn. This is a pale yellow shade, which is obtained by mixing white and medium chrome yellow in about equal proportions.

Lemon. For this color, lemon chrome yellow is used alone, but the tint may be made by using white lead for a base and adding medium chrome yellow until the desired tint is obtained. The tint that is usually preferred is obtained by mixing five parts of chrome to two parts of white lead, and adding a little green. However, lemon chrome yellow purchased ready made is the best.

Light Buff. A little yellow ochre added to white lead gives a good buff color, the tint varying with the quantity of ochre.

Light Stone. Tint white lead with French ochre and lamp black.

Lemon Yellow. This is also called lemon chrome, and is the palest shade of lemon chrome yellow. It is very useful for preparing the lighter shades of yellow, and may be imitated by adding cadmium yellow to zinc white.

Corn Yellow. Mix yellow and white in the proportion of about three parts of the former to one of the latter to get this light yellow shade.

Manilla. Is made by tinting white lead with French ochre and chrome yellow. Or a mixture of white with four times the quantity of yellow will produce a shade of manilla.

Marigold. This is obtained by mixing a very little bright yellow with orange chrome.

Melon. Mix equal quantities of black and white. Add twice the bulk of orange chrome and a quantity of medium chrome equal to the mixture of black and white.

Mushroom. A dull yellow shade, which may be obtained by adding one part of orange and two of yellow to ten parts of black.

Middle Stone. Mix as described under Stone, but use more umber and ochre.

Naples Yellow. This yellow is not now much used, chrome yellow having to a large extent taken its place. It may be imitated by tinting zinc white with cadmium yellow and a very little yellow ochre.

Naples Yellow. This is obtained by mixing orange with twice as much yellow and three times as much white. It is also the name given to an artist's color.

Ochre Yellow. Mix orange and yellow in about equal proportions with a rather larger quantity of black.

Old Gold. Use middle chrome with a little vermilion and burnt sienna, and add a very little cobalt. A cheaper color may be made by mixing ochre and burnt sienna. One part of green and three of bright yellow mixed with a little white will give an old gold shade. Or it may be obtained in the same way as gold, but a little burnt umber may be added. Some painters prefer to tint white lead with a mixture of chrome, raw sienna and vermilion. White tinted with a little orange chrome and burnt umber also gives a good old gold tint.

Olive Yellow. This color is sometimes called olive brown. It is made by mixing three parts of burnt umber with one part of lemon chrome yellow, a larger quantity of yellow being added if a lighter shade is required. Another method is to mix ten parts of black, one of orange, twelve of yellow and five of green.

Orange. Mix white, yellow and orange in the following proportions: One part each of yellow and white and eighteen parts of orange. Or another shade is got with seventeen parts of orange, six of yellow and two of white. Orange chrome yellow can be easily purchased, however, and gives this color without any admixture being necessary.

Persian Orange. Mix fourteen parts of orange chrome, five parts of yellow ochre and one of white.

Pompeian Yellow. Tint white with Italian ochre and add a very little ultramarine and vermilion.

Portland Stone. Mix equal parts of yellow ochre and raw umber and lighten up with white until the desired tint is obtained.

Primrose Yellow. Lemon chrome used by itself answers admirably.

Primrose. Ten parts of white, three parts of green and four parts of yellow will give this light greenish yellow. Another shade is got by mixing one part of orange, two parts of green and five parts of yellow.

Spruce Yellow. Add a little Venetian red to a mixture of French ochre and white lead.

Stone. This color, so much used, is usually made by mixing together five parts of white lead, two parts of French yellow ochre and one part of burnt umber. By adding a little raw umber, the tint may be varied as desired. This color is suitable for outside work. Another method for obtaining the shade is to tint white with medium chrome yellow and burnt umber.

Straw Color. Lemon chrome mixed with raw umber.

Straw. White lead tinted with a little chrome yellow produces an excellent straw tint, but some prefer to add a little French ochre. Or medium chrome yellow may be used as a base, and a mixture added of white, French ochre and Venetian red.

Yellow Lake. This is a somewhat fugitive color which has but little body, but is useful for glazing. To imitate it use equal parts of burnt umber and white lead and tint with chrome yellow and lake. Or, mix umber and white in equal proportions and add Naples yellow and scarlet lake. To obtain this color in its full richness it is quite necessary to glaze either admixture with yellow lake.

Yellow Ochre. The ochres are natural mineral pigments, which are among the cheapest and most useful at the command of house painters. They can be used in any vehicle and are quite permanent, while they do not affect any other color with which they may be used.

Zinc Yellow. This is a chromate of zinc which is quite fast in light, and possesses the advantage of permanence even in the presence of impure sulphuretted hydrogen. It may be mixed with other colors, without adversely affecting them.

COLOR TESTING.

Although to accurately test the quality of a color requires somewhat elaborate experiments, both chemical and practical, yet there is no reason why the painter should not determine with a sufficient degree of accuracy for his purpose the quality of the color he uses. Indeed, if this was done more generally, much of the adulterated trash would be driven from the market, and none would rejoice more at such a result than the color manufacturers themselves. The manufacturers assert that they are as desirous that the trade should use pure colors as the painters can possibly be. Even the biggest houses produce cheap grades of colors, and this they do, as a rule, almost under a protest and simply because they are compelled by painters demanding colors for certain low prices, far below that at which it would be possible to produce the pure article. Make careful comparison between pure colors and those being used. At the same time, compare the prices and see which is cheaper to use. If even they come out at the same price, remember that by using a pure color all the benefit of the purity of tone so necessary for the execution of good work is gained.

The first thing to be done in testing any paint material is to have a standard. There must be no doubt about this. Unless we have in each case something with which to compare the particular sample of color that is being examined, we shall have no useful information concerning it. Take, therefore, good decorators' colors of well known make. If necessary purchase small tubes of the best colors, such as are put up for artists' use. This will be rather a severe trial, but still it will afford a standard. Having such samples and going through the tests we are about to describe, the painter can, after some amount of trouble, arrive at results which are almost as accurate as those which could be deduced by a chemist. An expert on this question some years ago summarized the characteristics of colors which should be considered in making the examination, under the following heads:

1. Purity of the material.
2. Purity of the tone, brilliancy; richness, which indicates the amount of care in selection.
3. Fineness of grinding or preparation; this means the degree of the division of the particles and upon the completeness of such division will depend
4. Its spreading capacity.
5. Its body. This applies, of course, only to opaque or semi-opaque colors. Body is opacity, and means capacity to conceal the surface to which the paint is applied, and must not be confused with spreading. It is an inherent quality.
6. Its staining power or tinting strength with white or colors.
7. The quality of purity of the tint with white.
8. If a paste color, the consistency of the paste.
9. Transparency of transparent colors and the quality of the transparency.
10. The permanency of the color.

It will be observed that all of these tests will not necessarily be applied to every color. For instance, a transparent color would be tested for its transparency, but certainly not for its body. The one condition is the converse of the other.

Purity of the Material. This is sometimes of considerable importance, as in the case of white lead, whilst in others, for example the earth colors, it can hardly be said that there is a standard of purity. As a rule a knowledge of practical chemistry is necessary in order to determine whether a sample of paint or color is pure or not.

The purity of white lead, however, can readily be ascertained by the painter who possesses no chemical knowledge by aid of a blow-pipe. Take a piece of flat charcoal and cut out a hollow space from it into which place a small piece of white lead to be tested, about the size of a pea. Now direct the flame of a blow-pipe upon it, using an ordinary candle or a Bunsen burner, taking care that the blue portion of the flame bears upon the lead. Keep up a steady blow for a few minutes and the white lead will be converted into metallic lead, which will show in the form of a bright silver-like button. If the lead is adulterated the blowing will only have the result of making it appear like a cinder. To conduct this experiment successfully requires a little practice with the blow-pipe in order to obtain a steady flame.

Another method of testing is to place a little white lead in a crucible and place this on a hot fire, when, if genuine, it will be converted into metallic lead.

Purity of Tone. Some remarks on this subject will be given under the heads of the various groups of colors. Speaking generally, the richness of brilliancy of tone is easily discernible by placing the sample to be tested side by side with another of well known excellence. In siennas, ochres and umbers the selection of crude material by which the richness of tone is assured is of great importance.

Fineness of Grinding. The method of testing the fineness of a pigment usually employed by the painter is to rub a little on the finger nail, but this is a crude and unreliable method. If the pigment is dry and it is desired to compare it for fineness with a similar pigment or white lead, the following is as good a plan as any:

Take two tall vertical glass jars, place in them an equal quantity of turpentine and then take a small quantity of the white lead to be tested. Place it in one jar, and an equal quantity of the pigment with which it is to be compared in the other; thoroughly stir up both and then note the time it takes the sample to settle. If graduated marks are made to the two jars the observations will be taken more readily.

Another test is to weigh out equal quantities of the two leads, and then to take a very small quantity of the same color, say black, and add to each sample, thoroughly mixing. The lead that is the lightest in color will be the finest. The explanation of this is somewhat interesting. Suppose that we have a number of cubes of white lead each measuring one inch side. This will give us six superficial inches to be colored. Now suppose that we break up these inch cubes into half inch cubes, which will give eight half inch cubes to each inch cube. Now as each half inch cube has six faces measuring half an inch by half an inch, it has a superficial surface of three square inches, and as there are eight of the half inch cubes, there are twenty-four superficial inches to be colored against six in the inch cubes. It will be seen, therefore, that by increasing the fineness of a pigment a greater surface is presented to be colored, and hence more color is required.

Another test for fineness is to paint different samples thinned in turpentine on plate glass; when dry the two specimens may be compared and the difference of fineness between them will soon be apparent.

Still another test, and one frequently used by painters, is to place a quantity of the color ground in oil that is to be tested upon a level surface such as a piece of glass, and to run the blade of a spatula or palette knife over it, and then over another sample with which it is to be compared, noticing carefully the difference in appearance of the two samples. By these means the presence of grit is discovered.

Spreading Capacity or Covering Power. The spreading capacity of pigments and their body are very nearly related, although of two equal in body one may possess greater covering power or spreading capacity than the other. A practical method of testing covering power is to mix a small quantity of a standard paint and an exactly similar quantity of the pigment to be tested, taking care to use precisely the same amount of oil and thinners in each case. Then, taking a clean brush for each of the paints, paint a door, or other surface that has been primed, on two panels side by side, continuing to paint till all the pigment has been in each case used up. The one that goes farthest has the greater covering power.

In comparing the two it will be well to notice whether the body is equal in both cases, as one may go farther but not cover so well.

Body. The word body, as applied to pigments, is almost synonymous with opaqueness. It is the most important property of a pigment, and it is because white lead possesses the quality in an eminent degree that it is so much valued.

Body is sometimes called covering power, but this term is a little misleading, as some may suppose it to relate to the spreading capacity of the pigment.

If two different white leads ground in oil to an equal consistency are applied to different panels of a door, primed in the same manner, the one of the two leads that possesses the better body will be shown by it hiding the grain of the wood better. Some white leads, especially those that are manufactured by the new processes, lack this important quality of body, and three coats will only cover the work as well as about two of old process white lead.

There are numbers of methods of practically testing the body of pigments, among the simplest being the following:

Prime and paint a board with alternate black and white squares, like a chess or draughtboard. Take a sample of a pigment, similar to that to be tested, of which the body is known to be good, and paint a wide strip across the chess board; then paint a smaller strip of the pigment to be tested. When both strips are dry, by comparing them one can tell almost at a glance which has the better body, the superior pigment covering or hiding the black squares better than the other. A second coat may afterward be applied to each over a portion of the strip, if desired.

It is important to notice that in all cases of practically testing paints the results are obtained by comparisons being made, and hence it is necessary in every case to have a standard with which to compare the sample to be tested as has already been explained.

The test of painting over squares of black and white may be varied by using stripes instead. The test answers equally well for white lead, zinc or any color of which the quality of body is of importance. In some colors it is of little moment.

Tinting or Staining Strength. Any painter can test the tinting strength of any color himself in a very simple manner. All that is necessary is to have a pair of druggists' scales, some blotting paper, a palette knife, some pieces of glass or a flat piece of marble and some pieces of waxed paper. First weigh out say eighty grains of dry white lead or dry zinc. Any other white will answer equally well. Place these eighty grains on one side of the glass and the second eighty grains on the other. Now take the dry color and weigh one grain and add that to one of the little piles of white, then weigh a grain of the standard color and add that to the other pile. Now add to each pile a few drops of oil, taking care that the number of drops is the same in each case. With the palette knife thoroughly mix until no streaks can be seen and the mixture is perfectly uniform. Then by comparing the two the difference in tinting strength will at once be apparent. The same result would have been produced had ordinary white lead ground in oil been used instead of dry lead or zinc. If the color is ground in oil a little difference in the method must be observed, the reason being that one color might be ground much thinner than the other, in other words might contain much more oil than the other, and hence if equal weights of each were compared the result would be misleading. Take then each color in oil, that is the standard and the color with which it is to be compared, place on a small quantity of blotting paper and allow it to remain a few minutes so that the oil may be extracted. If it is thought necessary the sample can be washed with benzine, but for painters' purposes the extraction of the oil by means of blotting paper is sufficient for the purpose. The two samples having remained on the blotting paper for a short time one grain of each is weighed out separately on little pieces of wax paper, this being used so that the color shall not stick to the scale. Then each grain is mixed separately with the white and the result compared as before. It is not too much to say that every painter should be prepared to make this test, because it informs him not only as to the tinting strength of the color, but also gives valuable information as to the tone. Of course the quantities may be varied if necessary, and a larger amount used instead of the single grains. It need hardly be pointed out that scrupulous cleanliness is necessary for successfully carrying out this test. The palette knife must be wiped between each operation and every care taken to do justice to both samples.

The Permanence of Colors. It must be admitted that it is very disappointing to a painter to find, after taking pains to produce the exact color required, that it flies or fades after a little exposure to the weather. The tests for the permanence of a color when exposed to light are simple enough, and are to mix a little of the colors to be tested in oil and to spread them on different slips of paper, cut the paper in half, number each half with corresponding figures or letters, expose one half to a strong light for as long as may be deemed desirable and put the other half away into a safe place where the light does not penetrate. Waxed paper is the best, as it will not absorb the thinners, or, better still, glass may be used, this being cut across with a diamond after the paint has been applied. It need hardly be said that the permanence of water colors is entirely different from that of oil colors. As far as pigments are concerned, yellow ochres, siennas, umber, Vandyke brown and the earth colors generally are permanent, as are Venetian red, Indian red, chrome yellow and lemon yellow. Ultramarine, Prussian blue and vermilion are also permanent or nearly so.

Colors Fast to Light. Some colors fly or fade very quickly, while others are perfectly permanent. The following is a list of the principal permanent colors under ordinary conditions: Yellow ochre, light red, Indian red, umber, cadmium yellow, Prussian blue, cobalt blue, Vandyke brown, red ochre, sienna, red oxide, Venetian red, vermilion, ultramarine, chrome green, lamp black, and other black pigments.

Probably the simplest method of testing the durability of colors is to provide a sheet of unglazed cardboard; that known as Bristol board will do very well. It must have so slight an absorbent property that if any coat of paint is placed on the surface it will remain there, and not soak into the substance of the cardboard. This sheet of board is ruled into squares or rectangles measuring about 3x3 inches, or 2x2 inches.

A little of the color to be tested is ground up with a little gum water into a smooth paste, and a portion of one of the ruled spaces on the cardboard painted with it. It is advisable to rule and prepare two sheets at the same time. The name of the color can be written either underneath the patch of color in the square, or in a corresponding position on the back of the card. It is also advisable to grind a little of the pigment with oil, so that the relative durability as a water color and as an oil color can be tested.

One of the prepared cards is hung in a place where it is exposed to as much sunlight and air as possible, while the other card is placed in a drawer away from any such influence. After a week or two of exposure the cards can be compared to see if any changes have occurred; they can then be replaced in their respective positions, and from time to time are compared together. Any change which may have been brought about by the action of sunlight and air on the exposed card will be observable; some colors will be changed in a few weeks' exposure, other colors require months of exposure to produce any effect.

By placing a card painted in the manner described, with different pigments in a closed cupboard, in which is placed a vessel containing some ferrous sulphide and diluted sulphuric acid, the action of sulphuretted hydrogen on the colors can be tested; if any are affected by this test it is certain that they will be similarly affected when exposed to the action of impure air.

ESTIMATING.

Exterior Work. To correctly estimate, one must know that a square is 100 square feet and that a square yard is 9 square feet. He must then obtain the actual dimensions of the surface to be painted. He must know how many square feet there are in the work, the condition of the surface and the amount of labor and material required to do the work, whether one, two or three coats. He must know on which part of the work he will have to double and treble measure; that is, where the work must be measured two or three times to arrive at the amount of time necessary to paint it. After he has taken all of these points into consideration he is ready to make an intelligent estimate; however, all rules for measuring a surface to be painted will fall short of the desired result if good judgment is not used. No definite rules can be furnished which will give a basis for arriving at the exact amount of labor necessary on work which is difficult to handle and requires extra ladders, staging or scaffolding. Should the estimator misfigure, he will either lose money or lose the job.

To measure a building, take a tape line and begin at one corner of the building, measuring all of the same height together; multiply this by the height of the building, commencing at the outer edge of the cornice and running to the lower edge of the baseboard, adding 1 to 1½ feet to the height for the edges of weatherboarding. This will give the number of square feet in the building.

To measure a gable, take the length of rafters, multiply by ½ of the height from the square to peak or comb of the roof. This will give the number of square feet in any gable.

This is all called plain work when painting and no extra measurements are allowed for two or three story work. Above three stories, one-half extra measurements are allowed. Wall work measure solid, no windows or doors deducted.

Stave or wainscoting cornices. $1\frac{1}{2}$ measurement.

Shingle gables. $1\frac{1}{2}$ to double measurement.

Dormer windows. $1\frac{1}{2}$ to double measurement.

Dimension shingles cut. $1\frac{1}{2}$ to double measurement.

Dimension shingles dressed. Single measurement.

Dimension shingles cut, undressed. $1\frac{1}{2}$ to double measurements, according to the amount of work.

Spindle work, turned. Measured solid on both sides.

Shingle work and pickets, square. 3 measurements.

Veranda railings and columns. Measured solid.

Veranda ceilings, beaded and rafter finished. Double measurements.

Verandas, plain. Measure floor and ceiling, allowing for the brackets and columns.

Verandas that have heavy columns and rails. Measure floor, ceiling and the entire veranda solid.

Columns, rails, lattice and turned work. Double measure.

More elaborate scroll or ornamental work, also square spindle work, close set. Treble measure.

Outside blinds. 3 measurements, usually done by the pair.

Lattice work. $2\frac{1}{2}$ to 3 measurements.

Picket fence. 3 measurements.

Another system for measuring verandas which is considered one of the most difficult by a great many painters is to measure the floor and ceiling solid, then measure around the veranda the same as in measuring the building, taking the height around over cornices to the lower edge of base or lattice work, and double this measurement if many brackets or much scroll work.

Roof Work. Roofs are measured solid except coping, which is extra if painted a different color.

Inside Measurements. Inside work is measured solid on both doors and windows, with three inches allowed on each square opening for tracing edges; base never less than one foot. Stair, rail and balustrade, three times.

Wall Work. With wall work, where the doors and windows are painted, one-half to two-thirds of the openings is deducted; where the openings are not painted, one-third is deducted; cupboards and pantry shelves, $1\frac{1}{2}$ measurement.

Floors measured solid—plain work.

CONSIDERATION OF SURFACE.

New Work. In figuring a piece of work, the consideration of the surface to be painted is of as much importance as measurements. There are certain lumbers used for exterior building which cannot with safety, to produce satisfactory results, be finished with two coats of paint, owing principally to the great absorption of the lumber, as well as its varied grain, ranging from dark to light. If the paint is mixed heavy enough to cover the dark grain the lumber will not be satisfied, and while a single painting may show satisfactory results, it will not sufficiently penetrate nor bind to withstand contraction of future coats, thus causing the paint to break from the surface.

Upon the reputation of a painter depends his success. His reputation is his principal stock in trade and should not be jeopardized by doing work against his judgment. If an architect, contractor or property owner has specified two coat work without consideration of the surface, and three coats are necessary, an explanation as to the resulting danger through such should be given him. If his views can not be changed, don't try to hide the surface by plastering on the paint, but apply two properly reduced and brushed out coats, remembering the surface must be satisfied even at the expense of hiding. It is much better for all concerned to have the lumber satisfied, thus leaving a good foundation for subsequent paint coats, even though a surface may be left which will soon show signs of wear under weather exposure through not having sufficient pigment to form protection, than to apply heavy coats which will not properly penetrate nor bind and with future coats soon break away, leaving a surface which will always be a treacherous one to paint no matter how much judgment may be used in future painting.

Old Work. The value of a practical painter is his practical knowledge in knowing how to treat or repaint a surface in order to produce the best results, no matter in what condition the surface may be. It is impossible to give definite instructions regarding old work, as conditions are too varied, but there are a number of important points which should be carefully considered in figuring on this work. In appearance the building may be in first-class condition and apparently only need freshening up. Examine the surface carefully and determine whether the foundation coat is properly bound to the surface. Do not be responsible for some one else's careless work in not having properly satisfied the surface, thus not leaving a foundation to which subsequent coats can be applied with satisfactory results. If you work over such a surface, you are the one who will be blamed, as invariably the statement is made that the building was in good condition before the last coat of paint was applied. Don't hesitate under such conditions to recommend that the building stand for a longer period before repainting, or, the application of but one coat of paint so mixed that it will penetrate through the old coating and into the original surface.

Never apply two coats of paint to an old surface when one coat properly reduced will answer the purpose. There is as much danger in applying too much paint as too little.

EXTERIOR PAINTING.

New Work. Be sure the character of the lumber is understood as to its absorption of the paint, and to assure satisfactory results see that the paint is reduced as thin as possible according to the conditions. Do not paint immediately after rain storms, heavy dews, fogs or in frosty weather. See that the surface to be painted is thoroughly dry and in proper condition to receive paint.

Do not follow too closely after the carpenter, as siding which has been tied in bundles is very often wet on the inside. Allow time for the siding to dry out, remembering that it is very hard to secure dry lumber. Do not apply shellac too heavy to knots and sappy places. Have it thin and brush well into the knots or other places that require shellac. Where light shades of paint are to be applied, use white or very light colored shellac.

Priming. It is bad practice to prime a building from a carpenter's scaffold. It is best to have the entire building ready to prime at one time so that the same mix of paint can be used. In this way a more even and better coat of priming can be given.

When a building or any part of it is ready to receive the priming coat, the carpenter should remove all scaffolds, blocks and braces. This leaves the building with no part of the surface hidden and all of it can be primed without interference. Ridges are left on a building primed with blocks or braces nailed to the corner strips or any part; when touched up, it is impossible to hide these spots so they will not soon show through the second and third coats.

It is good policy to always prime a building before the plasterer commences his work, as the priming coat will keep the dampness and fumes of the mortar beds from penetrating the surface. Reduce the paint according to the absorbing properties of the surface. Do not be afraid of getting the primer too thin. It must be thin enough to both satisfy and fill the surface and not leave an excess of pigment on the surface. The reduction must be with oil and turpentine, according to the character of the surface. Where hard, close grained woods are to be painted, a large percentage of turpentine must be used to assist in opening the pores of the wood and allow of greater depth of penetration.

The main point in priming is to satisfy all of the surface, thus leaving a uniform, even coating. A soft place here and there that is not satisfied and has received only half enough paint will soon dry out spotted; other places, where the wood is hard, an excess of paint which will dry with a heavy gloss. A good and satisfactory job of painting cannot be done over an uneven coat of priming. The priming coat should be applied with as much care as the finishing coat. Great care should be taken in keeping the paint of a uniform consistency. Where it is possible, prime the entire building at one time, as it is hard to prime a building in patches and obtain uniform results. In priming, use a full brush of paint to satisfy the soft spots, brush well and do not allow a surplus of paint to remain on the hard places. The priming coat should be as thoroughly and carefully brushed out as the finishing coat. To accomplish this, a good full stock brush must be used. Do not try to use a half-worn or cheap brush, as good results cannot be accomplished with poor tools. Use a medium full brush for painting under projections, cornices and under edges of the siding, being sure to fill all of the joints with paint, then use a full brush on the face of the siding and corner strips, thoroughly working the paint out under the brush so the pores of the wood will be filled. Be careful not to use a dry brush on any part of the work.

A building primed in the foregoing manner will leave an even surface over which to work and the second coat will go on smoothly and can be brushed out, thereby saving time and material.

Putty. Do not use cheap, ready-made putty. If it is not possible to secure putty that is known to be made from linseed oil and whiting, it is best for the painter to make the putty himself. This will not take much time and he can always be assured of overcoming some very annoying results. Cheap putty will peel from glass or after being traced with paint. Where used in grooves or over nail heads, it will turn yellow after paint has been applied. It is also apt to fall out, which is one of the most annoying things that can happen. A formula still in use by old practical painters is to take 5 pounds gilder's whiting and 1 pint raw linseed oil, the whiting gradually added to the oil and well kneaded in. As the mixture becomes too stiff to work by hand, pound it off with a mallet until all of the whiting is added and mixture is of a glazing consistency.

For a waterproof or harder-drying putty for use in floor seams or other exposed places, to the foregoing add one pound keg lead well worked in. If the keg lead is of a thin consistency, a little more whiting may be necessary to bring the putty to the proper consistency. This latter mix will be found to be more durable and produce more satisfactory results for glazing and all exterior puttying. Knife putty into all seams, cracks and nail holes; do not use the thumb in pushing putty into seams and cracks.

Middle Coat. Be sure the priming coat is hard dry. Do not have the second coat too oily, thus drying with too high a gloss, as this will cause the finishing coat to crack, peel and flatten. Do not paint over dirt, grease or mud splashed on the building from down spouts. Do not paint over frosts, dews or wet places. Do not paint while the plastering is drying out. Be sure the basement is not wet or damp. If such is the case, the moisture is liable to go up through the house between the walls and siding and be attracted to the surface, causing dampness between coats, which will result in peeling in a short time. See that the basement windows or ventilators are open, allowing the basement to thoroughly dry out before applying a second coat of paint. Use a full stock brush that has been well broken in, even up by thoroughly brushing any skips or uneven places in the priming coat.

Where light shades are used for trimming, better results will be obtained by applying the trimming color on both the middle and finishing coats. Medium dark shade trimming colors can be used for the finishing coat only. Apply two coats for solid colors, such as green, black and red, or one coat over a suitable ground color.

Finishing Coat. Do not paint when there are indications of rain or the weather becoming cold. Do not work late in the evening on cold nights. The paint will pucker or crinkle if a frost or cold wind strikes it when half dry. Do not attempt to apply paint early in the morning, or on a surface that has been covered with frost the previous night. Allow plenty of time for the surface to dry. After the paint has set, do not attempt to touch up the spots that have been missed. This will cause peeling of such places. Wait until the paint is dry, repainting the parts on which such spots may show. The paint should be well brushed and plenty of elbow grease used. Paint flowed on to cover or hide the surface will soon crumble or break away in scales. No paint can be properly applied to a surface without heavy brushing; this makes one coat adhere to the other. Heavy brushing also starts oxidation by forcing the air through the paint. Thorough brushing keeps the paint coat even and uniform and prevents the paint from crinkling or leathering, which is sure to be the result if it is not uniformly applied. Improper brushing will produce heavy spots which are sure to pucker or crinkle, eventually causing the paint to blister or peel on these places.

Always finish a stretch before leaving for lunch or at night. Do not attempt to touch up ladder or stage marks, as such will always show in spots. Paint the whole board on which such spots show. Always have the paint for the finishing coat free from specks and dirt. Good work cannot be done with dirty or lousy brushes. Clean out pots at night. Put brushes away carefully. If skins have formed or dirt has got into the paint, strain it before commencing to work.

Two-Coat Work—Priming. Before commencing, be sure that satisfactory two-coat work can be done on the lumber to be painted. Be sure the surface is dry, as the priming for two-coat work is of heavier consistency than for three-coat work and there is not the chance for the surface to dry out that there is if a thinner coat is applied. Brush the paint out well. Do not flow on, leaving the paint heavy in one place and thin in another. Remember this coat is to help cover the grain, as well as fill the wood, and only one more coat is to be applied to complete the work. If not uniformly applied, the last coat will soon show the effects of bad priming. Work the paint well into nail holes, cracks, beading and seams. Avoid holidays, as they will show up when the second coat is applied. Have the paint of a medium thin consistency, carrying sufficient turpentine to assist in penetrating and filling the wood. This coat must both satisfy and fill and leave sufficient pigment on the surface to assist in covering or hiding the grain of the wood.

Finishing Coat—Two-Coat Work. Be sure the priming coat is hard dry over the entire surface before commencing to apply the second coat. It is very often the case that part of the work has been primed for a month or six weeks and other portions have stood for only a few days on account of the inability of the carpenter to finish the entire building, or like causes. Places such as the latter will in a short time crack or peel, and when a complaint is entered the entire house is given credit for having been primed a month or six weeks. Do not apply the finishing coat during the time the plasterers are at work, as there is more or less trouble caused by the mortar being splashed or thrown over the work during this time; this necessitates retouching, which cannot be done without showing spots. Do not apply the finishing coat during the time the plaster is drying out, as it will absorb the moisture from the plaster, causing trouble through the paint peeling by having dampness between coats. Finish the interior of the building before applying the exterior finishing coat. This will give time for the plaster to dry out somewhat before this finishing coat is applied and result in a more clean and satisfactory job. See that the basement ventilators are open. This assists in properly drying out the basement. See that the surface is perfectly clean and free from plaster mortar before starting the work. Carefully putty all nail holes, seams and cracks. Reshellac the knots or sappy places where the pitch may have come through the priming. As this is the finishing coat, exercise care in having the paint uniform and kept to the right consistency to insure proper covering. The paint should be of a full oil reduction so as to be elastic, as this coat must both hide the surface and withstand severe exposure; it must be carefully applied and of the best material in order to accomplish these results. Use a good stock brush and one that has been properly broken in. A new brush will not allow of proper application or spreading of the paint. Work out well under the brush to insure proper binding and a smooth, even coat. Do not use a paint which has to be flowed on to hide the surface, as this will leave a spongy coat without proper binding. Bring the body and trimming color down together. Wipe off the body color from corner strips, door and window frames. Do not work this paint off with a trimming brush, as this will cause spots. Square up the work at noon and night so as not to have any laps.

Three-Coat Work—Priming. See that the surface is dry and in condition to receive paint. Study the character of the lumber and reduce the paint according to its absorbing properties. Note general information in regard to priming new work. The paint should be mixed to a thin consistency to fully satisfy the lumber with only enough pigment used to fill the grain of the wood and not leave an excess of pigment on the surface. This will allow the middle coat to penetrate through the priming coat to a sufficient depth to adhere to the fiber of the wood, as well as the pigment in the primer, thereby assisting in binding itself to the surface as well as to the coats that are applied over it.

If the primer is mixed to a heavy consistency, it will retard absorption or penetration and leave an excess of pigment on the surface that will under contraction and expansion break loose when successive paint coats are applied.

Second or Middle Coat. Before applying the second or middle coat, be sure the priming coat is hard dry over the entire surface. As this is the medium between the foundation or priming coat and the protecting or finishing coat, extreme judgment must be used in mixing the paint for this coating. It must not be too elastic and should dry without a high gloss. The paint for this coat, being the easiest working of any applied to the building, requires thorough and careful brushing to assure satisfactory results. Reshellac knots or sappy places if necessary. Knife putty into cracks, seams or nail holes. The paint should be mixed heavy so as to brush out well, also assist in filling and penetrating the priming coat, leaving a surface to which the finishing coat will readily adhere, as well as a surface which properly dries from the bottom out.

Too heavy an oil reduction will leave a high glossy surface over which the finishing coat will not adhere or properly dry. The reduction should be with sufficient turpentine to form penetration and still make a paint which will be elastic enough to withstand contraction and expansion and dry firm. Over such a surface the finishing coat can be brushed out smoothly and evenly without crawling or slipping under the brush. The paint will dry without danger of puckering, leathering, or flattening of the finishing coat as would be the case in a short time if applied over a high gloss. It is also very apt to crack and peel if oily coats are applied one over another. It is almost impossible to have solid painting with an excess of oil in undercoats as the coats will most always be spongy, rarely adhering closely to one another.

Finishing Coat—Three-Coat Work. See that the undercoat is hard dry over the entire surface. The surface should be perfectly clean and free from dust and dirt. Reputty where necessary. Follow the same precautions as previously given for finishing coats. Brush thoroughly and carefully. Use a full stock brush properly broken in. Do not use new brushes for finishing coats. The paint for this coat should be the most elastic one applied, as it must stand the most severe exposure. It should be of good consistency with a full oil reduction, mixed so as to brush out smoothly and evenly, remain where left without danger of running or sagging and dry from the bottom out. The drying and gloss are always assisted by having the under or middle coats properly reduced and applied. Follow previous instructions as to cleaning off body color on parts that are to be trimmed. Bring down and square up the work so as not to show laps or poor workmanship.

Roof. Be sure the surface is dry. Do not use tar oil or other offensive smelling oils that will ruin the cistern water. Turn supply pipe from cistern when painting the roof. Mix the full amount of paint required for the first coat, as it is very difficult to make two mixes for shingles which will appear the same. Apply uniform coats to prevent spotting. Have the priming coat thin so it can be easily worked into the cracks. Keep ladders from resting on tin or in gutters. Hook over the comb of the house. Trim the ridge-board and coping as the work progresses. In doing this work do not go over the roof with the ladders after it is finished. The life of a shingle roof can be more than trebled if the shingles are dipped into properly prepared paint before being laid.

In dipping the shingles, they should be dipped at least eleven inches. This will allow 4½ inches to the weather and 6½ inches for the under lap. Never dip damp shingles; break the band around the bunch and spread them out to allow of drying before dipping or applying the paint. For dipping shingles, use paint of the proper consistency for finishing coat, reduced with not less than 50 per cent raw linseed oil. When the shingles are laid, finish with one coat of paint of a finishing coat consistency. Remember the roof is subjected to very severe weather wear and soon shows defective work.

The Paint. The paint for the roof should be of good material. A mistake which is often made is that a very cheap mixture will do for shingles. Have the priming coat thin and enough of it mixed at one time to cover the entire roof. Keep the paint uniform while working and avoid having heavy laps or spots, as they will soon show through the second coat and make an ugly looking job. The second coat should be of good consistency and be well brushed out, using care to keep from applying the paint unevenly.

Foundation and Flues. Do not paint damp brick. Oil paint is the best size for brick. If the flues run from the foundation to the roof on the outside of the building and are to be painted a different color from the house or given a ground color of Venetian red, they should be painted before the siding is painted, especially the first coat, as it is very hard to keep paint from splashing over the siding in working on rough brick. Where flues are to be penciled and flat brick used, the flat color can be very easily applied after the body color has been applied. Never apply less than three coats on brick. If after the second coat has been applied the soft brick show, touch them up before applying the finishing coat. This will even up the work.

The Paint. The first coat for brick and foundation flues should be mixed thin so as to strike into the brick to a good depth and form a foundation for subsequent coats. Ten per cent of the total amount of thinners used in the priming should be turpentine. The second coat should be mixed half flat and well brushed over the surface. The third or finishing coat should be elastic, of good consistency and applied smoothly and evenly.

Window Sash. If the house is to be finished in natural wood on the inside, shellac the sash on the inside and prime on the outside. Paint the rabbit for the glass so that putty will adhere. Before setting the glass, apply a coat of varnish to the inside and a coat of paint to the outside of the sash. This will save a great deal of time in tracing. If the sash is to be black or dark color, give the surface a second coat of lead color mixed half flat. Never use black or dark sash color on bare wood.

Outside Blinds. Outside blinds should be primed before the carpenter fits them to the window. This will assist in keeping the blinds from swelling. Paint for all coats on blinds should be thin and well brushed out. Do not allow the paint to be heavy on the rail or ends of slats. Lay the blinds on a trestle with the stick side up. In painting, care must be taken not to get too much paint on the ends of slats, otherwise they will stick. If the work is to be painted green or any dark color, finished with two coats, the best results can be obtained by applying a priming coat of oil paint lead color. The finishing coat must be mixed with raw oil and sufficient dryer to set the paint. If three-coat work, prime with oil paint lead color, second coat with a finishing color mixed with part turpentine. Do not paint the ends of the slats or inside rails with this coating. This surface should receive but two coats of paint. The finishing coat should cover the entire surface and should be mixed with raw oil and sufficient dryer to set the paint.

Brush out well between the slats. Never use paint of heavy consistency on blinds.

When drying, open the slats. Care must be taken never to allow the slats to turn down flat when drying, otherwise they will stick.

Veranda Columns and Rails. These should be primed as soon as set, as they are usually made of heavy lumber and liable to crack if not primed. Do not paint columns and rails unless dry. Paint will soon blister or peel on heavy timber if the least dampness is present. Do not paint over shop or mill priming without thoroughly sandpapering or scraping off as much of this paint as possible, as it is usually a cheap mixture applied heavy, preventing penetration and not fit for priming. It will generally peel in a short time after another paint has been applied over it. Do not be responsible for paint applied over primers other than the ones you applied. Do not apply paint heavy on round columns, as very little paint is required on a round or convexed surface. If applied heavy, it will soon blister, crinkle or peel. Carefully guard against an excess of paint on this kind of a surface. Use very nearly a dry brush and work the paint out well. The same applies to spindles and other turned work. Guard against painting the tops of rails and like surfaces which are damp from frosts or dews.

The Paint. The paint for veranda columns and rails should be reduced in the same manner as for the siding, but requires an extra amount of brushing. The paint should be well brushed out to insure smooth, even coats. Knife putty into all cracks and nail holes, using a good, hard-drying putty. Sandpaper the columns and rails before applying the finishing coat, dust off and apply a well brushed coat. This work, together with veranda and porch floors, should be the last finished on the exterior of the building, as such will insure the surface from being scuffed or damaged by use.

Veranda and Porch Floors. A heavy coat of paint applied on the tongue and groove before laying will more than double the life of the floor through keeping out the water. Do not apply coats which are too oily. Brush well into the surface. Do not have an excess of paint or pigment on the surface. Remember the floors have to be walked on, consequently the paint must dry firm and hard. Thoroughly fill all cracks and crevices with paint, then brush out. Keep the work clean. Do not paint over mud, grease or plaster. Do not use old, fatty or skinny paint for floors. It will not make satisfactory work, will never dry hard and will soon scuff off. Do not paint floors immediately after frosts or heavy dews. Allow plenty of time for the surface to become dry and warm. Sufficient turpentine should be used in all coats to assist the paint in drying and hardening. More trouble is caused from floors not properly drying than from any other condition. The finishing coat can not dry solid if undercoats are spongy; neither will the paint wear well where the undercoats are not thoroughly hard. A finishing coat of elastic paint can be applied over a flat coat without causing trouble, but a flat or quick-drying paint applied over an oil coat will cause cracking or peeling. Do not flow paint on floors and expect successful work. Two coats will not make a passable job on a porch or veranda floor.

The Paint. For priming, the paint should be of a thin consistency, reduced with a liberal amount of turpentine so as to penetrate well into the surface. See that the priming coat is thoroughly dry before applying subsequent coats. Putty all seams, cracks and nail holes with putty which will dry hard. The second coat for floors over good solid priming should be mixed half flat so as to dry hard and firm. Enough paint should be left on the surface to fill and form a good protecting coat, but should not dry with a gloss or tack, as such retards the drying of the finishing coat. The third or finishing coat should be elastic and of good consistency, carrying sufficient turpentine to work free, penetrate into the previous coating and dry hard and firm. Remember that walking has to be done over this coat, therefore it must be brushed out smoothly and evenly so as not to leave heavy places which will dry unevenly and soon scuff up from usage.

Fence. Do not neglect the fence. Paint it as well and as neatly as the house. The pickets, rails and caps should be primed before nailing up, as this will save a great deal of time and allow of all edges to be painted. Do not paint the tops of rails or caps when damp from rain, dew or frost. The paint should be of the same consistency as that used on the main building, and if the rails, pickets and caps are primed well before nailing up, two coats are usually sufficient for the fence. The fence should receive the same trimming as the house. The paint should be of the same material as used for the main building and as well and neatly applied as on any other part of the work.

EXTERIOR PAINTING.

Old Work. In repainting an old surface, it is especially important that the contractor consult a practical painter. Carefully examine the surface to be painted before commencing the work and determine whether there is any loose paint or whether the undercoat is in condition to break loose as soon as an elastic coat is applied over it. If the building has previously been primed with ochre, watch out for spots that have received a heavy coat and are ready to break loose. Examine the surface for dampness from basements, drain pipes, down spouts and wet soil. Before starting to paint, see that dampness has not undermined the paint and that the boards do not contain enough moisture to cause the paint to break loose as soon as other coats are applied over them. Look out for loose scales, fine or powdered. They do not appear to be dangerous, nevertheless, they will keep the paint from adhering solidly to the surface and make it soon break away. Be careful about mildew, as this condition is always a sure sign of dampness, and paint applied over mildew will soon spot or peel. Examine the surface to see whether the paint of previous coatings has shriveled. Paint applied over a shriveled undercoating will soon break loose. Prepare the paint according to the surface over which it is to be applied.

Repainting. When the surface to be repainted is in good condition and not cracked or peeled, thoroughly clean the building free from dust, dirt or soot. Wash mildewed spots with turpentine. It is seldom that one mix of paint will answer for all parts of the building. Portions of the house that are the most exposed and weather-beaten should receive the most elastic coat of paint. Portions that are protected, like under porches and verandas, and portions shielded by trees and other buildings, which would render them in about the same condition as under verandas, should receive a coat of paint mixed so as to penetrate the old surface and dry hard and firm without high gloss. If one mix of paint, which will satisfy the exposed portion of the building, is applied over the entire surface and to the protected or hard parts of the building, this oily or elastic coat of paint will dry with a full or heavy gloss, retarding the drying of the second or finishing coat, also causing blistering, checking, cracking and flatting in a short time.

First Coat. For an exposed or weather-beaten surface, the paint should be mixed with 2-3 oil and 1-3 turpentine to assist in penetrating the old surface, as well as parts on which some paint still remains. It should be applied with a full brush to fully satisfy the surface and be well and evenly brushed out so as not to have an excess of paint on the surface where the old paint remains.

The cornices and protected portions should receive paint that is mixed half flat or with enough turpentine to force penetration through the old paint, thus firmly binding this coat to the surface and preventing the second or finishing coat from crawling. The paint should be applied smoothly and evenly and be well brushed in. Do not flow the paint on and expect a uniform coat.

Second Coat. When the surface is thoroughly hard, putty all cracks, seams and nail holes, knifing the putty well in. One mix of paint for finishing coat can be applied over the entire surface. This will dry uniformly. The paint should be mixed to medium heavy and elastic consistency and be well and evenly brushed out.

Cracked and Peeled Paint. Owing to the many kinds of cracked and peeled surfaces, as well as the innumerable causes from which they come, it is impossible to give definite directions for repainting under all of the varied conditions. Judgment must be exercised in studying the surface and treating the same according to its needs.

The following suggestions as to repainting a cracked or peeled surface will meet the most common of both found in the general run of painting.

The preparation of a surface before painting is one of the most important matters to be considered. Properly preparing the surface will often go a great way in assisting to make a successful job of painting over a very badly cracked or peeled surface.

To properly clean a surface, it should be scraped and carefully gone over with a wire brush. The kit should consist of a good scraper and two wire brushes, one stiff and coarse, the other fine and soft. On a surface where the cracks are small and fine, a soft brush will assist in cleaning the dirt from the cracks and leaving the surface in better condition than will a coarse brush. On a surface with large cracks or a peeled surface, a coarse, stiff brush will assist in forcing off the scales, also breaking the peeled edges that have begun to turn out and are sometimes very hard to break loose.

The amount of turpentine recommended in the following reductions is based upon a gallon of hand mixed or prepared paint of a full linseed oil reduction.

Cracked Surfaces. When the paint is cracked in small hair lines, it is usually called crazing of the paint. Generally these hair lines run crosswise of the grain the entire width of the boards to which the paint is applied. The paint is invariably very hard and this crazing is often attributed to an excess of zinc. It is usually caused from an improper reduction or combination of pigments which do not dry uniformly, one being more easily affected by heat and cold than the others, thereby leaving a paint surface which is not uniform as to contraction and expansion. This trouble is especially noticeable on parts of work that have to withstand a great deal of vibration. If the paint has not been applied too heavy and upon examination is found to be perfectly bound to the wood, it can be successfully repainted in the following manner:

A great deal of care should be taken in the preparation of the first coat, as the surface is usually hard and brittle. If the paint is mixed half flat it will have sufficient turpentine to penetrate well into the undercoats, and if well brushed will thoroughly bind to them.

The finishing coat should be of good consistency and well brushed. It should contain from 1-32 to 1-16 gallon of turpentine to a gallon of paint, as the paint should not be too elastic, otherwise it is liable to blister on this hard surface if exposed to heat when fresh.

Paint found to be cracked only through the top coat, the checks not running through to the work, makes a very treacherous surface to repaint, as the first coat applied is liable to penetrate only through the hard glaze which has already commenced to crack and possibly breaking loose from the undercoats, and when a second and more elastic coat has been applied this glaze will break loose and cause the last coats to peel. The first coat should be mixed with ¼ gallon of turpentine to the gallon of paint, so as to penetrate, if possible, the glazy surface to the undercoats which are more firm, thereby binding itself as well as the finishing coat to the surface. The finishing coat should not be applied too elastic. This is to avoid having an excess of oil on the surface.

Large and deep cracks, running to the primer or undercoats, are usually caused by coats being applied too rapidly, not allowing sufficient time for proper hardening, or undercoats being mixed heavy with boiled or rosin oil or an excess of japan which did not allow the paint to properly harden and left the under-surface soft and spongy. Such paint is usually tough and elastic and the undercoats are found to be spongy and easily affected by hot or humid weather. This paint usually shows no signs of peeling, as it is very tough and seems to be firmly adhering to the wood, but to repaint the surface requires a great deal of care in keeping the new paint from following the first coats and cracking in like manner. Be careful not to have an excess of paint on the surface, as such will blister and peel.

Thoroughly clean the surface with a wire brush. Mix the first coat of paint fairly elastic or with 1 pint to 1½ pints of turpentine to a gallon of paint. This will not dry too hard and will be sufficiently elastic to withstand contraction and expansion over this treacherous surface, also penetrate to a good depth. Brush out well and do not attempt to fill the cracks with this coat. The finishing coat should be mixed to a good consistency with 1-32 to 1-16 gallon of turpentine to the gallon of paint and be well brushed over the surface. If, however, all of the old paint is solid and dried through, a half-elastic coat, ¼ gallon of turpentine to a gallon of paint, can be applied and should be well brushed into the cracks. This will dry firm and hard and a second coat of elastic paint can be applied over it. This, well brushed into the cracks, will to a certain extent fill them and make a very passable job without danger of blistering, which would be the result if a first coat of very elastic paint had been applied.

Alligatored Paint. Where the paint is cracked in every direction, forming blocks, triangles, and in fact, every conceivable shape, it is called alligatoring. This comes from a number of causes, but can usually be traced to non-drying undercoats and heavy coats of different mixtures. Ochre or similar slow-drying pigments mixed with boiled oil will very often be found at the bottom of this trouble. Fatty paint or the use of adulterated oil also causes paint to alligator. Such paint is usually tough and hard except where it is well protected and there the undercoats will be found to be tacky and spongy. The only successful way to repaint this surface is to burn off the paint. This is a very difficult job, as the heat softens up the excess of oil and a gummy, sticky mass of paint is the result. This soon gums the knife, also forms a cement over the wood, which is very hard to remove. This is especially true where excessive painting has been done, the paint having been mixed with boiled oil or an excess of japan added, or where the paint has cracked when first applied and paint heavily applied over it in an attempt to fill the cracks, leaving the surface with an excess of oil paint spread over it.

If it is not possible to burn the paint off, it can be painted with fairly good results if first cleaned with a wire brush, breaking the edges of the paint that may have commenced to show signs of peeling and turning out, also removing all the dirt from the cracks, then applying a coat of paint mixed with from a pint to a quart of turpentine to the gallon of paint, according to the elasticity of the surface. Do not apply a heavier coat than is absolutely necessary. Be particular to brush the paint well. Do not have the paint too flat on the protected or more elastic portions of the building, as these parts are very easily affected by hot or humid weather. Do not attempt to rush the work. Allow ample time for the paint to harden, then apply a finishing coat of paint mixed to a good consistency reduced with 1-32 to 1-16 gallon turpentine to a gallon of paint. Brush out well. This will not blister nor pull the undercoats and will make a fairly satisfactory job.

Peeled Paint. In preparing the surface for the repainting of peeled work, the same care should be exercised as with cracked paint. Where the paint has commenced to peel in small chips and upon examination it is found that the trouble is with the last or finishing coat, such is called chipping or fluffing. The trouble can usually be traced to the improper application of the paint or its having been applied over dampness caused by dews or frosts, also the paint becoming chilled or applied in freezing weather, not allowing sufficient penetration, which caused it to soon chip or fluff off. This trouble can very easily be overcome by scraping or going over the building with a wire brush and coarse sandpaper, removing all the loose paint and then applying one coat of paint of good consistency mixed elastic with 1/8 gallon turpentine to the gallon of paint. This mixture will thoroughly penetrate and bind to the undercoats, generally making very satisfactory work.

If the paint is peeling in small thin scales and the trouble only goes as far as the priming, it usually will be found upon examination that this coat was of material like yellow ochre which has been applied heavy and dried with a gloss, the second coat not reduced with a sufficient amount of turpentine to penetrate the hard surface. To repaint this surface, the scales and loose paint should be scraped and brushed off and a coat of paint, mixed with sufficient turpentine to penetrate the priming coat, applied over the spots where the paint has peeled, then apply a well brushed finishing coat over the entire building. This should not be too oily or elastic, otherwise it will break loose from the undercoats, but it should carry from 1-32 to 1-16 gallon turpentine to assist in brushing and penetrating the old surface.

Where the paint is peeling in patches, exposing the bare wood, and it is found upon examination that the backs of the scales have a heavy coat of ochre or some other dry pigment which is absorbing the oil from the wood, and the paint has not been applied uniformly and is breaking away in spots, these places can be scraped and thoroughly brushed, then a coat of paint mixed with a percentage of turpentine to assist in penetration applied over these spots. One coat of paint can then be applied over the entire building, if the surface is in fair condition, and the undercoats have not been applied too heavily. However, if the building has been standing and one coat is not sufficient, the first coat should be mixed half flat so as not to leave an excess of oily paint on the surface. This will even up the work and an elastic finishing coat can then be applied over the entire building.

When a building has been painted a number of times and the surface is peeling to the bare wood, the only satisfactory way to repaint this is to burn the surface to the wood, following special instructions given for burned surface.

Where the paint has peeled in spots from dampness, caused either by wet basements or plaster, the surface can be successfully repainted after the house has been allowed to dry out, by cleaning it and touching up the spots where the paint has peeled, then covering with one coat of paint. This will even up the surface and avoid repainting the entire building if only part of the house is peeling.

Repainting a Surface on Which the Paint Has Been Burned. Where paint is peeling or cracking badly, the only satisfactory way is to burn the paint to the bare wood. This leaves all of the surface practically new, and if the character of the work is understood good results can be accomplished, but it must be borne in mind that all paints when burned do not leave surfaces in the same condition and the resulting character of each must be understood before mixing the priming coat. Where an excess of boiled oil has been used in successive repainting and the work has commenced to crack or alligator, it will be found very hard to get the work in good condition, as the oil will set on the surface and form a glaze which is very hard to penetrate; likewise where fatty oil or paint with a percentage of gloss or rosin oil has been used. While the heat of the burning lamp softens the oil and paint, it is very hard to remove all of it from the surface.

To repaint this surface, care should be exercised in thoroughly sandpapering and scraping or breaking this glaze where it is possible and a liberal amount of turpentine should be mixed with the first coat to force penetration through this hard surface. Where dry ochre or similar primer has been used, causing the paint to peel from its not having penetrated the surface, only a small proportion of oil having gone into the wood, it is very easy to remove with a burning lamp, leaving a surface which is practically new, as most of the oil will have been drawn from the wood during the process of burning. This surface can then be treated the same as any new wood, with possibly the exception of some protected parts where the oil has penetrated to a greater depth and the paint is in better condition than on exposed parts. The cause of blistered and peeled work can often be traced to too elastic a coating of paint having been applied over a burned surface. This is especially true where boiled or heavy oil has been used in the primer of the paint which was burned. Boiled oil should never be used in a paint applied over a burned surface, it will not penetrate but will lay on the surface and will soon crack, blister and peel. These troubles are often laid to dampness or the paint used, or some defect in the building which supposedly did not allow the paint to properly harden, while the true cause is from the paint not having been properly reduced or applied over the surface.

Blistering. When paint blisters, the cause is usually attributed to dampness, and it is perhaps true that more trouble of this character on new buildings can be traced to wet or unseasoned lumber or fresh plastering, than to any other cause, and on old buildings to bad roofs, leaky gutters, broken down spouts and wet basements. There are so many chances for dampness to get under the paint of either new or old buildings that it naturally follows there would be more blisters from this cause than from all others.

As to buildings being in the foregoing condition, the weather before and during the time the paint is applied has much to do with it.

Dampness causing blistering of paint is more easily detected than any other condition. This is especially true where the dampness comes from wet plastering, as the blisters will be full of discolored water which stains the paint when they break, and upon removing the paint over the blisters it will be found that there is very little, if any, paint or oil left in the grain of the wood. When examining surfaces where the water or dampness is not perceptible at the time of the examination, it is safe to assume, without fear of an error in judgment, that dampness has been the cause of the trouble, but there are also many other causes for paint blistering which are often laid to the foregoing.

Where linseed oil has been used from the bottom of a tank and the settlings or foots are mixed with the paint, it will cause blistering. This has the appearance of dampness, there being spots where the paint has not penetrated and the surface is almost bare. This paint will sometimes pull away in large blisters, the underneath of which show that the paint has adhered to the surface but contained something which would not allow of solid drying. This trouble can be attributed to non-drying mucilaginous matter which separated from the linseed oil and did not allow of uniform penetration, binding or drying. Such blisters are invariably oblong and follow the grain of the wood.

New linseed oil will often cause the paint to blubber in very warm weather, these blubbers causing small blisters, that is attributed to the moisture in the oil which the heat draws out in the shape of different sized blubbers, breaking and forming small blisters when the paint is dry.

Paint mixed with rosin oil will blister under extreme heat. Paint applied over old work blisters more often from the application of excessive oil coats than from any other cause outside of dampness. As stated before, dampness is easily traced in either old or new work. Numerous coats of oil paint will often blister very soon after the paint has been applied. The back of these blisters will show that the paint has at one time been dry and was hard enough to hold to the surface, but when paint was applied over it, it could not stand the tension or pull of the other coats. This is caused by numerous coats of oil paint which do not thoroughly cement together and form a solid foundation. This can be proven by the backs of the blisters which often have glossy spots that would not show had the coats of paint thoroughly cemented or adhered. Other parts of the blisters show gummy points, proving the paint had once been cemented together in spots. This also shows that the paint was over-elastic and had pulled away from the surface by the heat which broke the coats apart. This latter trouble is sometimes called a splitting of the paint. An excess of oil on a hard surface like ochre priming, where there has not been sufficient penetration, will cause the paint to blister on protected parts of the building, such as underneath porches, etc. This trouble is very hard to understand, but the true cause is excessive heat on a porch or veranda floor, reflecting on the sides of the building, causing blistering or the raising up and breaking loose of the paint from the under-surface, this is especially true where the sun reaches porches and verandas which have an enclosed end, preventing free circulation of air and causing intense heat.

Blistering sometimes takes place from excessive painting on the sides of buildings where the sun does not reach. This is caused by radiation of the heat, which is very intense at certain times of the day, and no free circulation of air, also from stone or cement walks which become very hot from the rays of the sun, radiating this heat and blistering the paint for some distance above these walks. Freshly painted veranda floors will reflect enough heat on the side of a building to cause the paint to blister and break away. Veranda ceilings will sometimes blister. The cause can be traced to water which has been thrown on the floor or to pools of rainwater which reflect the heat of the sun on the ceiling, forming a lens the same as would a convex glass if laid in the same position. This reflection will cause the paint to blister on ceilings and the trouble is often misattributed to leaky roofs, gutters or like causes.

Blistering Over Ochre. If a coat of oil paint is applied over a heavy coat of ochre priming which has dried hard and flinty, it will often cause it to blister badly when exposed to the heat of the sun. This result is due to the paint not penetrating into the hard surface, thus leaving an excess of oil on the ochre coat. Where ochre is mixed dry with oil, it is impossible to thoroughly incorporate the two and when applied will sometimes raise up in small blisters: the under part will be found dry and the paint can be powdered. This is caused by the dry ochre lying on the surface, absorbing all of the oil and leaving nothing to satisfy the wood, consequently, the heat of the sun will soon pull it away. This is more noticeable after another coat of paint has been applied over the priming.

To successfully repaint blistered work, the character of each kind of blister must be understood; study the cause of the trouble and repaint the surface accordingly. If water or dampness is the cause, the paint for retouching should be mixed with a full oil reduction to satisfy the bare wood; if from fat oil, it must be mixed with sufficient turpentine to penetrate the surface which this oil leaves; if from fatty or non-drying oil, the surface must be first washed with turpentine to remove the grease, then touched up with paint mixed with part turpentine to assist in penetrating to a good depth.

For ochres and like surfaces, the same directions apply for touching up as for a peeled surface. On old work where the paint has blistered from an excess of oil, retouch with paint mixed half flat. This will penetrate through the old paint and give a good foundation. After the work on the foregoing has been touched up, the entire building can be given a coat of paint: this will even up fairly well, but the spots caused by the blisters will show to a certain extent.

Roof. Do not paint damp shingles. Allow time for rain, dew or frost to dry off and the roof to become thoroughly dry. Sweep the roof with a good broom and remove all dirt, lint, cinders and soot.

The mix of paint depends upon the condition of the roof. Use good material reduced with raw linseed oil in painted shingled roofs.

On old shingles apply a uniform coat of paint mixed to the consistency of satin. It is necessary to have the paint of a very thin consistency to fully satisfy the old weather-beaten shingles. When thoroughly dry, apply a finishing coat of heavier consistency, well worked into the cracks.

If the roof has been previously painted or the shingles dipped before laying, and are in a fair condition, the paint can be used of heavier consistency and one coat is usually sufficient to do a satisfactory job on this surface.

It is sometimes claimed that a roof has faded or spotted out in a comparatively short time. This is more often the case where combination pigments which go to make up greens or olives have been used. In the majority of cases such complaints can be traced to the color not fading, but the oil having been absorbed by the shingles, these not having been fully satisfied by the undercoat reductions. A little oil rubbed over the surface will demonstrate that the full color is there but has flatted out through having been robbed of the oil required to bring out the original shade or brilliancy.

Foundation and Flues. Foundations or flues which have been painted should be treated the same as new work. Where foundations or flues have been kept painted, with oil paint, one coat of similar color mixed to a good consistency is usually sufficient. This should be applied after the house has been finished. If previously finished in flat color and is to be painted again in the same manner, one oil paint coat of good consistency and one coat of flat color should be applied.

Window Sash. Break sashes loose so they can be worked without trouble. Scrape off all loose paint and putty, then sandpaper. If the putty is soft or broken away, it is best to remove all and not attempt to patch up broken places. Apply a heavy coat of paint in the groove where the putty has been removed. The same paint used for trimming or body color is often used for this coat, but should usually be of a heavier consistency and requires a different mix, however, where blacks or reds are used, it is a good idea to have a groundwork of dark lead color for black and terra cotta for reds. If the sash is in good condition, not badly weatherbeaten, the paint should be mixed half flat and a finishing coat of black or red varnish color applied. Before applying this finishing coat, reputty the sash where necessary. If the putty is to be painted, it is best to reputty some days before tracing, so it will become set.

Outside Blinds. Remove blinds from the building and examine the slats to see whether they will work. If stuck together from previous painting, they are sometimes very difficult to break loose and require a great deal of patience to keep them from breaking. Use a sharp knife and cut in between the slats, also at the ends. Break one slat loose at a time. As soon as broken loose, cut or scrape the old paint from the edges of rails, also ends of slats, and break the paint from around the staples on stick so they will work freely. Sandpaper exposed parts and dust off thoroughly. If the blinds have been closed and the inside is in good condition, they will require only one coat of paint on this part. Exposed and weather-beaten parts should receive the first coat of paint of medium consistency mixed with 2-3 and 1-3 turpentine, well brushed out. The ends of slats and inside of frame work do not need this coat. After the first coat has become hard dry, the blinds should receive a coat of paint all over. The paint should be of good consistency and be well brushed out so as not to have an excess of paint, causing the slats to work hard. Leave the slats open until the paint is dry. If closed, they are very apt to stick.

Veranda Columns and Rails. Be sure that the surface is dry. Scrape and sandpaper loose paint from veranda columns and rails before first coating. Fill the cracks and nail holes with paint. See that there is no mildew on the base, skirting boards or lattice work caused by dampness underneath the porches and verandas. Knife putty into cracks and nail holes before applying finishing coat. Use the same paint as for the building, well brushed out on the round columns and turned work.

Veranda and Porch Floors. Sweep the floor clean, also remove dirt from cracks so that the paint can be brushed into them. Paint applied too heavily on floors will not dry solid and will soon scuff up. Be sure there is no dampness coming from underneath, as such will cause the paint to blister or peel and not allow of proper hardening. It is very hard to avoid blistering in the repainting of floors that have been kept oiled. First wash the floor with turpentine and wipe off dry, then apply a thin coat of paint mixed half flat. Allow ample time for the paint to harden, then apply the finishing coat mixed with 2-3 oil and 1-3 turpentine, well brushed out.

On old floors that have been kept well painted, one coat is often sufficient. Where they are badly weather-beaten they should receive a coat of paint of good consistency mixed with 2-3 oil and 1-3 turpentine. When hard dry, putty the cracks, nail holes and seams, then apply a coat of paint of heavier consistency mixed with the same proportions of oil and turpentine. The floors and steps should not receive the finishing coat until all of the other painting has been completed.

The fence should receive the same care as to preparing the work for painting as the building. Sweep and dust the work thoroughly before painting. The same mixture of paint should be used on the fence as on the house and the fence trimmed with the same color.

Old Work—One Coat. Where the paint has stood for two or three years and one coat is to be given over a shade similar to the one already on the building, the surface should be thoroughly cleaned with a wire brush or broom, then thoroughly dusted. It is sometimes necessary to wash the surface with sponge and water to remove the smoke and dirt, which otherwise will work up through the paint, changing the color and making un-uniform shades. It is almost impossible to brush dirt streaks out and the only way to get the work in condition for painting is to first wash the surface with water. Allow time for the surface to dry, then, if the wear of the paint is found to be uniform, one coat mixed to a good consistency with a full oil reduction and sufficient turpentine to assist the working will make a satisfactory job. If, however, upon examination the paint is found to be weather-beaten or wearing off in spots on the exposed parts, the building will have to be touched up on these exposed portions and a coat of paint applied to the entire surface to even it up; otherwise it will be spotted when the paint has dried out, making an unsatisfactory job.

If the paint has not worn down to the wood and is only worn off to the undercoats which are solid, mix the paint with half turpentine and half oil, go over the exposed portions of the building with a smooth, even coat, and as soon as hard dry give the entire surface a coat of paint mixed to a good heavy consistency, as before directed. The paint should dry out even, thus making satisfactory work.

As all portions of a building do not have uniform exposure, it is very hard to find a surface where one coat will produce satisfactory work over the entire building. On the most severely exposed parts of a building, the paint will naturally show more wear than on the protected parts and these exposed parts will need to be touched up or painted over to even them up with the less exposed portions.

GILDING.

Gilding may be broadly understood to mean the application of metals in thin leaf form to decorative purposes, by the use of mordants and vehicles. Originally limited in scope to the application of gold leaf, it has now become a general practice to substitute many kinds of metal, both in imitation of gold, and in order to produce other metallic color effects. This is not altogether to be regretted, as the use of the more precious metal in such a form that it is ultimately totally lost to the community is a deplorable waste, which is not entirely defensible, especially as it draws a large quantity of the metal away from its more legitimate use in the arts of the goldsmith and metal worker. The small proportion used for really high-class decorative work, as in illuminating and permanent decorative schemes and pictures, is in proportion less than one per cent of the enormous amount used for commercial advertising, and the overlaying of plaster and composition picture frames.

The various metals in common use for gilding in the leaf form are:

Platinum.
Gold, in many degrees of fineness and tint.
Alloys of gold and copper.
Alloys of gold and silver.
Alloys of copper and silver.
Alloys of copper and tin.
Silver.
Aluminium.

The alloys are known as metal d'or, Dutch metal, gold metal, etc. The commonest and cheapest forms are thick and brittle in quality, while the better degrees of gold leaf are beaten to extreme thinness, the malleability and ductility of the metal allowing as many as 2,500 leaves, 3 inches by 3¼ inches, to be obtained from 1 ounce of fine gold, or to put it in another way, the total thickness of 300,000 leaves is less than 1 inch. Gold leaf is usually put up in books of 25 leaves, each leaf being 3¼ inches square. It is sold by the 1,000 leaves—viz., 40 books. Silver leaf is usually 4 inches by 4 inches, and metals are made in both sizes, and larger.

Gold leaf is termed white, pale, medium, deep, extra deep, citron, red, etc., according to its color. Gold is readily damaged in the book by handling, damp, and shaking, for this reason good gold leaf of recent make should be selected. The best work cannot be produced by any other. It should be kept in a dry place, and may, with advantage, be placed upon a hot plate, or in the oven prior to using. The red powder on gold books is put on to prevent the gold sticking to the leaves of the book, it is bole, a red earth from Armenia, of peculiarly flaky, smooth, and soft texture. A red French clay is sometimes used for the same purpose.

Methods of Gilding. The various methods of applying gold leaf used by painters and decorators are termed: Oil gilding, Japan gilding, and Water gilding.

These methods vary in detail upon different kinds of grounds. Oil or Japan gilding is used upon painted surfaces, or grounds that have been strongly sized or varnished.

Oil Gold Size. Oil gold size is a preparation of fat linseed-oil, which has, by exposure to the atmosphere, lost its power of absorbing oxygen, and become viscid and less hard drying, it may be prepared by exposing linseed oil to the air and light in a wide, open-mouthed vessel for about six months. To make it usable and give it a little body and color, ochre is ground up in about one-third of the whole quantity and added to the whole bulk, a little driers, usually litharge, is also required, and, if too thick for use, it must be thinned to proper consistency with boiled oil. A small quantity of good varnish, one part to twenty, added to gold size, gives it hardness and additional luster. Good oil size will be ready to receive the gold at any time between twenty-four hours and a week from the moment of using it, and the longer it holds its tackiness the better is the result, provided that the size ultimately dries firm and hard, like a piece of gold-beater's skin.

Japanners' Gold Size is a quick varnish drying in about half-an-hour to two hours, and is ready for gilding as soon as sufficiently dry. It must be gilded upon at once when this is the case, as the tack soon changes into a hard varnish surface.

Gilding can be done with varnish, but the excessive gloss gives a blackish look to the gold, and as the varnish hardens it loses its hold of the metal, which will then wash off with soap and water. Notwithstanding this fact, it is often used in large proportions added to gold sizo by certain decorators, who admire the additional gloss, but do not trouble about durability.

Many special sizes of a varnish nature are made for sign writers.

Water Gold Sizes vary in their nature for different purposes. For gilding on prepared wood, papier mache, plaster, or composition, as for picture frames, two kinds are used, burnish and matt gold size.

Burnish Gold Size is made from pipeclay and black lead, with a small quantity of mutton suet added in the grinding. It can be purchased ready made, and is used with ordinary parchment or gelatine size as a binding medium. Gilding on this size will take a good polish, or burnish with an agate burnisher.

Matt Gold Size. Matt size is for gold which is required to have a matt or dead surface, and is made from pipeclay, Armenian bole, and other materials. It can be purchased ready for mixing with the clear parchment or jelly size.

Isinglass Gold Size. Gilding upon glass is done with isinglass size. Take a pinch of best Russian isinglass, put it into a pint of water, and stand the whole in a covered jar in the oven for a few hours, when dissolved or cooked add a ¼ pint of spirits of wine and strain or filter through white filter paper. The spirits of wine removes the solid or waste portion of the isinglass, and also serves to counteract grease on the glass, or in the hairs of the brushes used, its action is similar to that of wine in milk.

Clear Size for Gold. Gold is often clear sized to improve its color and prevent blooming. This size, as well as that used for matt and burnish work, is best prepared from finest gelatine, or from boiled parchment cuttings.

Tools for Laying Gold. The operation of gilding is the same, whatever process is used, in as far as laying the gold is concerned. The best and general method is by means of a cushion and tip. The cushion is a small board about 8 by 5 inches, covered with flannel, and over this a tightly stretched chamois leather. A draught screen of parchment is fitted round one half of it, this to prevent the wind removing the gold from the cushion. It has a thumb strap beneath, and loops for the knife, etc., and is held like a palette on the left hand. The other tools required for the laying are a gilder's knife and a tip.

The knife is a long flexible blade of equal breadth throughout its length. The tip is a flat brush made by setting a row of hairs, either camel or badger's, between two pieces of card. The fingers of the left hand hold the tip and knife alternately when either is not being used by the right hand. Dabbers and camel-hair brushes, and mops, are required to press the gold down in its place, and remove superfluous scraps.

Laying Gold Leaf. The size being ready to receive the gold, about a dozen leaves are put in a heap in the back part of the cushion, then the cushion is taken in the left hand and the knife in the right.

The gold is taken from the book by merely opening each leaf and gently blowing the gold out on the cushion. With the knife a leaf of gold is taken to the front of the cushion, laid squarely, and deftly blown out flat, cut to any size required by a sharp jerking, saw-like movement of the knife not like ordinary cutting, the knife is then transferred to the left hand, and the tip to the right, the gold is then taken up by the tip and laid upon the work. The whole process is extremely simple after practice. Breathing must be carried on gently through the nostrils, so as not to disarrange the gold. When blowing a leaf flat, aim a smart jet of air right into the center of the leaf, sudden and short. When cutting, lay the edge of the knife, which must not be keen, on the gold leaf firmly, give a little jerk, lift it up, and the gold will separate. Take care not to cut the leather of the cushion. The knife must not be sharp enough to do so. If the gold does not at once adhere to the tip, pass the same lightly over the hair or beard to slightly grease it; this also sets up a magnetic action which assists to hold the gold. It must not adhere too firmly to the tip, or the gold will tear in transferring itself to the gold size. Always allow each leaf to lay $\frac{1}{8}$ inch in laying, to secure a good joint. Use whole leaves wherever possible, and fault up every hole and crevice before dabbing down. Well press down all joints or there will be a slight gap apparent at the junction.

In gilding a plain surface, hammer well down with a firm touch and a good cotton wool pad before skewing off, and then skew with a soft new stencil tool, using a circular motion, and polish with a soft piece of cotton wool. Laying gold upon ordinary oil or Japan gold size is sometimes done by a process of transferring. This process is economical and useful for outside work, or for etched and partial gilt work. To accomplish the process, the gold must be what is known as transfer gold, gold leaf which has been put upon tissue paper. Sheets of thin tissue paper are cut into convenient sizes and slightly waxed with a tablet of white wax. When pressed against the gold leaf in the book, the leaf adheres to these waxed sheets and is from them in turn transferred to the work. The waxed sheets being slightly adhesive, only those portions of the leaf that are in contact with the gold size leave the tissue sheet, and so there is no waste. The tissue being somewhat transparent the operator can see exactly what gold is still left upon the tissue, and utilize every portion of it for the work in hand, he can also see when the gold size has not been covered with the gold. Gold can be transferred to the tissue leaves without the necessity of waxing them, by merely interleaving the gold book with tissue and putting the book into a copying-press and well pressing.

The exceptions to these two methods of laying the gold are fanciful and individual, the most general being what is termed laying from the book. When gilding a large flat surface, the gold leaf can be laid direct from the book and much time saved thereby, by the use of a long-haired tip which can take up a leaf at a time without the necessity of cutting. The odd spaces and small bits are afterwards filled from the cushion in the usual manner. Another method is to dispense with the tip, and by taking the book in the left hand, and opening it with the right to turn the leaves straight on to the work. This is a great saving of time for large letters out of doors or for large flat surfaces of oil size gilding, but it requires some dexterity to be sure and economical.

All gilding for interior decoration, and all out-door gilding that can be conveniently left long enough before gilding, should be done in oil gold size. The exceptions are, when time is an object of importance, or where the work is fine and intricate, as in small lettering.

To Prevent Gold Sticking to Ground. The ground for gold sizing must be free from any tackiness, hard, dry, and impervious. If it is not so it must be coated with some preparation to prevent the gold sticking where it is not required. The white of an egg beaten up with a little water is the best preparation upon varnished or enamelled work. The white of one egg to 4 ounces of water is sufficiently strong. Upon ordinary painted work, a good rubbing with a pounce bag, that is, a small calico bag filled with fine sifted whiting, will suffice. A little size and water is also effective, and if a little whiting is added to it, it is still more so. White of egg must not be used too strong, never more than two-thirds water to one-third egg. This is the least detrimental to the luster of the gold. Ordinary painted work that has to be partly gilt and then varnished, may be prepared by rubbing with a piece of very fine glass paper and some dry whiting. Whiting preparations have a tendency to cause the gold size to run.

The gold size must be laid evenly and sparely. If laid too heavily it will crinkle up after the gilding has been done. It is sometimes necessary to add color to the gold size in decorative work, so as to see better where the size is put on level, etc. Tube colors may be used for this purpose, and they should always approximate to the color of gold as nearly as possible, as the gold leaf is full of innumerable small holes, and the color used in the size has an effect upon the appearance of the gold when laid. Chrome, burnt sienna, vermilion, or ochre are suitable colors.

Gold size should never be gilded unless quite ready. The size should be just tacky enough to hold the gold leaf, but never wet enough to smear or move if rubbed with the finger tip. Gold laid upon too wet size will turn black and lusterless. The precise condition is ascertained by the application of the clean finger tip, and practice will enable the operator to judge very accurately.

Turpentine should not be used as a thinner in gold size, because it leaves behind it, after evaporation, a resinous oil, which never properly hardens. A little boiled oil is the best thinner. Japanners' gold size may be thinned with a little turpentine if both are heated to boiling point together.

Oil gilding should always be well washed down with clean water and a soft sponge, and then sized with clean gelatine size, this washing hardens the oil, and the size protects and preserves the gold and gives it a more uniform luster, in place of the broken metallic brilliance it has as the result of its beating. Before washing, it should be carefully pressed down with cotton wool, all faults made good, and the whole dusted off with cotton wool or a camel-hair dabber.

In gilding enriched and molded surfaces, the gold will sometimes require double laying, in order to reach the interstices of the work.

All waste gold, known as skew, should be saved and used for dusting into the carved portions, and when these are dusted out, the skew should be carefully collected in a tin canister for future use, or for disposal to the dealer in old gold and silver.

Burnish and Matt Gilding. Burnish and matt gilding are much alike in method of procedure. They are principally used for enriched ornament, cornices, and picture frames. The work is brought up to a good surface in size and whiting, and then coated with five or six coats of the matt size or burnish size, as the case requires, each coat being rubbed down with very fine glass paper, and the size laid on with a camel-hair brush and allowed to dry thoroughly between each coat. When the ground has a sufficient number of coats to be perfectly solid, the gold is laid with water only. The size is well wetted with water in a camel-hair brush, and the gold laid on the water, which, as it dries, carries the gold on to the size coat and fixes it there. The leaf must be laid immediately following the water while it is yet live, to accomplish this quickly, the expert gilder uses the water brush with his right hand by clenching it with the two little fingers in his fist at the same time as he has the gold upon the tip held between the forefinger and thumb of the same hand. The flowing water catches the gold from the tip, and spreads it out smoothly on the surface of the water in the moment or two between the application and the absorption of the water by the distemper ground. This completes the gilding as far as the matt portion is concerned, except for a final clear sizing and sometimes coloring or coating with ormolu.

The burnished portion, however, requires polishing or burnishing. This is done at the moment the gilding is dry, and before it becomes so hard as to be brittle. An agate or flint stone, set in a handle, is the burnisher. These are of different shapes. They are rubbed lightly against the gold, which takes a remarkably high polish, and retains it. Burnished gold must not be sized.

Burnish and matt gilding are confined to the flat or curved plain portions of the work, and are done first. The enriched and fancy parts are afterwards oil-sized and gilded in the usual manner.

Ormolu for matt gold is prepared from best garnet shellac and white sticklac dissolved in spirits of wine, and tinted to the required depth with dragon's blood, a few drops are added to the usual gelatine or parchment size to produce an even, lusterless and rich surface of any desired depth.

Glass Gilding. Gilding upon glass is done in the same manner as described for water gilding, isinglass size being used in the place of water. The glass is well cleaned, freed from grease, and set before the operator at a slight angle, sometimes the glass is upright, as in a window, and has to be done in that position. The isinglass size, before described, is used in precisely the same way as the water in water gilding, and the gold laid on the flowing size so as to stretch itself out as the size recedes. The size must be used freely and allowed to run off quickly. It must not be strong, the weaker it is the brighter will the finish of the gold be. The less size there is remaining between the glass and the gold and between the two coats of gold, the better polish can be obtained.

In all other methods of gilding the gold is attached from the back of the leaf, and the finished work shows the unalloyed brightness of the metal, but in the case of glass gilding, the size comes between the gold and the eye, and the glass interposes a further medium, so that it is at once apparent that the cleaner the glass, and the clearer and thinner the film of size, the less is the brilliance of the gilding interfered with. The purity and cleanliness of the size and glass will be assured if the size can be laid upon the glass without cissing or gathering. If it runs off like water on a duck's back, the glass is greasy or the size is not clean, or perhaps the water used is too hard, boiled rain water makes the best size, but it must be clean and clear.

Gilding on glass requires a second coat in order to make a solid job. The first coat of gold when dry is lightly polished with finest cotton wool, and fixed and burnished by scalding with very hot water as near boiling as can be used without splitting the glass. It may be poured over from the spout of a kettle, so as to run over the whole of the gilding, and then down on to the ground, or laid over with a broad 4-inch camel-hair flat. This removes the scum of the size from between the gilding and the glass and adds to its clarity and brilliance. The work may then be carefully polished with a piece of finest cotton wool. It is then allowed to dry and the whole of the gilding and clearing with hot water repeated. After this the gold is backed up by a coat of hard Japan or varnish which will dry in about eight hours and have a perfect gloss. In cold weather the whole of the glass must be treated with the hot water whether gilded or not, or breakage will result from the inequality of expansion produced, and if the day be frosty, the job must be done very cautiously in a hot shop, or deferred. The water must never be boiling.

The gold used for glass gilding is specially prepared, being more even in thickness than the ordinary gold, and put up in books of special paper that does not require dusting with French chalk or Armenian bole to prevent the gold adhering to the book. The gold thus supplied is much cleaner than that used for general purposes. It is important that glass gilding be made to dry off quickly and that no time be allowed to elapse between the operations, or it will accumulate dust and get discolored.

Although gilding on glass is looked upon as a difficult matter to successfully carry through, all the difficulties are overcome by the exercise of cleanliness. The cleanliness of the glass may be tested by breathing on it, and if the moisture evaporates quickly, leaving the glass clear, it will do. Glass may be made chemically clean by the use of dilute nitric acid, and well rinsing with water.

Tissue paper is a good glass polisher. Filtered rainwater makes the best isinglass size, or distilled water, as it is free from metallic taint.

Gilding upon paper, parchment, and vellum can be best done by using a size made from yolk of eggs and glycerine. This is ground together with a little ochre and thinned with water. If used in a very liquid state as a mere water wash size, and the gold is laid directly thereon, as in glass gilding, it may be tooled or burnished. All gold work should be sized before writing or painting upon it.

Platinum and Silver Laying and Metaling. Platinum leaf is used in the same manner as gold lead, and is applicable to all the same purposes.

Silver leaf and gold leaf of very pale tint, that is, which contains a large proportion of silver, should never be laid on the oil gold size, neither should metals which are subject to oxidization, as the oil has a strong affinity for oxygen, and the oxidization of the metals is set up and goes on more rapidly. If used upon a spirit size or water size, and well protected with lacquer or spirit varnish, these metals will be perfectly lasting. Their durability depends entirely on their perfect enclosure and envelopment in an air-tight case of lacquer or varnish, both under and above them.

Japanners' gold size, with, or without, the addition of a little Venice turpentine makes as good a size as can be had for metals. There are many special sizes for the purpose prepared ready for use, but nothing is better than a good full bodied japanners' size exposed to the air for a few days to fatten a little.

Aluminium leaf may be used best on a mixture of ochre ground in oil and japanners'. It is reported to be unchangeable, and is so as far as it has been tested in actual decorating. It cannot be lacquered into a good gold, but silver leaf can. Silver is more lustrous than aluminium, which has a rather leaden look when used alone. It makes a pretty combination with gold, being grayer than silver. The cheaper metals can be laid by hand, as they are so thick as to stand handling freely, and can be cut into pieces with a pair of scissors.

The principal qualification for success in gilding is a deft and delicate handling of the metals, especially gold leaf, and there must also be a ready recognition of the possibilities and peculiarities of each kind. Always remember that whatever the condition of the under size or ground, it is hermetically sealed up when the leaf is put on, which thus prevents any change or further drying in the ordinary way, so that if gold is laid on soft coats of paint, they will not all harden off together, but will go on working under the gold, expanding and contracting, and will ultimately ruin the gold leaf.

Bronzes. Bronzes have the same qualities as the baser leaf metals, and the same precautions must be observed in using them. They must not be mixed with oil varnishes, or oil mediums, but can be put upon japanners' gold size, or upon any spirit varnishes in powder form. They can be mixed and applied as liquids in any spirit varnish, or in size or gum, though the tendency of gum to become acid sometimes turns the bronze black. In bronzing with the powder, the size, usually japanners' gold size, is applied, and when tacky, the bronze is dusted on with a rabbit's foot, a wad of close cloth, or a chamois leather pad. The bronze is protected by a thin coat of lacquer, and then varnished in the ordinary way.

Bronzing should never be varnished over with oil copal varnishes, as it will rapidly lose color and oxidize if so varnished, some of the commoner house-painters' oak varnishes have so little oil in them that this effect does not follow rapidly. If metals, silver, or gold be sized with a clear jelly of gelatine size, or thinly lacquered, they may be varnished with any kind of varnish, as the interleaf of size will stop the direct action of the varnish upon the metal.

Bronzing is sometimes used over paint to give the effect of metal. Thus a piece of iron casting may be painted green or copper color, and then the highest portions of the relief touched with bronze. This is done by coating the article with japanners' varnish or gold size, and when tacky dusting over a little powder bronze, which can be applied by a piece of cloth or velvet rubbed in the powder. The bronze should not be applied to the bare oil paint. The color of the bronze must bear a correct relation to the color of the paint used.

Lacquer for Metals. Various lacquers are used to give gold or metal a different color. Any lacquer can be made from an ounce of good shellac dissolved in half a pint of spirits of wine, and tinted with saffron, turmeric, sanders, or other dye-woods, dragon's blood, or any of the aniline powders. The most useful colorings are turmeric and dragon's blood, a colorless lacquer may be used, and the tinting done by the use of transparent oil colors in varnish.

The house painter often has to re-lacquer small brass fittings. These are better gilded and then coated with French polish or a good lacquer. This does not apply to handles, but to certain hooks, curtain pole ends and brackets, bell pulls, etc., clean, and give them a coat of patent knotting before gold sizing, gold size with japanners', and gild in the usual way.

Preparing Open Grain Wood and Stone for Gilding. To prepare rough cut deal, ash, open grain oak, or stone, for gilding, give a couple of coats of French polish and spirit varnish in equal parts, or two coats of patent knotting, then gold size in the usual manner. Japan gold size sometimes works cloggy in fine lettering. When working indoors at fine gold lettering on a black ground, if the Japan size be stood in a jar of hot water it keeps fluid and works extremely well, setting quickly when once on the work. It must not be too hot. A pot may be filled with hot water and the size in a smaller pot stood in it.

GRAINING.

The art of graining consists in working transparent color over an oil ground, the ground being of a color that will match the lightest tone in the markings on the wood. The transparent colors used for the general markings match the colors in the real wood, and are applied with large brushes, the effect is further assisted by still darker touches of color, put on here and there in places with smaller brushes. To produce a good piece of graining, the most important matters to be considered are, the ground on which the graining is to be worked, the figuring, the over-graining, the glazing, the tools. the state of the color and the manner of applying it, and, because there are several modes of procedure, the particular process to be adopted. There are three different kinds of graining—namely, water color (distemper), spirit color, and oil color, outdoor work is done in oil, water color is used for facility and for fine gradation, and spirit color for quickness. The several methods are frequently combined, as, for instance, water color over oil, in order that the second coat of the figure may not disturb the first. If water color is used over water color, the under coat must be fixed with a mixture of equal parts of varnish and turpentine.

It is assumed that the reader already is acquainted with the practical elementary stages of brush work, as the plain painting is termed, and that he is capable of producing a good ground upon which the graining can be worked. The ground of the graining is very important, for although a skilful workman could work on a white or even a poorly constituted ground, yet he could do far superior work on a ground of good tone and in good condition. The ground is a technical term involving two distinct ideas, surface and color. A properly prepared surface should be free from grittiness, from coarse brush marks, from dents, etc., and should be hard and smooth. The amount of gloss depends on the proportions of linseed oil and turpentine in the grounding paint, and is a matter for individual preference, some grainers prefer a groundwork of a brilliant bright tone, trusting to the brown glazing color to break it down, others prefer to have the ground of a dull color, and work a brighter tone of graining color over it. Some prefer the color mixed up with three parts oil to one of turps, others prefer the color to be made up of half turps and half oil. The former gives a hard gloss suitable for oil-graining with steel combs. For water or distemper graining, more turpentine, giving a dull gloss, is better, for this class of work two coats of varnish are ultimately required, while, if the ground is hard and oily, only one coat of varnish is necessary, as the varnish binds the pigment when the water has evaporated. A good ground cannot be obtained by the use of dead or flatting paint, there must always be sufficient oil in the color to allow it to be thoroughly spread and laid off, and so ensure the absence of coarse brush marks. The color of the ground is determined by the wood about to be imitated. Correct judgment as to the combined effect of ground and graining colors is the result of much careful observation and experience.

The preparation of the woodwork has been already mentioned. Rough and imperfectly got-up woodwork is often grained in imitation of oak, the graining being supposed to hide the defects, but to obtain a serviceable grained surface, a smooth ground is essential. Ordinary woodwork as it comes in its rough state from the carpenter can be filled up or levelled in the following manner: First, well rub it down with glass-paper, and then remove the dust with a painter's dusting brush. Coat any knots with the transparent varnish known as patent knotting, when this is dry, prime the wood with a paint made by mixing together three parts of white-lead, one part of red-lead, and one-tenth part of liquid driers, then dilute with three parts of linseed oil and one part or less of turpentine. When this priming is dry, putty up any nail-holes and allow the work to stand untouched for a day or two. The next coat should contain much less turpentine and no red-lead, and should be stained a few shades darker than the desired ground, this being obtained by the application of a third coat. Strain the paints before using, and lightly glass-paper down between each coat.

Oil paint is apt, after a time, to present a greasy surface, so that it will ciss, even if oil color is laid over it, that is to say, the color will not lie, but will curl up into small beads. This tendency, as well as the want of affinity between water and oil, makes it necessary to prepare the ground for the reception of the graining color. This may be done in several ways. A small quantity of dry whiting may be rubbed over the work with a piece of flannel, and the superfluous whiting brushed away, or the work may be brushed over with weak ale to which a small quantity of whiting has been added, or with water mixed with fuller's earth, or stale beer alone, or even size, may be used, the liquid being allowed to dry before the graining is begun, but care should always be taken not to use too great a quantity or too strong a solution. Anything of a solid nature, such as whiting, should be cleared away when it has accomplished its purpose. The ground should be slightly glossy, and should not be glass-papered, especially for light woods, as the marks of the papering are liable to show.

Properly prepared graining color works freely and cleanly not only from the brush but during the subsequent manipulation, it also combines the correct and particular color with the transparency of the pigment which, when laid upon the ground, is to imitate the color of the genuine polished wood. This matter of combined color effect must be thoroughly grasped, as it is the chief working principle upon which the imitation of wood is based. An opaque body graining paint which shall give the appearance of oak, without necessitating the two distinct grounding and graining processes, is impossible. As soon as white-lead is mixed with the pigments from which the graining color is made, the transparency and richness of the latter are decreased, whilst the graining color alone, being only a stain, lacks the preservative qualities of a white-lead or body preparation.

The graining colors should be purchased in bulk, and if to be used merely for practice, obtain such cheap grainers and stainers as burnt umber, burnt sienna, vandyke brown, Venetian reds, Italian ochre, and after a little experience the madder lakes, scarlets and Prussian blues may be procured. Graining colors should be of the best, and in every case be ground very fine, since they are always used as transparent colors.

The following remarks apply to grounds and colors for oak graining. The basis of all oil ground colors for oak graining should be white-lead ground in linseed oil. Any colored pigments that may be added to obtain a dark ground can be considered only as stains, as none of them furnishes the opacity, solidity, or durability, for all of which qualities white-lead is so noted. Of course, if a very dark ground, such as that for antique oak, is required, not so much white-lead is used in its composition as for light or medium grounds. It may not be out of place to say that the grainer who relies on the use of white-lead to obtain a good ground seldom produces those unnaturally bright and garish grounds that always offend the trained eye. As a general rule, in making grounding paint, sufficient white-lead for the purpose, together with one-tenth the quantity of patent driers, should be broken up in linseed oil, and the staining pigments added and well mixed in. The paint should be strained through a mesh, and then thinned to a working consistency with about two parts of linseed oil to one part turpentine. This gives a good gloss, but if a ground is required which may be quickly grained, the proportions of the linseed oil and turpentine should be reversed.

The following are recipes for ordinary oak grounds: For light oak, use a mixture of white-lead and yellow ochre (sometimes with a touch of chrome to brighten it). Oxford ochre and Venetian red are used for dark oak, with the addition of burnt umber, and raw sienna for still darker wood. A rich tone of buff, given by vermilion and chrome, is sometimes adopted. A buff ground is made with 7 pounds white-lead, ½ pound of yellow ochre ground in oil, ½ pound of driers, mixed with linseed oil 2 parts and turpentine 1 part, and stained when thin enough for use. White-lead, stained with orange chrome, and thinned with one raw oil to two turps. Mix 1 pound of white-lead, 2 ounces of patent driers, and 2 ounces of Oxford ochre. Thin with oil and turpentine.

As regards the graining color, for water color work, it should be ground up very fine in beer, and kept in a bottle tightly corked, when used it should be thinned with weak beer and water. A permanent water color graining is obtained by melting gum arabic in hot water, and mixing enough of the gum with the graining color to bind it. If the gum is in excess it will cause cracks. Softness, flatness, variety and permanence are produced by this method. The grain of oak is frequently done in spirit color. Gilders' whiting is ground up stiffly in turpentine, and stained to the required tint with burnt umber and raw sienna, which are also ground up stiffly in turpentine. A small quantity of japanners' gold size and boiled linseed oil or ordinary varnish is now added to bind it, and it is then thinned with turpentine and strained through a piece of muslin into a large-mouthed pot, when it is ready for use. If too much varnish is used, the color will set so quickly as to be unmanageable. Only a small portion of graining, just enough to allow for combing, can be done at a time, as the color dries so quickly. The lights are taken out with a fitch, dipped in a fairly strong solution of soda in water or in turpentine. Both the soda and the turpentine should be stained with a little burnt sienna, otherwise the markings will be too staring. Hold in the left hand a rag on which to wipe the fitch, so as to prevent the fluid running down and spoiling the work. Spirit graining should not be varnished for twenty-four hours, and even then must not be rubbed too much.

When oil is the medium in oak color, raw sienna, with burnt umber or Vandyke brown, according to the depth of color required, is finely ground in linseed oil. Patent driers is then added, this acting as a megilp, giving substance or body to the color; ½ ounce of patent driers to 1 pound of color, mixed with equal parts of oil and turpentine, is the proportion. Without this megilp the color will be flat and uninteresting. To get the ribbed appearance of the grain of oak, beeswax, soft soap, lime-water and rain-water are often used when patent driers is not available. The method of preparation is as follows: Wax must be thoroughly incorporated with oil by shredding the wax into an earthenware receptacle, covering it with linseed oil and stirring with a red-hot poker till the wax is thoroughly dissolved; then add the staining color, well mix and dilute it with turpentine. An excess of wax with the color will cause the combing to stand up too much. In the natural wood the markings are depressions, but in the graining they appear as ridges of color. The markings should not, therefore, stand up more than is absolutely necessary to produce the desired effect. The lines must to a certain extent be distinct, although softened down in places. Soft soap must be broken up with either patent driers or whiting, and thinned with boiled oil, or it may be made up into a lather with plain water, and in this state mixed with oil color. The objection to soft soap is its alkaline nature, all alkalies weakening and destroying paint. Lime must be slaked in water, about 2 pounds of lime and 1 gallon of water, allowed to settle, and the clear liquid poured off for use. Sufficient lime-water is mixed with the graining color and well beaten up. But graining by this method is liable to fade, the lime destroying the color, and causing the paint to crack. Rain-water used alone and beaten up thoroughly with the color has many advantages; it does not exert injurious action, the color does not spread and as soon as the color has set the water evaporates.

The best megilp, seldom, however, used for graining on account of the expense, is made from mastic varnish and boiled oil. To make it, pour the boiled oil into the varnish, and use the jelly formed by the mixture. As a hard and fast rule cannot be laid down for mixing graining colors, the proportions depending on the conditions under which the work is done, the colors should always be tested before use. The color should rub out cleanly, easily spread, and the lines left by the comb should keep their place, not running into each other or settling down. A method of oak graining now seldom practiced consisted in first laying the markings in with a flat, square-edged fitch, dipped in a mixture of sweet oil and beeswax. When this was dry, the graining colors, made up with weak beer, were applied. When the work had thoroughly dried, the beeswax was carefully washed off with turpentine. Ordinary graining color is best made with about equal parts of oil and turpentine, to which is added paste driers, one-eighth of the whole bulk, with sufficient coloring matter.

The coloring pigments used as ingredients of all oak grounding and graining paints may be briefly classified as either opaque or transparent. Of the former class are the chromes, yellow ochres and Venetian red, which should be used only in making stains for grounding paints. Raw and burnt sienna, or terra di sienna, raw and burnt Turkey umber and vandyke brown may be considered as being transparent, though the quality is possessed by them in a varying degree. They are sufficiently translucent to give due effect to any colored ground upon which they may be superimposed. For purposes of glazing and overgraining, ivory and blue-blacks and Prussian and indigo blue may be used, though the two latter are required seldom.

Prussian blue is a good working and staining color, and a quick drier. Venetian red is cheap but permanent, and must be procured ready ground in oil. It is useful for grounds.

Lemon and orange chromes, when of best quality, are chromates of lead. They are brilliant, have good body and covering power, and make good tints when mixed with white. When used in oil they must be protected by varnishing, especially if exposed to impure air, which in time will turn them black. The chromes destroy Prussian and some other blues. The yellow chromes are made in three shades; the fourth shade is the orange chrome, a deep rich color. The shades are varied by increasing the chromate for deep orange, and lessening it for the pale yellows. These colors are injured by damp and impure air, sulphur fumes and hydrogen, but the orange chrome is said to last better than orange oxide of lead.

Chrome of either middle or orange tint, may be useful to a slight extent in staining ground colors, when very bright and rich imitations are required. Generally, however, chrome conduces neither to good coloring nor to the attainment of a natural woody effect. The chrome-yellow tint sometimes forms a ground for light oak, whilst orange-red is used for medium oak.

White-lead, the basis of all graining grounds, is one of the most frequently used pigments, and also one of the most faulty. It is made by suspending rolls of ordinary thin sheet lead over malt vinegar or pyroligneous acid, in close vessels, the evaporation from the acid being kept up by a steam bath underneath. The lead is thus reduced to a white powder ready for being ground with linseed oil into a paste. White lead improves by keeping and for good work should be stocked for at least twelve months after purchase. Very pale and old linseed oil should be used in the thinning, otherwise it will probably soon discolor. It is, however, about the best pigment for preserving wood from the effects of the weather. Zinc white is an oxide of zinc. It does not discolor and is a very pure pigment. It is a substitute for white-lead, but is not so employed in the practice of graining.

Vermilion is used only in the most exceptional cases; it can be had as a fine dry powder, free from grit, and is a very brilliant color in oil. The best quality only is permanent, and that is a sulphuret of mercury. Chinese red, or vermilion, is of a deep crimson tone, but has bad covering power, and, unless well protected, will soon fade under the action of light and impure air.

Indigo possesses great body, and is a good glazing color. It is not very durable and is injured by impure air.

Ivory black is made by placing ivory dust in a covered crucible exposed to a great heat. An inferior color known as bone black is made by treating bones in a similar way. Ivory black, the deepest and purest of the blacks, being somewhat hard, requires very careful grinding, and unless ground very fine is useless. It is best ground in turpentine, and diluted for use with turpentine, gold size and a little varnish. In drying it will become dull, so that it should not be used unless it is afterwards to be varnished. If thinned down too much with turpentine it will not bind, so that when the varnish is applied it will rub off onto the rest of the work and spoil the whole. Ivory black, when purchased unground, resembles drops and is sometimes called drop black, but bone black is prepared in the same way.

The various ochres, Oxford, yellow and Italian, are used only in the composition of grounding paint, and never in graining color. Really, commercial yellow ochre is the only one of this class of pigment there is need to use, since the addition of a little Venetian red will give any warmer tint desired. This latter tint, a kind of burnt ochre, can alone be commended for obtaining warmth in grounds. Yellow ochre is not a very bright color; it is best purchased in tubes, otherwise it is not thoroughly ground. Ochre is an earth found in most countries, and is of all shades, from the warm yellow of the Oxford ochre to the pale straw yellow of the French earth. The ochres are not liable to change through any chemical action, and may therefore be considered permanent.

Umbers, natural pigments consisting of a mixture of clays and brown hematite, are valuable on account of their transparency and of their good drying qualities when in oil; the latter qualities are so pronounced that umbers may be employed as drying agents. Raw umber is unsurpassed as a graining color for light imitations, whilst burnt umber may be used for antique oaks from light to the darkest. In mixing grounds, also, umbers are invaluable. Raw umber does not injure colors with which it is mixed. Burnt umber is very permanent, and is sometimes used instead of Vandyke brown.

Raw sienna is the yellow pigment used for very rich and light oak, but, properly, should seldom be required, as decided yellow and bright tones are not characteristics of real oak. The siennas are used in oak colors to produce a forced richness. Similar in nature and preparation to the umbers, they are more transparent, but lack the natural drying qualities of umber when used in oil. Siennas are used to produce those imitations which are obtained by the use of pigments ground in water; they are useful for graining in mahogany, maple and walnut. Raw sienna is rather an impure yellow, but has more body than the ochres and is also more transparent. By burning it becomes burnt sienna, which has similar properties. Burnt sienna is a rich, transparent and red-brown pigment; gold size may be used as a drier with it. It dries better than raw sienna, and is very permanent, as it is not liable to change by the action of light and oxygen, or by damp and impure air.

Vandyke brown, a transparent earth pigment, is a very slow drier, and, if used in oil, requires to be diluted with a drying agent. It has a dark color, inclining to neither yellow nor red, but yet extremely rich and deep. In oak graining, it is generally ground in water, its color being warmer and richer than when used in oil. It is the principal pigment used in overgraining oak. It is a bog earth.

Neutral blacks and blues, previously mentioned, are also to some extent transparent. Blue-black in conjunction with Vandyke brown is largely used for overgraining oak. Black enters into the composition of the dark grounds for antique oak. The effects of transparent blues may be regarded by some grainers as questionable, but it must be remembered that richness of color in woods is only a matter of comparison and contrast, and, therefore, if instead of forcing the color values by bright grounds, bright graining color and rich overgraining, some contrasting cool tones are introduced, it is possible to obtain more natural color variety and yet retain the subdued contrasts of the real oak. Prussian and indigo blues are vastly different when ground in water from what they are in oil; whilst the tints are considerably mellowed by the final coating of copal or oak varnish. The first stages of oak graining should be worked in subdued tones rather than in false bright ones, and any desirable enrichment should be left for the glazing and overgraining to accomplish in preference to struggling in the final phase to modify early faults.

Megilp is added to oil graining color to ensure that the latter shall not spread when combed. In ordinary and cheap oak graining an excess of the drying agent is made to serve the purpose, but the megilp generally acknowledged to give the most satisfaction is a preparation of beeswax. A few ounces of pure wax is shredded and dissolved, by the application of heat, in linseed oil; add to the dissolved beeswax 1 pint each of linseed oil and oil of turpentine, 1 gill of patent dryer and the pigments ground in oil. The wax must be thoroughly mixed with the other constituents, or the drying qualities of the color will be affected. It must be remembered that wax is not added as a drying agent, but solely to make the color more amenable to the dividing and wiping-out action of the combs.

Distemper graining pigments are bound by the use of beer. Vandyke brown, however, does not require a binder for overgraining in water, nor do the siennas very often. When using black or the cool tones, either alone or in combination with warmer colors, a little beer is necessary, because black has no binding power; if mixed with Vandyke brown in equal proportions no binder will be required, but it is always best to ensure that the overgraining will not work up when the varnish is applied. In finishing antique oak in black alone, the wash must be strong in beer; for mixed washes, one-half beer is a safe proportion.

For very light oak, the ground color is made from white-lead paint, and is tinted to a decided cream with yellow ochre. The graining color may be stained with raw sienna and raw umber, or the latter alone; the work may be overgrained in water with Vandyke brown and weak blue-black, or indigo.

Ordinarily light oak requires a clean buff ground, stained by ochre, and occasionally a touch of Venetian red or umber. Raw umber is suitable for the graining color, though burnt umber gives a richer cast. For the overgraining, Vandyke brown and blue-black are used.

Medium oak looks best on a warm buff, the red and ochre therein being slightly toned down with umber. Burnt umber alone makes a good graining color, whilst Vandyke brown is generally sufficient for shading.

The grounds for dark oak are best made with three pigments, ochre, burnt sienna and burnt umber. In this mixture red should show prominently, but it should, together

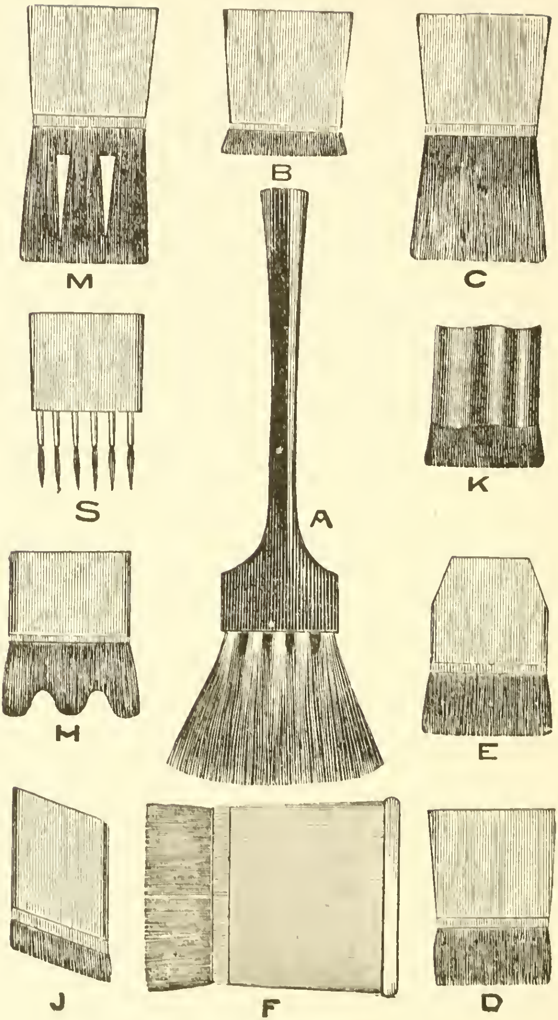


Fig. 28.

with the yellowness, be sobered by the umber. For the graining color, burnt umber or burnt sienna and black may be used, overgraining with washes of black and Vandyke brown, used either separately or together.

Very dark or antique oak has a neutral ground, in which the red and yellow are subservient to the umber or black tones. The graining color may be Vandyke brown or ivory black and burnt umber in oil; blue-black or ivory black is used for the overgraining. An overgraining of Vandyke alone is rich, but transparent black tones are more characteristic of real antique color. A little Vandyke toning here and there is an improvement.

The use of the graining brushes shown in Fig. 28 are given in the accompanying list:

A—Badger Blender, set in wood.
B—Camel-Hair Cutter, square.
C—English Bristle Oval Grainer.
D—Thin Bristle Mottler.
E—Bristle Oak Grainer.
H—Bristle Marbler.
J—Angular Bristle Cutter.
K—Bristle Snake Grainer.
L—Bristle Blender, set in wood, style A.
M—Knotted Bristle Grainer.
S—Bristle Pipe Over Grainer.

In oak there are markings of little black lines, varying in length from $1/8$ to $5/8$ inches, and in width from 1-32 inch to a point. These require to be imitated, and nearly every grainer has his own dodges and ways of working, which are to him the best. These dark markings do not appear all over the natural woods, but only in places. They may be produced during the overgraining by drawing a coarse comb down the whole length of the lines, finishing it afterwards with a fine steel one, leaving long, unbroken lines. The fine steel comb carried down with a sharp, wavy motion of the hand breaks up the line. The badger gives the rest. A special comb is made, much like a hairdresser's comb, in which the teeth are cut in such a manner as to cause the hair to divide with a sharp edge at the point. This pressed on an overgraining brush will divide the hairs, and form up the streaks of color into thin lines.

Another method of producing the little lines in oak graining is to use an oak combing roller. The rollers are used as a mechanical means of printing fine lines or irregular lengths on veined work, producing an excellent imitation of

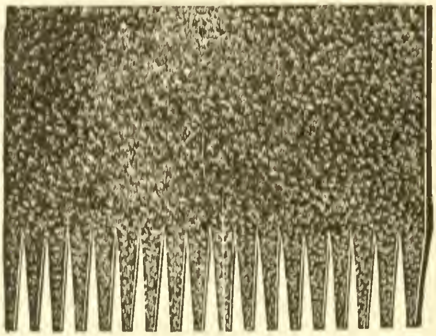


Fig. 29. Graining Comb.

the natural grain. The roller has to be fed with a brush containing the color while rolling the work. The color used is a little blue black and Vandyke mixed with stale beer.

After the combing is done and the paint dry, but before varnishing, a little black paint is mixed on the palette. A short, stiff, hog hair brush is dabbed vertically upon this, so as to take up color on its end only. The brush is then held in the operator's left hand in front of the graining, with the handle about parallel with the face of the work and a few inches from it. By taking a chip of wood and drawing back the hairs with it so that they will spring forward again suddenly, a number of splashes or small dots of black are sprinkled over the work. On drawing a small badger brush downwards over the dots, they are drawn out into the lines noticed. A great deal of oak graining is done without these lines appearing in it at all.

Shading or glazing, which involves the use of oil paint, alters the tone or color of either new or old oak graining. Very thin color is spread over those parts which require to be deepened and enriched. A drying mixture is stained to

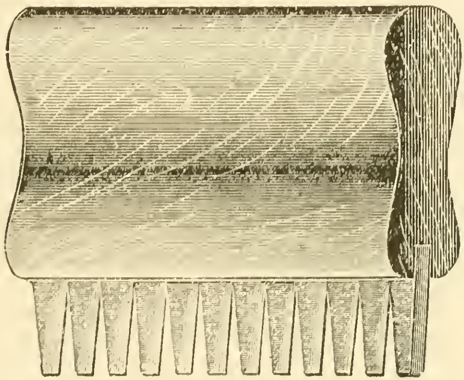


Fig. 30. Graining Comb.

the required color, the addition of megilp not being necessary. In matching old graining, the oil-glazing process assists in getting the mellowness which, independent of the graining, the aging of varnish imparts. The student who has mastered the foregoing instructions will find no difficulty in glazing certain portions of new work, in converting light to medium oak or the latter to dark oak. Occasionally the glazing principle is reversed, inasmuch as a panel is rubbed in, figured with lights and half-lights, but not combed; when dry, the oil color is again spread, and then combed with gutta-percha or cork combs. The grain which crosses the lights is wiped out, and the work is then overgrained and varnished. This method is too tedious for ordinary purposes, but the student will benefit by studying this process, with which far more natural effects can be obtained than with the usual methods.

In glazing over water color, allow the under work to dry, then apply a coat of turpentine and gold size mixed. Glazing is frequently executed in oil, in which case it is easy to wipe out the lights with a rag. When the glazing is done in water color, the lights are wiped out with a damp wash-leather, a sponge being sometimes used to get certain de-

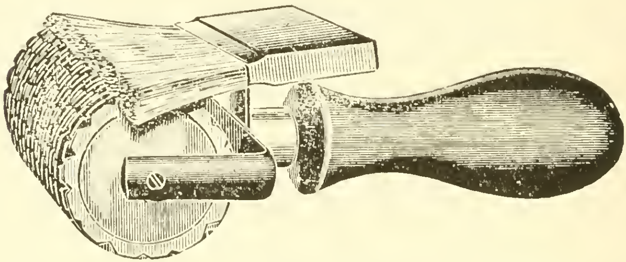


Fig. 31. Double Line Check Graining Roller.

sired effects. Vandyke brown, because of its richness of tone and transparency, is the color generally used for glazing. It is toned with burnt sienna for a warm tone, and with blue-black for a cold tone.

For oak graining a wainscot in oil, make up the color for the ground from white-lead tinted with small quantities of yellow ochre and burnt sienna to match the lightest portion of the grain. If the oak is gray in tone, a touch of blue will secure the desired tint. To every 2 pounds of white-lead add 1 ounce of driers. When the work is dry, and before applying the graining color, rub it over with stale beer to which a morsel of whiting has been added. For combing, take raw sienna with burnt umber or Vandyke brown, according to the depth of color required. These colors can be procured very finely ground in oil. Mix up the colors with half oil and half turps, and add ½ ounce of driers to each pound of color as a megilp to enable the color to stand the combing. The overgraining color should be ground in water. Mix it up with equal quantities of beer and water. The work should be so managed that the overgraining will not contrast with the under work, but will darken it. A slight coat of turpentine, with which is mixed a small quantity of japanners' gold size, added after the work is dry, will bind down the overgrain and allow of the work being finally glazed with Vandyke brown mixed with oil.

POLLARD AND KNOTTED OAK GRAINING.

The distemper or water color method for ordinary oak graining has little to recommend it. For graining in imitation of pollard oak, however, this method is invaluable. Pollard, or rather pollarded, oak belongs to the same natural class of oak as the ordinary figured variety. Its striking appearance is brought about by combined artificial and natural means. When a young oak tree has its branches lopped off, and provided that loppings take place at intervals of a few years, the wood that comes from the mature tree will show clusters of knots—gnarled and twisted grain, with intervening spaces of plainer grain—in which condition it is known as pollard oak. The importance of working from and studying natural specimens of this wood cannot be too strongly emphasized, and really good imitations cannot be executed without such previous study.

The brushes required for this imitation are a large thick mottler, a large sash tool such as that used for overgraining oak, the badger softener, a piece of old open sponge, a wash-leather, medium and small round fitches, sable pencil, and sable overgrained in tube. The ground color should be made from white-lead, ochre, a little Venetian red, and, when the graining is to be quiet, a little burnt umber.

A recipe for pollard oak ground is to mix together 2 parts of ochre, 2 parts of orange chrome, 1 part of Venetian red, 1 part of burnt umber, 20 parts of white-lead, and 2 parts of patent driers, and to thin for use with equal parts of raw linseed oil and turpentine.

In imitating pollard oak, there are two slightly different methods of treatment, the first aiming at reproducing the general effect of the wood in a broad and natural manner on a buff oak ground, and the other aiming at a conventional appearance, the ground being made for a warm and rich final tone, such as the real wood acquires as the result of polishing and age. In the latter treatment, the plain

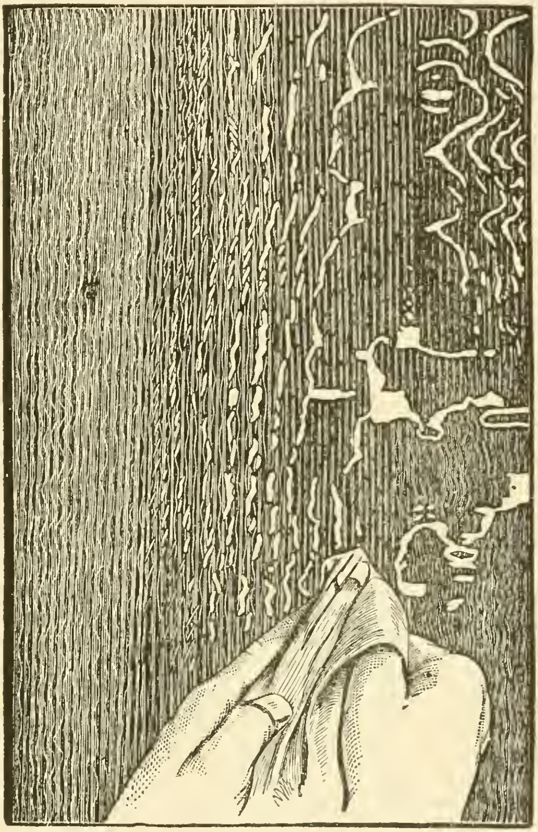


Fig. 32. Wiping Out Figure in Oak Graining.

and knotty features of the grain are more distinctly separated and the details are shown more minutely.

Mix some Vandyke brown with beer in one vessel and some burnt sienna with beer in another vessel. With the large sash tool rub the sienna wash into the panel, which should then be dabbed and rolled with a damp washleather,

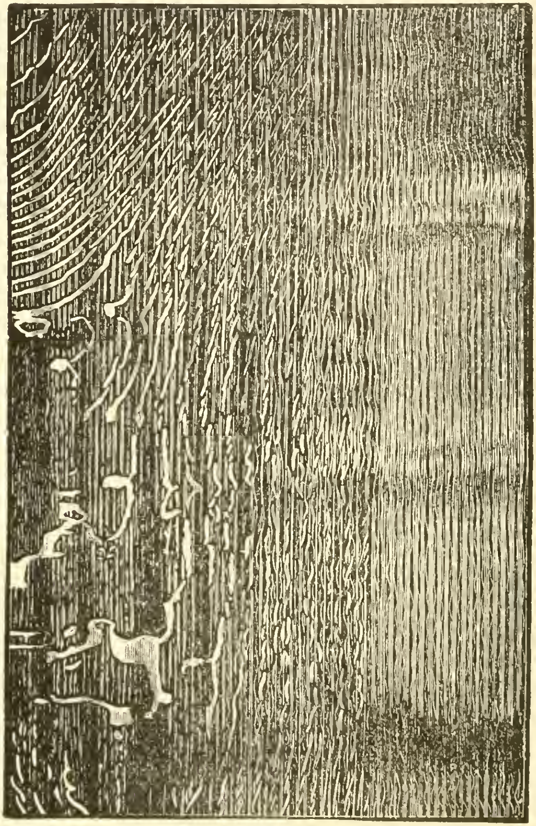


Fig. 33. Oak Panel Figured and Overgrained.

to give an irregular but connected mottle. This mottle is at once softened by the badger into stronger but softer masses. Put in clusters of knots, which should have an open appearance, with a stiff round fitch dipped into Vandyke brown and blue-black mixed with beer. When, in a few minutes, this is dry, pass the mottler, dipped in clean,

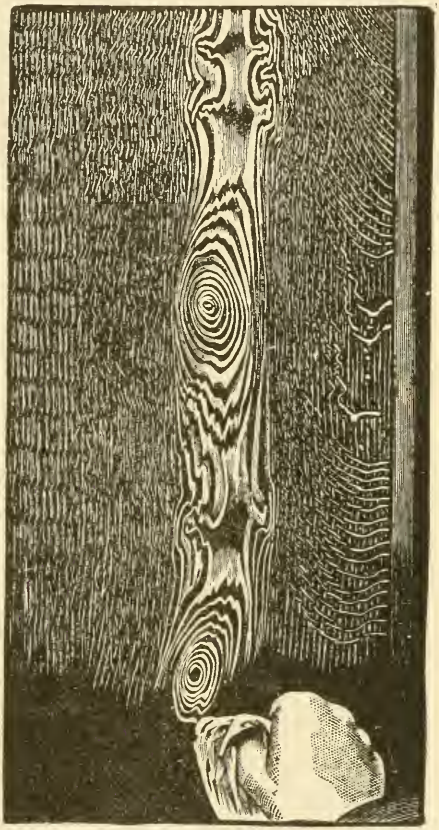


Fig. 34. Wiping Out Sap in Oak Graining.

cold water, over the work, and, with the sable overgrainer charged with Vandyke brown wash, put in fine grain which crosses more or less irregularly the plain spaces between the knots. When a few lines of grain have been done, each one is softened by the badger to a dark edge, and when all

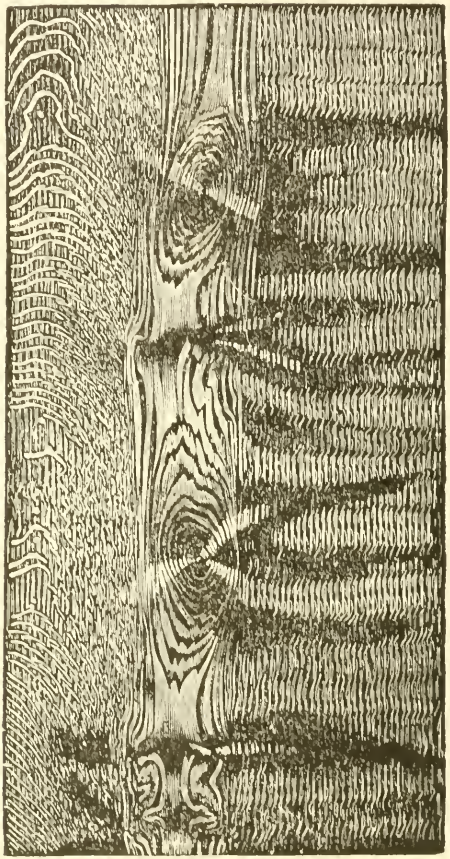


Fig. 35. Oak Panel Finished.

have been so treated, the numerous fine veins that cross the fainter cross grain and work from knot to knot, are painted in black with a sable pencil. When the work has been varnished or coated with a mixture of equal parts of japan, gold size and turpentine, it is ready for the final glazing or overshading.

This glazing is a similar process to the first mottling, but a weak beer wash of fine blue-black is used instead of burnt sienna. The wash having been well brushed over the panel, the sharp lights amongst the knots are wiped out with the leather, which is then rolled over the work in such a manner as to give more depth and transparency. If these instructions are carefully followed a rich and natural woody effect will be obtained, and a panel so treated is an admirable foil to the maiden oak stiles of a door. The work, after it has been coated with copal varnish and allowed to stand untouched for a few days, is ready for flatting or felting down with finest pulverized pumice-stone, rubbed with felt and water. Finally, a good coat of carriage copal varnish gives a finish that will last, with occasional re-varnishing for many years.

Another imitation of pollard oak, based on the same principle as that just described, is obtained by slightly different means. The ground, which is rich and warm, has a strong wash of burnt sienna rubbed in. The dark masses of knots are dabbed in with a sponge dabbed in the Vandyke wash and also slightly into the blue-black; the connecting touches of dark color are also put in. The color surrounding the knots is now worked with the mottler in one direction; use the brush at right angles to the board, and get one natural lead across the plain spaces from one nest to another. The graining surrounding and amongst the knots is worked with the round stiff fitch into the same natural curves indicated by the mottler; any knots that appear too spotty or set are opened with the fitch. When the work is dry, wet it with beer and proceed to overgrain, using the thin overgrainer charged with a thin Vandyke wash and separated into divisions. Soften the grain to a dark edge, and put in with a sable pencil dipped in a blue-black wash the fine markings which cross the grain. The varnishing or binding coating is now given, and the work

Fig. 36. Pollard Oak Graining—First Stage.

glazed with Vandyke brown, if desired full and rich, or with blue-black if the warmth requires to be toned. If beer is used with the pigments, the work can always be safely wetted to ascertain the color when varnished. Any slight alterations or additions can therefore easily be executed by rewetting parts that may have dried too quickly.

Pollard oak in oil is grained similarly to that in water. To execute pollard oak in oil, the colors required are umber, Vandyke brown and raw sienna, ground to a paste in boiled

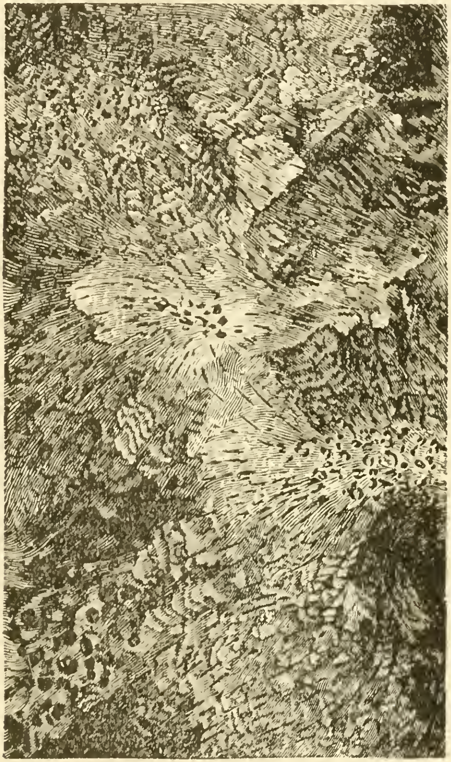


Fig. 37. Pollard Oak Graining—Second Stage.

oil, placed on separate palettes, and thinned for use with turpentine. With a large hog-hair tool or a sponge, give a thin coat of burnt sienna over all the work, and before it is dry dapple it over in various directions with the prepared colors, putting plenty of color where the knots are to be shown. The best tool for this purpose is a well-worn flat mottler, having a thin, uneven row of hairs, and it should be dipped first in one color and then in another. To form the knots, dip the brush into the burnt umber made thin with turpentine. The knots can be further shaped by taking out the lights with a brush moistened with turpentine. Small fitches rinsed in turpentine will take out sharp lights. When this color is set, put on in a curly direction a thin glaze of burnt umber. There must be enough oil in the color to bind and keep it open so that it may be easily worked. The softener must be liberally used. A cork is sometimes useful for forming knots on the dark part of the color, and it should be twisted with the finger and thumb to give the light and shade. The heart and sap of the wood should be taken out with a fitch, in the same way as for light oak, but there is not much of the ordinary figure in pollard oak. A flat graining brush, well filled with thin black, will produce the top grain in a curly form, and finally the work should be glazed with Vandyke brown, with a touch either of black or of burnt sienna. The knots and dark parts may be finished with a camel-hair pencil. The glazing may be done either in oil-color or water-color. If done in oil, the lights can be wiped out with rag. The color is made up of Vandyke brown, with a little burnt sienna or black, according as warm or cold tones are required. Really, final glazing is the same as in the distemper process, except that the colors do not require binding.

Root of oak is similar to pollard oak. The grain, however, instead of flowing from each set of knots, encircles the masses of knots in irregular rings of overgrain, and the dark pencil veins are more in evidence.

Knotted oak, so called, combines the knotted and figured portions of the wood. It is often employed, when graining oak in oil, for the panels, with ordinary oak stiles. It has a warm buff ground, containing a dash of umber, whilst for the graining color the best burnt Turkey umber is used. The color is rubbed in, and one side of the panel combed, while on the other side the dark knots are put in by means of a stiff fitch dipped in umber and drier. With another fitch give these knots and the surrounding space a growing motion towards the other half of the panel. Now put in the fine lights across the slightly combed half with a lead towards the knots, and then work up the knotted half with a pencil and rag. When this is dry, overgrain with a distemper wash of Vandyke brown.

GRAINING GROUNDS.

Maple. White lead tinted with a very little vermilion and about an equal quantity of lemon chrome. Some prefer yellow ochre only, others ochre and raw umber in the proportion of four ounces ochre and one ounce umber to thirty pounds of lead.

Medium Oak. Add French ochre to white lead in the proportions of about one hundred and twenty of lead to five of ochre. Add a little burnt umber.

Mahogany, Dark. Four pounds of medium Venetian red, one pound of orange chrome yellow and one pound of burnt umber, or a little less burnt umber may be used according to the strength.

Mahogany, Light. Mix six pounds of pure white lead with one pound medium Venetian red and five ounces of burnt umber.

Light Oak and Birch. Eighty parts of white-lead to one of yellow ochre produces a good ground, but sixty pounds of white lead, half a pound of French ochre and one ounce of lemon chrome is sometimes preferred.

Dark Oak. Sixty parts of white lead and one part of golden ochre may be used, or the following mixture if preferred. Six parts of white lead, one part of French ochre, one part medium Venetian red and one part of burnt umber.

Satinwood. Mix six ounces of lemon chrome to fifteen pounds of pure white lead and add a little deep English vermilion.

Pollard Oak. Tint one hundred parts of white lead with twenty-seven parts of French ochre, four parts of burnt umber and three and three-quarter parts medium Venetian red.

Pitch Pine. Tint sixty parts of white lead with half part medium Venetian red, and quarter part of French ochre.

Italian Walnut. One part of French ochre mixed with ten parts of pure white lead and quarter part of burnt umber and medium Venetian red give this ground.

American Walnut. Thirty parts pure white lead tinted with nine parts of French ochre, four parts burnt umber and one part medium Venetian red.

Antique Oak. Thirty parts pure white lead tinted with nine parts of French ochre, four parts burnt umber and one part medium Venetian red.

Ash. White lead tinted with a very little vermilion and about an equal quantity of lemon chrome. Some prefer yellow ochre only, others ochre and raw umber in the proportion of four ounces ochre and one ounce umber to thirty pounds of lead.

Birch. Eighty parts of white lead to one of yellow ochre produces a good ground, but sixty parts of white lead, one-eighth of a part of French ochre and one-sixteenth part of lemon chrome is sometimes preferred.

Knotted Oak. Sixty parts of white lead, nine parts of French ochre and three and one-half parts burnt umber.

Rosewood and Dark Mahogany. Four parts of medium Venetian red, one part of orange chrome yellow, and one part of burnt umber, or a little less burnt umber may be used according to the strength.

The graining ground mixtures must be taken as an average arrived at from comparison of the methods employed by different painters in various parts of the country. As has been explained, the mixtures given are those which may be considered an average, and a variation of them may be made according to individual taste and judgment.

GRAINING COLORS.

It will be understood that the method of obtaining a graining color varies just as much as it does in the case of the ground color, according to the opinion of the painter. The following are given as what may be safely followed to get an average good result:

Light Oak. Mix one-third burnt umber with two-thirds raw sienna, and add a very little drop black.

Bird's Eye Maple. Mix raw umber and raw sienna with a little Vandyke brown or ivory black.

Ash. Same as light oak.

American Walnut. Burnt umber to which is added a little Vandyke brown will give a good graining color for walnut.

Mahogany. Burnt umber, burnt sienna and Vandyke brown with the addition of a little crimson lake for overgraining, will answer well for mahogany.

In producing the color for ordinary use, such as, for instance, Anaglypta or lincrusta or other relief material, mix Venetian red with equal parts of burnt umber and burnt sienna, and even add a little orange chrome to give brightness.

Rosewood. Vandyke brown, with the addition of a little black, should be used, and rose pink may be added if desired.

Pollard Oak. Mix burnt umber, Vandyke, raw and burnt siennas and add a little black or ultramarine.

Cherry. Use raw and burnt siennas and raw umber.

Chestnut. Mix raw sienna, Vandyke and raw umber with a very little burnt sienna.

HOUSE PAINTING.

New Work. Do not use cheap ground ochres or Venetian red to produce tints or ground work. They will cause paint applied over them to blister and varnish to curl and flake.

For work that is to be varnished, do not use colors ground in oil for the solid ground color; even though reduced with turpentine and dry apparently flat, they still contain too much oil for a satisfactory ground for japan color or to allow of varnishing over them with safety.

For application over the lead coats, use colors ground in japan for deep ground colors or tints which require a large percentage of coloring matter.

New store fronts, vestibules, etc., which are built of soft wood and are to be painted in oil, should receive a priming or first coat mixed with 2-3 oil and 1-3 turpentine. Allow ample time for thorough drying. Putty and sandpaper. The second coat should be mixed with half turpentine and half oil to a good consistency. When hard dry, sandpaper lightly and apply a coat of oil paint. This will not blister, provided the wood does not get wet from the sweating of glass or like causes.

If the fronts are to be painted and varnished, they should receive a priming coat mixed with half turpentine and half oil. When hard dry, putty and sandpaper and apply a coat mixed with 2-3 turpentine and 1-3 oil. The paint should be tinted to approach the shade of the ground work. When hard, sandpaper lightly and apply a flat coat of ground color. Rub this coat smooth with fine steel wool and apply one or two coats of color ground in japan, according to the strength of the color. All that is necessary is sufficient japan color to make a solid coat. Stripe and ornament according to specifications, then finish with a coat of exterior varnish. If more expensive work is desired, a coat of color varnish can be applied over the japan color. This color varnish can be made by adding a small percentage of the japan color to the rubbing varnish. When hard, rub smooth with fine steel wool or curled hair. Stripe or ornament as desired, then finish with a coat of elastic varnish.

If the finish is to be black or green, the undercoats should be dark lead color; if wine, dark terra cotta or dark red; if vermilion, dark yellow for light or terra cotta for dark, and vermilion for carmine or lakes where a deep effect is desired.

Old Work. When store fronts and vestibules are to be painted in oil and are in good condition, showing no cracks or signs of peeling, they should be sandpapered smooth. If two coats are to be applied, the first should be reduced with half turpentine. Over this apply an oil paint. It should be borne in mind, however, that too much oil must not be used, especially where the fronts are exposed to the hot sun.

When store fronts and vestibules are to be repainted and varnished and the old paint has stood for two or three years and is in good condition, the surface not having received too numerous coats, they can sometimes be sandpapered smooth and a coat of flat ground color applied, then a coat of color in japan. Stripe and ornament, then finish with a coat of exterior varnish.

When the fronts have been repainted a number of times with oil paint, they will not stand sun exposure after receiving the varnish, without danger of blistering. In such cases the paint should be burned off or removed with a paint remover. The surface is then practically new and the work can proceed as with new work, with the exception of the priming or first coat, which should contain a larger percentage of turpentine to assist in penetrating through any old paint left on the wood. Then proceed as with new work, building up the surface in the same manner by using flat ground colors and color ground in japan and exterior varnish.

Iron Store Fronts. Thoroughly clean the surface. If the work has been covered with a shop coat, scrape and thoroughly sandpaper before applying the paint.

In painting an iron store front in oil or flat color and varnish, the treatment should be the same as for a wooden front, with the exception of the first coat. The surface being non-absorbent, the first coat must be mixed so as to dry firm and hard by oxidation and evaporation. If to be finished in oil paint of a light tint with a lead or zinc base, the first coat should be reduced with 1-3 oil and 2-3 turpentine. If a solid oil is to be used, such as black, red, etc., reduce with turpentine and a small proportion of japan to assist in hardening. Allow ample time for thorough oxidation. Finish with one coat of oil paint. If to be painted and varnished, the first coat should be mixed with ¾ turpentine and ¼ oil, tinted to approximate the shade of the ground color to be used. When hard dry, sandpaper and proceed with a flat coat of ground color as for a wooden surface.

Interior Finish—New Work. The protection and preparation of the surface should be the first consideration and should be as carefully planned and carried out for plain painting, staining, varnishing or natural finishing as for more expensive work, as these are often the foundations for a better class of future finishing.

Inside door frames should not be set until after the plastering has been completed, then put in with the other finish, otherwise the mortar will stain the wood badly and these stains cannot be removed without a great deal of trouble. In fact, frames are often ruined by mortar stains and bruises from plasterers removing their scaffolding. These bruises and stains especially ruin the work when it is to have a natural stain or finish.

If the frames are set, they should be protected before the plasterer commences work. If the work is to have a natural finish and the frames are hard wood, they should first be filled with paste filler, then a coat of shellac or liquor filler applied. If the frames are soft wood and are to be stained, they should be given a coat of oil stain; if to be painted, they should be primed. If water or spirit stains are used, cover with a coat of shellac or liquid filler, otherwise the lime water in the plaster will change the color of water stains. A strip should be tacked to the face of the frames to protect them from being bruised or scuffed up during the plastering.

Floors which are to be finished natural or stained should not be laid until after the plastering is done. Floors should be the last work of the carpenter as well as the painter. This requires laying an extra floor. On the best and more expensive buildings this is looked after by the architect in his specifications. However, there are a number of buildings in which the floors are laid before the plasterer commences his work, and as these are to be finished either natural, stained or painted, they should be protected from plastering.

As soon as the carpenter has finished sandpapering and dressing down the floors, they should be carefully swept and dusted off. The cracks should be filled with either a good linseed oil putty mixed with 1-3 keg lead, or a good crack and crevice filler, which is not so likely to be affected by shrinkage of the floors as is putty.

If hard, open-grained wood, the floors should first receive a coat of paste filler, then a light coat of shellac or floor finish.

If the floors are soft or hard pine and to be finished natural, they should receive a coat of shellac or liquid filler of good quality, applied thin. If to be stained, they should receive a coat of oil stain.

When dry, cover the floors with heavy building paper or plain carpet lining tacked down solidly. Sprinkle dry sand around the walls to keep the mortar from soaking into the paper. Allow this covering to remain on the floors until after the painting or finishing is done on the other parts of the room. The floors should be finished last.

Before the carpenter turns the work over to the painter, he should remove from the rooms all blocks, shavings, etc., and turn as much of the building over to the painter at one time as is possible.

The painter should sweep the room clean and thoroughly dust off the work before commencing to paint, stain or varnish.

Putty nail holes, joints, etc., with good putty, one which will not soften with age or turn yellow if white or light tints are applied over it.

If the work is to be painted, soft pine doors and casings should first receive a coat of size to keep them from spotting. This should be a shellac size if the work will permit. Good liquid filler is often used with good results by reducing to a thin consistency and applying a smooth, even coat. Hard drying varnishes, such as copal and hard oil finishes, are successfully used by applying them thin. Glue size can also be used if applied hot and very thin. It should not be allowed to get cold, as it will not strike into the wood but remain on the surface and is liable to break away. It is very hard for ordinary dampness to affect glue size after it has been properly applied and covered with paint or varnish. Where the price of work will not permit of sizing or the specifications do not call for it, satisfactory work can be done by mixing varnish with the priming coat. Varnish and turpentine will, to a certain extent, keep the work from spotting.

The paint for interior work should be mixed with a large percentage of turpentine. Oil will turn the work yellow. If white work, such as flat white, white enamel, is to be done, it is absolutely necessary that the priming coat should be mixed with turpentine, otherwise the work will yellow in a very short time, especially where sizing has not been used. An excess of oil will also cause the work to crack and check badly. Too much oil cannot be used for interior work with safety. Where the work is to be finished with oil paints, more oil can be used in the priming. It should be borne in mind, however, that interior work should always dry hard and firm to insure good results from its present painting, also to allow of satisfactorily repainting.

In giving these directions for the different classes of work, the one principal object has been to caution against the application of too numerous coats. It is not the amount of paint applied to a surface which produces the results, it is the manner of application, the proper mixing of the paint and the preparation of the surface. In enameled or grained work it is especially true that where too numerous coats of ground work are applied, it is very hard to repaint such a surface if at any time a different class of work should be desired.

Throughout the directions for undercoats on all classes of work it will be found that varnish is specified in place of oil and japan. This gives the most satisfactory undercoat surface that can possibly be made, especially if a good grade of varnish is used. The work will remain in good condition for an indefinite length of time; it will not crack or check; the grain of the wood will be thoroughly filled and with this method of reducing the paint, the number of coats to produce satisfactory work can be cut down.

Mixtures of japan and oil for undercoats are not always satisfactory for interior work. Too much oil makes spongy work which is liable to crack and check badly. Heavy mixtures of oil and japan will do likewise.

The directions given are not new but have been tried out in the most practical ways and have always proved entirely satisfactory.

Sandpaper or smooth the surface with fine steel wool and dust off thoroughly before applying the paint.

Where paint, enamel or varnish are retarded in their drying by weather conditions or other causes, the work can be assisted in drying and hardening by sandpapering or mossing off, killing the gloss and allowing it to be exposed to a free circulation of air. This will harden work in a few hours as much as if allowed to stand for a considerable length of time.

Cheap paint should not be used for inside work any more than on the exterior of the building, if good results are to be expected. It is a mistake to use cheap ochre for priming. The same paint, or something as good, should be used for priming or first coat as is used for the finishing coats or for building up the ground work for enameling, graining and like work.

Oil Paint in White. Where two coat oil paint work is specified, without sizing, the first coat should be reduced with half turpentine and half oil to a good consistency, then a half pint of good hard drying or enamel varnish added. This will dry hard and will not spot as badly on soft pine wood as a turpentine oil reduction. After it is hard dry, putty crevices and nail holes with good putty, one which will not turn yellow, or the puttying can be done before the priming coat is applied. Should there be holes that are not properly filled, they can be reputtied over the first or priming coat. Sandpaper or rub with fine steel wool to a smooth, even surface, dust off and apply a second coat mixed to a good, heavy consistency with half oil and half turpentine, or 1-3 good hard drying varnish, 1-3 oil and 1-3 turpentine. Either mix will dry with a good gloss and can be washed.

For three-coat work the primer should be mixed as before stated, the second coat mixed with three parts turpentine and one part oil or hard drying varnish. This will dry with an eggshell gloss. Sandpaper or rub with fine steel wool to a smooth, even coat and apply the finishing coat of medium consistency, mixed with half turpentine and half oil, or 1-3 each turpentine, oil and varnish. This should dry with a good gloss and can be scrubbed. This work, however, will turn yellow with age, as will enamel if applied over it.

Gloss Work in White. Satisfactory two-coat gloss work cannot be done on bare wood. If the work is not filled or sized, the primer should be mixed to a thin consistency with 7/8 turpentine and 1/8 hard drying or enamel varnish. The second coat should be of the same mixture but of heavier consistency. If for a size or filled surface, the first coat should be of the same consistency and mixture as for second coat over bare wood. This will dry flat. Sandpaper or rub with fine steel wool to a smooth, even coat.

If the work is to be finished in lead, use 1-3 of the second coat flat mixture and 2-3 hard drying or enamel varnish. If a white finish is desired, zinc in place of lead should be used. For zinc finish, prime with lead reduced as before stated. Second coat with zinc varnish reduced with turpentine. Sandpaper between coats and finish with 1-3 second-coat zinc mixture and 2-3 white or enamel varnish. Either of these finishes will dry with a good gloss and should not turn yellow or check.

Oil Paint in Tints. Reduce the priming coat with half turpentine and half oil. To one gallon of paint add a half-pint of good varnish. The paint should be of good consistency and applied smoothly and evenly. When hard dry, sandpaper, dust off and apply a coat mixed as before stated, only of a heavier consistency. This paint will dry with sufficient gloss to allow of washing.

For three-coat work the primer should be mixed as noted and the second coat mixed with three parts turpentine and one part oil. This will dry about flat and can be sandpapered smooth before applying the finishing coat which should be mixed with half turpentine and half oil. To a gallon of the mixture add a half-pint of good mixing varnish; this should dry with fair gloss and can be washed or scrubbed.

Gloss Work in Tints. The primer can be mixed with half oil and half turpentine. It is safer to cut down the amount of oil, using 2-3 turpentine and 1-3 oil. After the priming is thoroughly hard, putty and sandpaper and apply a coat of flat color of good consistency. When hard, sandpaper to a smooth, even surface and apply a coat of 1-3 flat color and 2-3 good color mixing varnish. This paint should be flowed on smoothly and evenly. It will dry with a good gloss and make a very satisfactory finish.

Flat Finish in Three Coats. A satisfactory flat finish cannot be obtained with less than three coats unless the wood has been filled or sized. The priming coat for bare wood should be mixed to a thin consistency with 7/8 turpentine and 1/8 varnish. Putty with good, hard drying putty, one which will not show gloss spots or turn yellow. Sandpaper or rub with fine steel wool to a smooth surface. The second coat should be mixed to a heavier consistency, carrying a little larger percentage of varnish so as not to leave a surface which is too flat. This same mixture should be used for the first coat over a surface which has been filled or sized. If for white work, white enamel varnish should be used where varnish is specified. Rub smooth with curled hair, dust off and apply a finishing coat mixed flat. This will dry without gloss spots. It can be mixed with either lead or zinc, according to the specifications, also white or tints according to the work desired.

If a dead flat finish is desired, when lead is used, the lead should first be washed with turpentine. If a zinc finish, use zinc reduced with turpentine.

Enamel in Three Coats. The priming or first coat should be mixed according to directions for flat work. If the lead used is soft ground, it should be washed with turpentine and allowed to stand over night and the turpentine poured off in the morning. Reduce the paint with all turpentine to which reduction should be added 1-32 to 1-16 gallon of the enamel to each gallon of paint. This will assist in hardening the paint and the mixture can be used either on bare wood or over a sized surface. When the priming or first coat is thoroughly hard, putty with good hard-drying putty, one which will not turn yellow, then rub with fine sandpaper or steel wool, after which apply a second coat mixed flat, to which has been added a pint of the enamel to a gallon of paint. Rub this coat smooth with fine sandpaper or curled hair. Apply a good, smooth, even coat of enamel of good consistency. If properly applied, the enamel can be left in full gloss finish or lightly rubbed. If a higher finish is desired, reduce the first coat of enamel with a small amount of turpentine, one pint to the gallon of enamel. Rub this coat with fine steel wool to kill the gloss and level down the surface, then flow on a smooth, even coat of enamel. This can be rubbed to the finish desired and polished after three to four days' standing. If desired, zinc can be used for the flat coats in the foregoing directions; however, it is best to use lead for building up undercoats.

Zinc Finish. The priming coat for zinc should be as directed for flat work. Lead is best to use for priming or first coat over a sized surface. Where two or three coats of flat zinc work are specified, reduce zinc that has been ground in varnish with turpentine to a medium thin consistency and apply over a first coat of lead. When dry, rub with curled hair and apply a second coat of the same mixture of a heavier consistency. This will dry flat and make a beautiful finish.

If a gloss finish is desired, apply the finishing coat of zinc in varnish reduced with turpentine to a consistency of cream. To one part of this mixture add two parts white enamel varnish. If a higher finish is desired rub this coat with fine steel wool and apply a coat of clear varnish. This can be rubbed to the desired effect.

Ebony or Flat Black Finish. Where work is to be finished in ebony, either in gloss or flat, the wood should be prepared according to the finish. If soft wood and is to be finished in ebony, it should receive a coat of shellac; putty with black putty and apply a coat of dark lead color, mixed flat, to which has been added a half pint of good hard drying varnish to the gallon of paint. When hard dry, rub off smooth with curled hair. Over this apply a coat of flat black. If a gloss or polish is desired, apply a coat of black color and varnish or ebony finish. This can be rubbed to a dead effect. If a more expensive finish is desired, slightly reduce the first coat of varnish color or ebony finish, according to the temperature of the room. When hard dry, cut down smooth with fine steel wool, dust off and flow on an even coat of the color varnish or ebony finish. This can be rubbed and polished.

Where grill work and plate rails or hard wood are to be finished and the open grain effect is desired, add to the flat black a few drops of oil and apply a coat to the bare wood. Allow to stand a short time, then wipe off to the desired effect of flat black or Flemish finish. If, however, the hard wood is to be finished in gloss or polish, it should first be filled with paste filler, then proceed as with soft wood varnish coats, leaving off the dark lead color coat.

Cupboards and Pantries. When cupboards and pantries are to be painted, the first or priming coat should be applied to the bare wood and mixed with 2/3 turpentine and 1/3 oil. This will dry hard and can be sandpapered smooth. If two coats only are to be applied, the finishing coat should be mixed to dry hard and firm. If oil paint, it can be mixed to a good consistency with 2/3 oil and 1/3 turpentine and a small amount of good japan, or mix the desired color flat and use half color and half good drying varnish. The paint should be of the same consistency as varnish. To this a further percentage of turpentine can be added to insure ease of working, or a small percentage of oil can be used, but not enough to cause the paint to dry tacky.

If three coats of oil paint are specified, the second coat should be of the same mixture as the primer, but of a heavier consistency. When hard, sandpaper and apply a coat of paint mixed with 2-3 oil and 1-3 turpentine. If sufficient time is allowed, this should dry firm and hard. If a varnish finish is desired, the finishing coat varnish color can be applied as recommended for two-coat work.

In painting the pantries, cupboards, etc., it is very essential that the doors and drawers should not be closed, so as to allow the paint drying hard. A free circulation of air is absolutely necessary.

Graining Ground. Graining grounds which are mixed with all oil are very liable to crack and check after varnish has been applied over them. Care should always be used in noting that the undercoats are thoroughly hard before applying subsequent coats. There should not be too much oil used.

If the priming is to be applied to the bare wood, reduce with half oil and half turpentine. Allow this to thoroughly harden through, putty, sandpaper smooth and apply a coat of paint, mixed flat, to which has been added a half-pint of hard-drying varnish to the gallon of paint. When hard, rub smooth with fine sandpaper or steel wool and apply a coat of the same paint with the addition of varnish to allow of drying with a slight gloss, or a small amount of oil can be used, but not enough to cause the paint to dry tacky. If the surface has been sized, the first coat should be mixed with 2-3 turpentine and 1-3 oil, smoothed off and finished with one coat as recommended for finishing on bare wood. Graining color can be worked over this ground without danger of cutting through with the graining combs or when cutting out growths, as is often the case when oil is used in ground work.

It is best to grain in distemper for interior work. For exterior work, more oil can be used for building up the ground work than for interior. However, if the work is to be varnished, most of the oil should be cut out. A great many painters prefer not to varnish exterior work, but apply a coat of oil, rub off with a soft cloth and let the work remain with this finish. Where varnished work is used on the exterior, the graining should be done in distemper if possible, or the oil graining color should be allowed to stand until thoroughly hard before applying the varnish; this insures against blistering and cracking.

Floors. Where the priming can be allowed to stand a sufficient time to thoroughly harden, the paint can be mixed with half turpentine and half oil. Where time will not permit, 2-3 turpentine and 1-3 oil should be used. Floor paint should dry hard, remembering that the priming or foundation coat is very important. After hard dry, putty and apply a second coat of paint mixed with 2-3 turpentine and 1-3 copal or mixing varnish. This will dry hard with a slight gloss. Sandpaper and dust off and apply a coat of the same shade mixed with 2-3 varnish and 1-3 flat color. This will dry with a good gloss and can be used without fear of scratching or peeling if the varnish used is of good grade. After the floors have been used and have become somewhat worn, they can be renewed by washing clean and applying a thin coat of floor finish. This can be repeated as often as the floor shows wear.

STAINING.

Where it is possible, the wood should be stained before being nailed to the wall or as soon as the carpenter has finished dressing. This will save time and labor in finishing. The stain should be of thin consistency so as to penetrate into the wood and not remain in spots on the surface. Allow the stain to remain on the wood a short time, then wipe off with a cloth to even up the work. On very soft pine, it is often necessary in order to produce uniform work to size the same with a thin sizing before staining. This size should be very thin, and it is well to wipe it off immediately after applying so as not to have an excess on the surface, thus keeping the stain from striking in and the soft and sappy places from absorbing so much of the stain as to make the finished work spotted.

Where size is used, the stain should be allowed to remain on the surface longer than on the bare wood so as to allow of good penetration before wiping off. It is not necessary to wipe if care is used in brushing on the stain. Where it is not possible to stain the wood before nailing to the wall, the work should be thoroughly dusted, then puttied. Knife the putty into nail holes or cracks, after which apply the stain. Allow the stain to remain on the surface a short time, then wipe off to even up the work. When hard, sandpaper lightly and apply a shellac or liquid filler. When hard, rub with fine sandpaper or fine steel wool to a smooth, even coat, after which apply varnish, the number of coats depending on specifications.

Cupboards and Pantries. Where cupboards and pantries are to be stained inside on the shelving, inside drawers, etc., they should receive a coat of shellac or good liquid filler over the stain, then a thin coat of hard-drying varnish, one which is not easily affected by heat, otherwise there is danger of warm dishes or other utensils sticking to it.

Floors. Where floors are to be stained and finished, they should be stained and protected according to instructions previously given. Where these instructions have been followed, and as soon as the interior is finished, remove the paper and dust off the floors. If there should be dust from the plastering which cannot be removed with a duster, dampen a cloth with a mixture of half turpentine and half oil and with this remove all the dust and leave the floors clean. Do not have enough of the mixture on the cloth to make the floor oily, just a sufficient amount to take up the dust. If shellac is to be used over the stain, use turpentine for cleaning. Apply over this stain a thin coat of shellac or good liquid filler. Rub off lightly with fine sandpaper or steel wool and apply a coat of floor finish. This can be left in the gloss, rubbed with pumice stone and oil, or sandpapered to kill the gloss, then waxed in the usual manner.

Should a deeper stain be wanted or the floor be marred or scratched, use a mixture of 1-3 stain and 2-3 floor finish. If the floor has not been protected before the plastering was done, it should be thoroughly cleaned, the mortar scraped off, sandpapered and dressed down smooth and the cracks filled with crack and crevice filler or puttied with good putty; then apply a coat of stain, after which the floor can be finished as noted.

TO PAINT PLASTERED WALLS.

Plastered walls should receive a coat of size before painting. The best size which can be applied to a wall is a thin coat of oil paint. This is hard to apply without showing laps, but these can be easily covered with subsequent coats. When hard dry, apply a coat of warm glue size which will fully stop absorption.

If the walls are to be painted in oil with a full gloss, they should receive the finishing coat of a full oil reduction. If to be half flat, the finishing coat should be mixed to a good consistency with half turpentine and half oil. This will cover the work in a solid manner and make good two coat work.

If a varnish size is used, reduce a fair grade of hard oil finish or varnish to a thin consistency and apply freely with a full brush. When hard dry, apply a first coat mixed with half oil and half turpentine.

If a full gloss is desired, the finishing coat of full oil reduction can be applied over this surface, or, if half flat is wanted, the same mixture as for first coat can be applied, but must be of a heavier consistency.

If the walls are to be finished flat, three coats over a size must be applied. If an oil paint and glue size are used, a second coat mixed half flat will produce a satisfactory foundation for the flat color.

If varnish size is used, apply two coats of half flat paint, the second coat of a heavier consistency than the first coat. If to be left flat, apply one even coat of flat paint mixed to a good consistency.

If to be stippled, the paint should be mixed flat to a heavy consistency, carrying a small percentage of varnish.

In applying a flat color on large rooms, two men should work together in order to avoid showing laps. In stippling large surfaces, it is customary for two men to apply the paint and one man to follow with the stippler.

Where the walls are to be stippled in oil paint, the finishing coat should be mixed to a heavy consistency with 2-3 oil and 1-3 turpentine. Apply the paint medium heavy and allow it to stand a short time, then proceed to stipple. One man can apply the paint as well as do the stippling.

Where walls have been stippled or decorated, they can be protected by applying a thin coat of good starch. Boil the starch and strain. Be sure it is uniform throughout, then reduce to a thin consistency and apply a thin coat and stipple the same as with paint. This will protect the decoration, and after it becomes soiled with smoke it can be washed off and another coat of starch be applied in the same manner as before, thus saving the decoration for an indefinite length of time.

HOUSE PAINTING.

Interior Finish—Old Work. In repainting a surface that has been painted, varnished, enameled or stained a number of times, it is important to know the character of the surface to be finished, the kind of work that can be satisfactorily done over it, also necessary to know how to properly prepare the surface to receive the finish, as well as to know that certain kinds of work cannot be successfully done over numerous coats.

Flat white and enamel cannot be applied over numerous coats of oil paint, as they will turn yellow and are liable to crack. Grained work cannot be successfully done over an enameled surface, as the surface is so hard and brittle that when oil graining colors are used, it is liable to break loose, chip, crack or check. A surface which has been enameled cannot be successfully refinished except in enamel. The only satisfactory way to remove enamel is with paint remover or to burn the surface.

Painting cannot be done over numerous coats of varnish without danger of checking or cracking, therefore the varnish should be removed before the paint is applied. Where numerous coats of oil paint have been applied and are of a spongy character or have not dried solid, the surface should be burned or the paint taken off with a paint remover. If the surface is cracked or alligatored, it should be cleaned to the wood with a burning lamp or paint remover. If the work is badly cracked and will not permit of burning, it should be painted in flat color. Cracks will not show so badly finished in flat as in gloss.

Oil Paint. Where oil paint is to be used over old work, sandpaper the old paint to a smooth surface and apply a coat mixed with half turpentine and half oil. If more than one coat is desired, the second coat can be applied of the same paint mixed to a heavier consistency; however, one coat is usually sufficient over old paint. It is not necessary to apply extra coats if the color used is of a similar shade to the old paint. A well covered surface can be made with one coat. Avoid applying more paint than is absolutely necessary to produce a solid finish.

Gloss Finish. If the work is to be refinished in gloss, clean the surface and sandpaper or rub with steel wool to a smooth surface, then apply one coat of enamel or gloss finish as directed for new work, finishing coat.

Flat and Enamel Finish. If the work has received two or three coats of oil paint which have dried solid without signs of cracking or checking, it can be repainted with fair results if first sandpapered smoothly, then covered with a coat of paint mixed flat. When this is hard dry, apply a second coat if necessary; however, if the one coat will produce a satisfactory finish, it is all that should be applied. If an enamel finish is wanted over this same surface, the enamel can be applied over the flat color. The first enamel coat should be reduced with a pint of turpentine to a gallon of enamel. When hard, rub the surface with fine steel wool to cut the gloss and level the surface, then apply a smooth, even coat of enamel, using a full brush and flowing on the enamel. This can be rubbed or left in a gloss finish.

If the work is to be painted or enameled white and the surface has received numerous coats of oil paint and good results are expected, the old paint will have to be removed. Then the surface, if thoroughly cleaned and sandpapered, will be in good condition to receive paint and should be treated in the same manner as new work which has not been sized.

To enamel over a varnished surface, it is very necessary to remove all of the varnish. The ground work for enamel should be built up with a portion of the enamel or a good mixing varnish added to each coat. The paint should be mixed flat, with the enamel or varnish added. The first coat should contain from 1 pint to 1½ pints of enamel to a gallon of paint. Apply the second coat of the same mixture of a heavier consistency. Each coat should be thoroughly sandpapered or rubbed smooth with steel wool before applying another. The third coat can be applied with a good enamel reduced with a pint of turpentine to a gallon of enamel. If a deeper luster is wanted, apply a heavy coat of enamel of the original consistency. This can be rubbed to a flat finish or left in the gloss. If the enamel used is of good quality and the undercoats of varnish are not of a cheap rosin quality, this work will not check nor crack.

Kitchens and Pantries. Kitchens and pantries, to be repainted, should be thoroughly cleaned. The best way is to wash the woodwork and walls with rainwater and washing compound, using ¼ pound of washing powder or soda to three gallons of rainwater. Thoroughly sponge and brush the surface, then rinse with clear water. This will remove smoke or grease more readily than will turpentine or benzine. For the walls of the kitchen or pantry to be repainted, the first coat should be mixed half flat, then apply a full oil coat of a flat color mixed with varnish, in the proportion of 1-3 color and 2-3 mixing varnish. Either of the foregoing will dry with a good gloss and can be washed.

The woodwork should be thoroughly sandpapered, and, if in very bad condition, scraped. If the old paint is thoroughly hard and two coat work is necessary the first coat should be mixed half flat, then a full oil coat applied over this, or flat color and varnish in the proportions directed for wall work.

Shelves in cupboards and pantries should be thoroughly washed, sandpapered and then a coat of flat color applied. The finishing coat should be mixed with varnish and flat color to dry hard and solid so as not to be softened with moderate heat. Very warm cooking utensils are often placed in pantries and on shelves, and if the paint is not hard dry this is liable to soften it.

Kitchen and Pantry Floors. Floors should be scrubbed three or four days before paint is applied. If there are any grease spots, wash them with turpentine or benzine. The first coat of paint should be mixed to dry firm and hard in the wood. Reduce lead in oil with 2-3 turpentine and 1-3 good copal or mixing varnish. When hard, sandpaper lightly, dust off and apply a coat of 2-3 mixing varnish and 1-3 flat color. This will dry with a good gloss, firm and hard and make a coating which is not in danger of being scratched or scuffed up.

Graining Ground. If the surface has been previously painted and is in good condition, thoroughly sandpaper and apply a coat of paint mixed flat and tinted to the proper ground color with a pint of hard-drying varnish added. Should the paint dry too flat for good working or combing of the graining color, an additional amount of varnish can be added, or a small amount of oil. If numerous coats of oil paint have been applied, or if the surface is badly cracked, the paint will have to be burned or removed with paint remover, then proceed as with new work.

Where graining is done over an old varnished surface, it is best to remove the varnish before applying the paint to avoid cracking; however, if it is impossible to do so, the ground work can be mixed to a semi-paste with a good mixing varnish, then reduced to a painting consistency with turpentine. A small amount of oil can be used should the color not work freely, but not to exceed four ounces of oil to the gallon of paint. Should the paint dry too flat for good working or combing of the graining color, an additional amount of varnish can be used in the second coat to produce an eggshell or semi-gloss, whichever is desired.

Staining. If a surface which has been previously painted or varnished is to be stained, it must be handled and built up with the proper shade of ground color according to the wood to be imitated in the same manner as a similar surface for graining ground. The stain must be of a heavier consistency than for bare wood. Brush out thin and even. It cannot be wiped off as on new work and the effect depends upon the brushing. If the grain of the wood is to be imitated, the surface must be grained.

Drying. It should be borne in mind that light and air are necessary to the drying of paint. Paint will not harden in tightly closed rooms. This is especially true of kitchens, pantries and work of this character where there are numerous shelves and drawers, and if closed the paint or varnish will remain tacky and not harden through.

Floors which are to be painted should be exposed to a free circulation of air from underneath. If they are over damp basements or cellars, the windows or ventilators of same should be opened to allow of free air circulation from underneath, as dead or damp air will prevent the paint or varnish on floors from hardening.

MARBLING.

Sienna Marble. The ground of Sienna marble is white lead; the work is then to be evenly gone over with white paint mixed with equal quantities of turpentine and oil. After this, mix two light tints, the one consisting of yellow ochre and white lead and the other of vermilion and white lead, both mixed with equal quantities of oil and turpentine, and with separate tools dab patches on the white paint whilst yet wet, and with a brush well soften the patches together, great care being taken not to allow the red tint to be too dominant.

On a palette, on the side of which is placed a tin dipper containing turpentine, place a small quantity of blue black, the oil colors sold in collapsible metal tubes are the best for marbling, and a small quantity of purple lake; then with a sable pencil dipped in turpentine take a thin wash of the blue black and vein on the wet work, and soften; then work up the veins further with more blue black, so that the color may be a little darker, but still thin; after this, with a flat camel's hair fitch dipped in turpentine, and a small quantity of the purple lake and blue black mixed, apply very thin washes in some of the open spaces, and soften lightly. When dry, put in whites, with white lead mixed with turpentine, using a sable pencil, and subsequently softening the work with a badger. When the paints are quite hard, apply a light varnish.

Italian Pink Marble. Over a white ground apply a coat of white paint as in the last case, compound tints of ultramarine and white lead and vermilion and white lead, each being mixed with equal quantities of oil and turpentine, and with these dab patches, as already described, and soften.

On the palette place some Indian red and with a small pigeon feather dipped in turpentine and some of the Indian red, work the pattern and well soften. When this is dry, mix some white lead mixed rather thinly with turpentine, and flat the whole of the work; then with a feather dipped in turpentine scumble over the work and subsequently put in whites with white lead and turpentine. When the work is perfectly hard it is to be varnished.

Verde Antique. The ground of Verde antique is either black or dark green, the marbling colors being dark brown and green. Scumble over the work with these, then with Brunswick green and white lead scumble over again and soften with a badger; next with a fitch paint masses of white of various shapes, squares, irregular triangles, etc., and similar masses of black.

The painter may here be reminded of the difference between scumbling and glazing. In the latter the colors are thinly mixed so as to be transparent; in the former, the color is mixed thick and thinly spread or rubbed on it with a hard brush.

Egyptian Green Marble. This marble in color nearly resembles the Verde antique; it is superior serpentine, and there are several sorts, which are called by different names, which would be of but little service to the painter, as they are all for his purposes comprehended under the above title. Egyptian green differs from Verde antique in the form of the veins, which run in a more horizontal direction, having a greater quantity of small fossil substances mixed with it, and the dark veins frequently running in streaks which often appear as if broken by violence.

Serpentine. The same kind of marble, though not so variegated in vein or color, is found in Germany, Russia and England. It is called serpentine from its supposed resemblance to the skin of a serpent and in its rich variety of color and almost indestructible hardness, and is therefore eminently suitable for architectural ornaments.

Noble or Precious Serpentine has nearly the same appearance with the green marbles of the East, called Egyptian green. The green is generally the cold color of the leek, but varies in shades, some appearing in the darkest olive. The veins which appear black sometimes run in a horizontal direction, and then suddenly break and appear nearly upright; in other cases they seem to have undergone a violent concussion, and become broken and shivered to small pieces. It is the business of the geologist to explain the cause of this appearance in one of the most solid of minerals; it is sufficient for the painter to note the character, so as to reproduce it as far as possible by means of his art.

The common Serpentine is found in great abundance in the Isle of Anglesea. It is not so bright or so varied as the precious; the dark shades of green are much broader, and the light veins not so fine and reticulated, and consequently the fossil remains that are white show more distinctly in small, long, square pieces of various sizes and forms. The black vein is so mixed with the darkest shades of green as to be scarcely perceptible in some instances, and this renders the marble somewhat dull and not fit for ornamental painting.

The mode of producing all the green marbles, both in oil and distemper color, must be the same as that directed for Verde antique. The ground must in all cases be black and the different shades of green may be formed by scumbling the white over the black, more or less thickly according to the variety of shade required, and, when the whole is finished, glazing with green according to the tint of the marble.

White-Veined Marble. The ground for this marble is white laid perfectly smooth. The first vein will be found, on inspecting a specimen, to be very faint; it is the broad vein of the mica seen through a great depth of the semi-transparent body of the white. The shadows of white always partake of a yellow hue, and thus the faint vein will appear of a reddish gray, which is formed by mixing white, black and Indian red to a proper tint. This must be scumbled or spread very thinly in the forms that it is intended that the veins should take. In relation to the formation of marbles, it must here be observed, that they are beds of rock that are veined by metallic or other substances running amongst them, and that the veins always run in the direction of the strata, precisely as thin streams of water would if poured upon an inclined plane, such as the top of a table slightly raised on one side. If this experiment is tried it will be found that the streams, if they commence regularly, will, from some inequalities of the surface, soon alter their course and turn in various directions, sometimes joining together, forming a sort of star, and then spreading into finer threads, while others will join and form a thick vein, but still running in various forms towards the bottom. This is precisely the way in which the various substances spread themselves on the limestone, of course penetrating the surface and interspersed with the strata.

From this experiment the painter will see that however the direction of the veins, they must all appear to be traveling to the same point by different roads and nothing can be more contrary to nature than those violent and eccentric breaks which painters of veined marbles usually practice. This will apply to all marbles except Porphyry, Black and Gold and Florentine.

The first broad vein of the marble having been rather faintly painted, the veins nearer the surface are next to be put in. They are made a little darker by the addition of black and are to be drawn very thin, taking the direction of the broad faint vein and being divided according to previous studies from nature. The veins which are nearest the surface must, of course, be darker than the others, and the color may be darkened and warmed by the still further addition of black, with a little lake and blue. This vein should be drawn with a fine sable pencil very thin, and made to take nearly the direction of the last veining. Only very little is required, but it must be put in with spirit and skill and the beauty of the work will thereby be greatly enhanced.

The whole of these veins are put on one upon the other whilst wet and blended together with the badger softener. When quite dry the dark vein may be retouched either wholly or in parts.

Lay on a ground of white and put in the veins with a marbling crayon or camel's hair brush whilst the ground is wet, and soften with the badger. This is, of course, a much inferior method to the above, as the different degrees of depth of the veins, and the pale smooth portions caused by the confluences described are not as well represented.

Florentine Marble. The ground for this marble is white, Indian red and black, mixed together to form a very light reddish neutral tint. The veins are umber or burnt sienna; they are laid on very irregularly, while the ground color is wet; sometimes they are very close together, and then seem to break suddenly into the forms of rocks or ruins, an effect which must be studied from natural specimens and must be imitated by hand.

Black-and-Gold Marble. The ground is black. Paint the large spots from which the fibrous veins are to run with yellow ochre and white, the bright tone of which must be heightened by the addition of a little vermilion. These masses must be dabbed with freedom upon the ground with a brush full of color and, whilst quite wet, threads must be drawn from them in all directions, some, of course, being larger and thicker than others.

A white vein is sometimes seen running in the deepest parts of the black, with small threads attached to it, crossing each other and the yellow veins in all directions. Care must be taken that the threads are connected with, and run in some degree in the same direction as, the thicker veins. If the ground of this is properly prepared, the yellow and white veins may both be painted at once in oil color.

In cabinet work, most beautiful imitations of the finest specimens of this marble may be produced by spreading a leaf or two of gold in any part of the work where the gold, and silver leaf where the white, veins are intended to run. The black ground is then to be rather thickly painted over the whole surface, covering the gold and silver leaf, and, after the color has been on a short time, take a round-pointed bodkin, or similar implement, and draw the color in small reticulated veins from off the gold and silver leaf; the metal will then show in fine lines; the larger masses are to be wiped off with the wash-leather spread over the point of the thumb or a piece of wood. When the black is dry, the yellow and white veins are to be painted as before directed, and drawn over the gold and silver, which will by this means show through them and give great brilliancy water when the work has been subsequently varnished.

Paint the ground a deep ivory black; put on the veins in white, yellow ochre and burnt and raw sienna, using a camel's hair brush; glaze the spaces between the veins with a thin coat of gray or white, over which pass a few white veins. The veins may also be put in with gold leaf.

Porphyry Marble. Mix the ground color of Venetian red with a little vermilion and white, until it is of the tint required. The first layer of spots is produced by sprinkling in the following manner: Mix some of the ground color with a larger quantity of white, in a paint-pot, and use a large brush which has been well worked in the color; hold the palette knife over the paint-pot and press the hairs of the brush against the edge so that as much as possible of the color may be forced out of it; then, taking the handle of the brush between the palms of the hands, roll it to and fro with a rapid motion, the ends of the hairs being below the level of the paint.

Now hold a stick firmly in front of the work and strike the handle of the brush against it; the color that still remains in it will thus fall on the surface in a variety of small dots. Great care on the part of the painter is necessary at this stage, so as to distribute the spots equally; otherwise, whilst one part of the work will be left only partially spotted, others may be so thickly covered that the drops will become confluent and not be visible as spots afterwards.

When this work has become sufficiently dry, the sprinkling may be repeated by dipping the brush into a color rather deeper than the ground; it may be Indian red, with sufficient white to give it a body. The sprinkling with this color must be done very sparingly and rather more in some parts than others.

The last sprinkling is to be done with a clean small tool dipped in white paint only and the spots are to be very fine; as much color, therefore, as possible should previously be removed from the brush, and it will be found that, when so little color remains in the brush that it will scarcely mark a board when rubbed on it, there will still be enough to produce the fine dots when struck against the stick. The stick should be held at some distance from the work, as the farther away the finer will be the dots. In imitating some specimens, the three layers of spots are laid on and, in addition, a narrow opaque white vein is to be run amongst the spots; from this transparent threads are drawn in various directions; these cannot be added until the whole of the sprinkling is quite dry and hard; they must then be formed with a sable pencil and the threads drawn out with a feather.

Egyptian Porphyry. The ground for this rare and beautiful marble is composed of vermilion and white lead. A tint of Indian red and lake is then sprinkled over the ground by striking the handle of the brush containing the color against a stick, and turning the wrist whilst striking; some of the dots will thus become elliptical instead of circular. The sprinkling of the brush must be spread in every direction, and the spots will, as already explained, be larger as the brush is struck nearer to the work and smaller as the distance is increased. The darker spots are a strong tint of lake, sprinkled on the previously made spots by striking the brush very smartly once or twice over that part of the work where they are required. The whole must then be left to dry; after this, a light blue tint must be sprinkled very lightly over different parts of the surface, but in no part so thickly as to overpower the red. The larger spots are to be done with white applied with a sable pencil near the darkest sprinkling. Dark spots of a tint formed with blue and lake are now to be added, and the work is to be completed by white veins drawn with a fine camel's hair pencil.

Blue-and-Gold Marble. The ground for this marble is a light blue, and when this is quite dry dab on in separate patches light blue, white and Prussian blue, leaving portions of the ground visible. Soften these patches together and then vein in every direction with white and fill up some of the irregular spaces with yellow or gold paint, and finally add fine white veins.

Blue Ruby-Spotted Marble. The blue ruby-spotted marble comes from Switzerland; it is light-colored, beautiful marble which may be introduced either in large or small masses with equally good effect.

The ground for this marble is a very light blue, with a few patches of white in those parts where the yellow spots are afterwards to appear. Both the blue and white of the ground must be quite dry before any marbling color can be applied. A bright tint of Prussian blue and white may be painted on in spots over the blue ground, and above this, whilst wet, a few touches of a darker tint must be laid on in large spots sufficiently apart from each other to allow the first tint to be seen between them.

The yellow spots may now be applied over the white ground; this is done with King's yellow mixed with a little vermilion. The work must be left to dry before it can be proceeded with. The surface being quite hard, paint the dark red or ruby veins with a tint of lake and blue. This is rather dotted than painted over the blue, taking care to avoid the yellow. These marks in some places are quite red, and for these lake alone is used. As soon as the ruby tint is applied, mix a much stronger tint of lake and blue and draw the strong markings over the lake; these lines are drawn out in a long succession of spots over the blue. It is impossible to give a verbal description of the manner of applying the tints in the various markings of this marble, but the painter who keeps the general character cannot greatly err from nature.

This is a most excellent pattern for distemper color. The ground is white, the light blue is white and Prussian blue; this may be sprinkled with a large brush. The darker spots are a tint with a little more blue than the first.

Blue-Veined Swiss Marble. This marble is exceedingly splendid in color and not very difficult to imitate. The ground is white. Light blue spots or broken streaks are drawn over the ground so as to let the white be seen between them. The blue must be omitted on that part of the ground where the yellow markings are seen. On these spaces a tint of King's yellow is painted and on this tint broad spots or touches of burnt sienna. The work must then be suffered to dry, after which the purple tint may be applied over the blue spots; this tint is lake and blue; the marking upon it is black; a glaze of burnt sienna in different parts will give variety of tint to the representation.

To execute this marble in distemper the blue may be sprinkled upon the ground with a large brush. The yellow is King's yellow, touched up with lake; the purple tint is indigo mixed with rose pink, and the darkest markings are black.

Dove-Colored Spotted Marble. This differs from the Dove marbles commonly seen by the contrast of the strong dark and light spots, and the interspersion of thin light veins. Dove marbles are used to heighten the effect of white-veined or statuary marble in sepulchral monuments, etc. The imitation in painting is mostly required for chimney-pieces or common dark work, for which it is very appropriate.

The ground for this marble is a light grey formed with black and white, mixed to the tint required; the sprinklings on the ground are done with a very dark tint formed of the same colors. The large spots are black, laid upon the sprinklings while wet with a sable pencil. The white spots and the veining may also be painted while the dark sprinkling is wet, as they will then blend with it and have a more natural effect than it would if they were painted when the dark sprinkling had become dry.

The process and colors are the same if the work is required in distemper, but as it is so easily and quickly performed in oil it is seldom that distemper color for so dark and common a marble can be used with advantage.

Dove Marble. For the ground of this marble two or three coats of good lead-color should be laid, and these should each be nicely smoothed with glass paper. The color used for marbling is the same as the ground, but thinned with turpentine. In order that the work may be satisfactorily blended whilst wet, only a small portion must be taken in hand, the whole being executed piece by piece until complete. The marbling color having been rubbed over a certain portion, small specks representing fossil remains are to be formed in it with a whitish tint, and these must be blended into the color, but not so much as to lose their distinctions. Veins of various sizes are then to be put in with the thinned ground color, using a small sash tool, distributing them with taste, and interspersing them with very fine veins. The color is then to be made lighter by the addition of white lead, and with a feather dipped in this color the broader veins are to be passed over, thus forming numerous thread-like veins. Next, with thin white in a camel's hair pencil, pass partly over the same veins with short thick touches, which may be continued in the narrower parts with a fine striping pencil. When the work has become quite hard it should be smoothed with very fine glass paper before being varnished.

Jasper Marble. The ground is composed of Venetian red, red lead and a small quantity of chrome yellow, mixed with oil and turpentine in equal parts. Or additional brilliancy may be given to the color by vermilion or lake instead of Venetian red. While the ground is wet, dab on spots of white, using either a piece of sponge or a tool, and soften with a badger, subsequently repeating the white touches in parts to give them increased brilliancy. Spots of blue, brown or yellow may be added in the same manner. When nearly dry, veins and threads may be put in with a camel's hair pencil.

Granite. Granite is a well-known igneous rock, composed principally of three minerals, Quartz, Felspar and Mica, united in a confused crystallization, that is, without any regular arrangement of the crystals. The following is the order in which the ingredients are proportioned: Felspar, Quartz, Mica. The name of the stone is derived from its granular formation.

There are very many kinds of granite used in the arts. Amongst these are the gray, red, green, violet, rose-colored, etc.

For the gray granite the ground is a gray, mixed of black and white, and, over this, spots are to be splashed with black and white, used separately, the work being carried on as described in relation to Porphyry. For the various shades of red granite the ground is composed of Venetian red and white, the spots being black, white and vermilion. In the same way any of the other kinds may be represented.

MILDEW.

Mildew is a serious trouble. This is a vegetable growth and always a sure indication of dampness. It is impossible to satisfactorily paint a surface on which mildew has formed unless the surface is first treated to destroy this growth.

Ochre primers and ochre colors are particularly liable to this really serious trouble, due to the fact that they are largely of bog origin and contain the seeds or spores as they are called from which the mildew mold develops. Such growths result not only in a most serious discoloration of the work which at times may be taken as fading or change of color, but also are very destructive to the paint itself, mildew not only developing at times at the expense of the vegetable oil itself, but what is even more serious, growing between the wood and the paint and thus forcing the paint off.

Vegetable oils like linseed oil are not destructive to this vegetable growth, but turpentine is, hence the first thing to do in aggravated cases is to wash well and freely with turpentine, removing any loose paint; this will very largely destroy such growths. In addition, an exceptionally large amount of turpentine should be used in the first coat applied over such a surface; the paint should be well flatted. An undercoating well flatted with turpentine applied over a mildewed surface which has been washed with turpentine offers the best possible protection against repetition of the trouble.

OILS AND DRIERS.

Linseed oil is produced by expression from the seeds, either by hydraulic or steam power. This material varies in quality: According to the goodness of the seed from which it is expressed, and according to its age and clearness; for, when a large stock is kept, it is found that, in about six months, there is a considerable amount of accumulation of refuse at the bottom of the tank, which is only fit to be employed in mixing coarse paint for out-door work. The best is yellow, transparent, comparatively sweet-scented and has a flavor resembling that of the cucumber. Great consequence has been attributed to the cold drawing of this oil, but it is of little or no importance whether moderate heat be employed or not in expressing it. Several methods have been contrived for bleaching and purifying this oil so as to render it perfectly colorless and limpid, but these give it more beauty to the eye, in a liquid state, without giving it any permanent advantage, since there is not any known process for preventing the discoloring after its drying, and it is, perhaps, better upon the whole that this and every vehicle should possess that color at the time of using to which it subsequently tends, so that the painter may depend on the continuance of his tints, and avoid the disappointment and annoyance arising from a change of color.

Linseed oil is sometimes boiled with litharge to make it dry quickly, but when it is thus treated it is unfit for best work.

The quality of linseed oil may be determined in the following manner: Fill a phial with oil and hold it up to the light; if bad, it will appear opaque and turbid, its taste will be acid and its smell rancid. The oil which is expressed from good and full-grown seeds should, when held up to the light, appear clear, pale and bright; it is sweet to the taste and has little or no smell.

Linseed oil may be purified by the following process: Place the oil in a bottle or jar, and drop into it some powdered whiting, stir or shake up the mixture and allow it to stand on the stove, or in an oven, not too hot; the whiting will very soon carry down all color and impurity and form a precipitate at the bottom. The refined oil at the top may then be poured off.

In rare instances, where the least yellowness in the oil would be injurious, nut or poppy oil may be used with advantage; but, as already stated, linseed is the oil used for general purposes.

Oils of a nature suitable for painting are the most commodious and advantageous vehicle to colors hitherto discovered, first, because the unctuous consistence of them renders their being spread and layed on a surface with more evenness and expedition than any other kind of vehicle; secondly, because, when dry, they leave a strong gluten or tenacious body that holds the colors together, and defends them much more from the injuries either of the air or accidental violence than the vehicles formed of water. The principal and most general quality to be required in oils is their drying well, which, though it may be assisted by additions, is yet to be desired in the oil itself, as the effects of the pigments used in it are sometimes such as counteract the strongest driers, and occasion great delay and trouble from the work remaining wet for a great length of time, and frequently never becoming thoroughly hard. There are some oils that have this fault to an incurable degree. The next quality in oils is the limpidness, or approach to a colorless state, which is likewise very material; for where they partake of a brown or yellow color, such brown or yellow necessarily mixes itself with the pigments; but, besides the brown color which may be visible in the oil when it is used, a great increase of it is apt to appear some time afterwards when the oil is not good. There are three changes which oils of the kind proper for painting are liable to suffer in their nature, and which affect them as vehicles, that are mentioned by painters under one term, that of fattening; notwithstanding, these several changes are brought about by very different means, and relate to very different properties in the oils.

The first is a coagulation by the mixture of the oil with some pigment improperly prepared. This, indeed, is called the fattening of the colors, but the real change is in the oils and the pigments are only the means of producing it. This change is generally a separation of the oil into two different substances, the one a viscid body which remains combined with the pigments, the other a thin fluid matter which divides itself from the color and thicker part.

This last appears in very various proportions under different circumstances, and, in some cases, it is not found where the pigments happen to be of a more earthy and alkaline nature, for then only a thick clammy substance that can scarcely be squeezed out of the bladder, if it is put up in one, is the result of the fattening. This fattening not only happens when oil and pigments are mixed together in bladders or vessels, but sometimes, after they have been laid on the proper ground for them, instead of drying, the separation will ensue, and one part of the oil will run off in small drops or streams, while the other will remain with the color, without showing the least tendency to dry.

The second is the change that takes place in oils from long keeping. This, if it could be afforded by the oil-manufacturer or the painter, is by far the best method of purifying linseed and other oils, as, by thus keeping, they become lighter colored and acquire a more unctuous consistence; and, though they are said to become too fat, they are in a very different state from that before mentioned, which is caused by unsuitable pigments.

The third is the change produced by artificial means, from exposing the oil a long time to the sun, whereby it is freed from its grosser and more feculent parts, and rendered colorless, and of a more thick and less fluid consistence than can be produced by any other treatment; but, at the same time, it is made less likely to dry, particularly when used with mineral colors, as vermilion, Prussian blue and King's yellow; it likewise becomes disqualified by other bad qualities that render it of little use as a vehicle for painting. Oils in this state are called also fat oils, though it is a change that has not the least affinity with either of the other, but, on the contrary, differs from both. In speaking, therefore, of the fattening of oils or colors, attention should be had to the not confounding these three several kinds one with the other.

Linseed oil, from its cheapness, is the only oil in common use for house painting, and it may, by proper management, be made to answer for every kind of work. This oil is pressed from the seed of flax, and is best when manufactured in great quantities. The general defect in linseed oil is its brown color, and its tardiness in drying, both of which are in a much greater degree found in some parcels than others. There is also found such as, in consequence of its being mixed with the oil of some other vegetable accidentally growing near it, partakes of the nature of olive-oil, and cannot be made to dry by any means whatever. The faults of the color and want of drying quality may be greatly reduced, if not entirely taken away, by keeping the oil for a length of time before it is used; it then becomes fat in the second sense of the word, as before explained, and is a good vehicle for color without any mixture; but it is generally used with a proper drier, as it never by itself becomes sufficiently pure to use with white or other light tints, without imparting a brown color to them.

Poppy Oil. This is a colorless oil, and is in some instances used for delicate works where the length of time required for drying is no object. It is much celebrated in some old books, under the name of oil of pinks and oil of carnations, as erroneously translated from the French œillet, or olivet, a local name for the poppy in districts where its oil is employed as a substitute for that of the olive. It is, however, inferior in strength, tenacity and drying to linseed oil, although next to it in these respects, and, though it is of a paler color, and slower in changing, it becomes ultimately not so yellow, but nearly as brown and dusky, as linseed oil, and therefore is not preferred to it.

Nut Oil is the oil of walnuts, and is used in ornamental painting, as it is nearly colorless, and can be used with flake white and other delicate colors without the slightest danger of tingeing them.

Driers. Driers are used to hasten the drying of paints. These are ground up in oil and are mixed in small quantities with the color; some colors, in fact, will not perfectly harden without them, but remain sticky, or, as painters term it, tacky, until sufficient dust has clung to them to render their external surface at least apparently dry; though, as can be well understood, it will remain disagreeable to the touch and much injured in color. Red lead is a good drier, but, of course, can only be used in situations or in paints where its color is not objectionable. Sugar-of-lead is, however, the best drier, but is more expensive than others. Patent driers, ground up in oil, may be purchased at the various paint stores.

Drying Oils. All the fixed oils have an attraction, more or less powerful, for oxygen, and by exposure to the air they either become hard and resinous, or they only thicken slightly and become sour and rancid. Those which exhibit the first property in a marked degree—as the oils of linseed, poppy, rape and walnut, are called drying oils, and are used as vehicles for colors in painting; the others are termed glutinous or non-drying oils.

The resinifying or drying qualities of the oils are greatly increased by boiling them, either alone or along with litharge, sugar-of-lead or white vitriol, when the product forms boiled oil, or drying oil of commerce. The efficacy of the process depends on the elimination of substances which impede the oxidation of the oil.

The following methods of preparing drying oils are culled from various sources; the quantities of each formula are given as in the originals, but these can, of course, be used in relative proportions when the preparation is to be carried on on a smaller scale.

Linseed oil, 1 gallon; powdered litharge ¾ pound. Simmer, with frequent stirring, until a pellicle begins to form; remove the scum, and when it has become cold and has settled decant the clear portion. Dark colored, used by house painters.

Three hours boiling, with litharge one-tenth in weight of the oil, renders the oil more perfectly drying than when the boiling is continued for a much longer time, when the oil acquires a darker color and so becomes injured in transparency the longer it is boiled. Merely heating linseed oil to 170° Fahrenheit, along with a small quantity of peroxide of manganese, as completely renders it siccative as any amount of boiling, and without any deterioration to its color or transparency. It appears probable that litharge acts more by its mere presence in inducing the oxidation of the oil than by actually giving up oxygen to it, and those engaged in boiling oils have remarked that the old litharge, with which linseed oil has been already boiled, acts more energetically in producing the siccative property in it than new litharge.

Pale Linseed or Nut-Oil 1 pint, litharge, or dry sulphate of lead in fine powder 2 ounces; mix, let it stand, frequently stirring it for ten days, then set the bottle in the sun, or in a warm place to settle and decant the clear portion.

Sugar of lead 1 pound, dissolved in ½ gallon of rain water; 1 pound litharge in fine powder is then added, and the mixture is gently simmered until only a whitish sediment remains; 1 pound of levigated litharge is next diffused through 2½ gallons of linseed oil, and the mixture is gradually added to the lead solution previously diluted with an equal bulk of water; the whole is now stirred together for some hours with heat and is lastly left to clear itself by exposure in a warm place. The lead solution which subsides from the oil may be used again for the same purpose by dissolving in it another pound of litharge as before.

Into linseed oil, 236 gallons, pour oil of vitriol 6 or 7 pounds, and stir the two together for three hours, then add a mixture of fuller's earth 6 pounds, and hot lime 14 pounds, and again stir for three hours. Next, put the whole into a copper, with an equal quantity of water, and boil for about three hours; lastly, withdraw the fire, and, when the whole is cold, draw off the water, run the oil into any suitable vessel, and let it stand for a few weeks before using.

Pale Drying Oil. The oil should be macerated two or three days at least upon about an eighth of its weight of litharge, in a warm place, occasionally shaking the mixture, after which it should be left to settle and clear; or it may be prepared, without heat, by levigating the litharge in the oil. Acetate of lead may be substituted for litharge, being soluble with less heat, and its acid, being volatile, escapes during solution and bleaches the oil, to which coarse smalt may be added to clear it by subsidence, increase its drying and neutralize its brown color. This affords pale drying oil for light and bright colors.

Boiled Oil. The above mixture of oil and litharge, gently and carefully boiled in an open vessel till it thickens, becomes strong drying oil for dark colors. Boiled oil is sometimes set on fire purposely, in making printer's varnish and printing ink, and also for painting and the preparation of japanner's gold size. As dark and transparent colors are in general comparative ill driers, japanner's gold size is sometimes employed as a powerful means of drying them. This material may be prepared in the following manner: Asphaltum, litharge or red lead, burnt umber or manganese, finely powdered, of each 1 ounce; stir them into a pint of linseed oil and simmer the mixture over a gentle fire, or on a sand bath, till solution has taken place, scum ceases to rise, and the fluid thickens on cooling, carefully guarding it from taking fire. If the oil employed be at all acid or rancid, a small portion of powdered chalk, or magnesia, may be usefully added, and will assist the rising of the scum and the clearing of the oil by its subsidence; and, if it be kept at rest in a warm place, it will clear itself, or it may be strained through a cloth and diluted with turpentine for use. Gold size for gilding is commonly made of boiled oil and fine yellow ochre.

There is often a difficulty in obtaining the oils bright; after boiling or heating them with the lead solutions, the best way, on a small scale, is either to filter them through coarse woollen filtering paper, or to expose the bottle for some time to the action of the sun, or to place it in a warm situation; on a large scale, the fine oils are often filtered through Canton flannel bags. The litharge and sulphate of lead used in the above processes may be again rendered available for the same purpose by washing them in hot water to remove the adhering mucilage.

Drier for Zinc White. Purified linseed oil is boiled for six or eight hours, and to every 100 pounds of boiled oil there are added five pounds of powdered peroxide of manganese, which may be kept in a bag like litharge. The liquid is boiled and stirred for five or six hours more and then cooled and filtered. This drying oil is employed in the proportion of from five to ten per cent of the weight of zinc white, and it should be added during the grinding of the pigment in oil, the admixture then being more thorough.

Drying Oils. Fifteen parts of lime made into paste with water are added to 100 parts of oil oxidized by peroxide of manganese. The whole is boiled or heated by steam until the water has evaporated; the oil then forms with lime a thick product which is a drier. It may be ground with the ordinary oil of turpentine, or with that of Venice, but the dryer is less powerful than when it has been mixed with oxidized linseed oil. Three to five per cent of this drier are sufficient for a rapid desiccation.

Other driers may be made by combining lime with resins and essence of turpentine in the proportions indicated for fixed oils.

Powdered Drier. Pure sulphate of manganese 1 part, pure acetate of manganese 1 part, calcined sulphate of zinc 1 part, white oxide of zinc 97 parts. The sulphate and acetate are ground in a mortar to an impalpable powder, which is passed through a metallic sieve. Three parts of this powder are dusted over the 97 parts of oxide of zinc, spread over a board or a slab; the whole is then thoroughly mixed and ground. The resulting white and impalpable powder, mixed in the proportion of ½ to 1 per cent with zinc white, will enormously increase the drying property of this product, which will become dry in from ten to twelve hours.

Volatile Oils, procured by distillation from turpentine and other vegetable substances, are almost destitute of the strength of the expressed oils, having hardly more cementing power in painting than water alone, and are principally used as solvents, and media of resinous and other substances introduced into vehicles and other varnishes. In drying they partly evaporate and partly, by combination with oxygen, form resin and become fixed. They are not, however, liable to change color like expressed oils of a drying nature, and, owing to their extreme fluidness, are useful diluents of the latter; they have also a bleaching quality, whereby they in some degree correct the tendency of drying and expressed oils to discolorment. Of the essential oils, the most volatile and nearest in this respect to alcohol is oil of sassafras, but that most used in painting is the rectified oil, improperly called spirits of turpentine, preferable only on account of its being thinner and more free from resin. By the action of oxygen upon it, water is either generated or set free, and the oil becomes thickened, but is again rendered liquid by a boiling heat upon water, in which the oxygen and resin are separated from it. When colored by heat or otherwise, oil of turpentine may be bleached by agitating some lime powder in it, which will carry down the color. The great use of this oil, under the name of turps, is to thin oil paints, and, in the larger use thereof, to flatten white and other colors, and to remove superfluous color in graining. It, however, weakens paint in preventing its bearing out, and when used entirely alone, it will not fix the paint.

The name of turpentine is applied to a liquid, or soft solid product of certain coniferous trees, and of the Pistachia terebinthus.

There are several varieties, as follows: American or white turpentine, Bordeaux turpentine, Venice turpentine, Strasburg turpentine, Canadian turpentine, or Canadian balsam, Ohio turpentine and Frankincense.

In nearly all cases the processes of collecting are similar. A hollow is cut in the tree yielding turpentine, a few inches from the ground, and the bark removed for the space of about 18 inches above it. The turpentine trickles down into vessels placed to receive it. The incisions are made about the close of March, and the turpentine continues to run throughout the vegetative season, especially during the summer months. In general character these turpentines have much in common; they are oleo-resins, varying slightly in color, consistency and smell; they enter into the composition of many varnishes.

Oil of turpentine is obtained by distilling American turpentine, which has been melted and strained with water in an ordinary copper still. The distilled product is colorless, limpid, very fluid and possessed of a very peculiar smell.

The residuum, after the distillation of the oil or spirits of turpentine, is the common resin of trade.

OIL PAINTING ON GLASS.

There are three principal modes of oil-painting on glass, as follows:

Non-Transparent Painting on Transparent Glass. In this mode the materials are the same, and the method the same, except in one particular, as that employed in painting on the front of mirrors. The sole particular in which it differs from this kind of mirror painting is this: it must be much less transparent in the shadows and half tints, for the reason that it has no silver foil or ground; the paint, therefore, must have sufficient body in every part to prevent anything dark or bright behind from being visible through it, and thus affecting the coloring. This mode is much used for decorating unsilvered plates of glass to be inserted as panels in screens. As, however, the back of the screen is not covered in the usual way, if both sides are likely to be seen, and it be found desirable to hide the unpleasant appearance of the back of the painting, this can only be done by repainting on the back of the glass the subject on the front.

The outlines must be made to coincide with those showing through and a study of the subject should be used to fill in within the outlines, but less finish will usually suffice.

Transparent Painting on Transparent Glass. This kind of painting is applied to windows, magic-lantern slides, etc.

Mirror-Painting on the Back of the Glass. This style of painting may be done either before or after the silvering. The former is the usual course, because simpler and less toilsome. In this case it is of the first importance that the outlines, or rather the boundaries, should be rendered sharp and true and with a good body of color, otherwise their ragged or blurred edges will be emphasized by the subsequent silvering.

The chief difficulty in painting on the back of the glass is to calculate the effect each touch will have when viewed in front. On so viewing his touches the artist will often be surprised at the discordancy they present, though he may have calculated their relative effect very carefully. There is no expedient that will materially lessen this difficulty. All that can be done is to register, so to speak, the value of the transparent, and the solidity of the opaque couches of paint, by placing a sheet of white paper behind the former, and a sheet of black paper behind the latter.

The colors that are more or less transparent must be applied at the outset, but they will only appear as such and of their proper tint and hue when opaque paint is spread over them. Of course, the transparent colors must not be reserved for final glazing, the whole process of ordinary painting being reversed, the last strokes of the latter having to be the first strokes of painting on the back of a mirror.

As the face of the paint must be as smooth as the polished surface to which it clings, texture, for the representation of the surfaces of objects, can only be obtained by means less direct, for the most part, than those available for other applications of oil-painting. When using transparent colors, and texture be required, they must be applied in a broken manner, and when using opaque colors for the same purpose they should be spread thinly, then scraped, and other tints or hues passed over them so as to show between the interstices of the scraping, according to the requirements.

When the work is otherwise complete a solid coat of white should be spread over the whole, and when this is dry a thick coat of Brunswick black. The first will prevent the second from showing through, as it might to the great detriment of the coloring. Brunswick black is used as the overcoat, because it effectually protects the painting proper from injury by the subsequent silvering.

If the plate is already silvered a separate study should be made and the outlines of this study traced on the back of the silvering. This being done, the portion of the silvering that the painting must occupy is etched away by a scalpel or other sharp blade, taking care not to scratch the glass. The etching may be effected and outlines obtained without much trouble if the silvering has been done by the mercurial process. But it is not so with the modern silvering, this being covered with a coat of hard varnish-paint that is almost impossible to remove without leaving ragged edges. Only for a large plate to be viewed at a distance should it be attempted, and then, so great is the labor involved, it would generally prove more economical to exchange the plate for a new one unsilvered.

All painting on the back of mirrors has, however, inevitable defects, which are apt to prove somewhat antipathetic to artists. Its difficulties, while augmenting the cost to the purchaser, preclude commensurate results. For the reason that the painter cannot see the progress of his work with the usual facility, the coloring can hardly be very harmonious. To mix each first touch of paint to the required hue or tint and lay it on at once in the right place is not easy to an experienced artist, but the difficulty is enormously increased when the work has to be turned to ascertain how the last touch behaves relatively to all those which preceded it. The coloring must also be comparatively dead, owing to the opaque ground. The painting can hardly appear other than flat and monotonously smooth, or with little spirit of handling, or touch, descriptive of texture and expression of light. And, although by this method there are no reflections from edges of the painting when the mirror is viewed at an angle, yet the painting is obscured by reflections from the surface of the glass before it, as well as lowered in brilliancy by the thickness and any greenness of the glass.

PAINTING A BATH TUB.

The method for painting an ordinary room is the plan which is followed in most cases of painting. The method of painting a bath tub, however, is an entirely different one. The wear and tear of an ordinary bath tub is very great; the heat of the water is in itself very trying to any paint or enamel, especially when, as often happens, the water is allowed to enter the bath in a nearly boiling state, there to mingle with the colder water. It will be a hint of value to know that the hotter the water the greater is the wear and tear on the paint material, and this whether the bath tub is of the highest quality or is of a cheaper make. But apart from the heat of the water, the soap and grease which abounds in the bath room is in itself a means of destruction to the paint. In renovating an old bath tub, the proper plan would be to have it taken out and sent to an enamelling firm, who paint it in a special manner and with a special paint, which is known as baking enamel. This is a description of paint specially made for articles to be placed in a stove of high heat whence the enamel is greatly hardened. The trouble and expense, however, of taking a bath tub out and sending it away in this manner is very great and many, therefore, prefer to paint their own bath tubs, if even they have to repeat the operations every spring.

The first thing to be done is to thoroughly clean the surface and this, as in all operations of repainting, is very important. At the risk of being tedious the necessity of getting every portion of the surface absolutely clean before the paint is applied must be emphasized, and in this case it must be added absolutely dry also. Sometimes the faucets of the bath tub leak a little; if so this must be stopped before the repainting is commenced, otherwise the job is hopeless. The best way of cleaning a bath tub is to first thoroughly scrub with soap and water, using hot water and plenty of elbow grease; any ordinary pure soap answers the purpose. The next thing is to rinse freely with cold water with a sponge or cloth, but even this, as a rule, does not remove all the grease, and a further operation is necessary to the same end of scrubbing with powdered pumice stone and water. A small scrubbing brush is moistened with water and dipped in the dry pumice stone and then the surface is rubbed over briskly so as to literally grind off any dirt or grease which may remain. A thorough sluicing with cold water completes the process and the bath tub is, when dry, ready for the first coat of paint. If time is limited a clean cloth may be used to wipe off the water from the surface, but it is better to let the work remain for 24 hours until it is thoroughly dry.

Sometimes it will be found that the previous coats of paint have chipped off in places; in that case, if a really nice finish is required, it will be necessary to remove all the paint and start from the iron, and that is a long and tedious process.

The paint to be mixed for this job is either white lead or zinc white, thinned with turpentine only, that is without oil, but with the addition of a tablespoonful of gold size. This paint should be somewhat thin and it will dry without gloss. It is called by painters, sharp color. The advantage it possesses is that it forms a very thin coat, much thinner than ordinary oil paint, and it may, therefore, be applied much quicker, and being thin it is less likely to shrivel or crack under the influence of hot water. If it is desired to tint the paint this can readily be done by adding a little of the color required. For instance, sea green can be made by adding a little light Brunswick green and a little raw sienna to the white lead or zinc white. As a rule bath tubs look best a very light color. A light pink looks well, and so does a light blue.

An ordinary paint brush will be used and care must be taken not to miss any small parts, and not to apply the paint too thick; a very thin, even coat is what is to be aimed at. The coat of paint will dry in an hour, but it is better to leave it for 8 or 10 hours before applying the second coat. A good plan, if the weather is dry, is to apply one coat early in the morning and the second at night. If the paint shows any signs of roughness it may be lightly rubbed over with very fine sandpaper. In that case the bath tub must be dusted out before a second coat is applied. As a rule three coats will be ample and two will usually suffice. If the paint is properly mixed and properly applied there will be no difficulty in determining when the surface has received a sufficient number of coats; that point will be reached when the tub is quite uniform in appearance. The beginner will be likely to view the work, however, at this stage with some doubt, owing to the unfamiliar appearance of the flat surface, without gloss. Persons have abandoned the work at this stage under the impression that the unfamiliar appearance looked too much like whitewash. However, this appearance is quite what might be expected, but it will quickly be removed by the next process which is that of applying a coat of varnish.

Now it must be very distinctly understood that ordinary varnish, even of the best quality, is useless for painting a bath tub. It must be special bath varnish, or one made specially for resisting hot water. There should not be any difficulty in getting a bath varnish at any good painters' supply house. Most of the best varnish firms manufacture excellent bath tub varnishes, which may be absolutely relied upon, and as the quantity required for an ordinary bath tub is but very small, the cost is nominal.

In applying the varnish it should be remembered that a thin coat only is required, and it is far better to give a second coat after the first coat is dry if a high degree of brilliancy is required than it is to apply a thick coat at one operation. Dip just the point of the brush in the varnish. Use the brush lightly first one way and then the other, finally drawing it lightly in one direction to smooth out the brush marks.

Another little point which seems so obvious as to be hardly worth mentioning is to take care that every part of the surface is reached by the varnishing brush. To ensure this is much more difficult than would appear at first sight, because the varnish is almost colorless, and when one looks directly at the surface it is almost impossible to see which part is varnished and which is not. It is easy, therefore, to skip a small portion of the surface without noticing it. The only way to provide against this is every now and then to look at the surface from a point at which the light reflects when the lines between the varnished and unvarnished surface will be readily discerned.

PAINTING IN DISTEMPER.

This mode of coloring, which, when applied to fine art purposes, is termed tempera painting, is undoubtedly the most ancient, and derives its name from the fact that colors are mixed or tempered with some liquid or medium to bind their separate particles to each other, and to the surface on which the paint is applied.

The Italian noun tempera admits of the widest application, and would include any medium, even oil; but, in its restricted and proper acceptation, it means a vehicle in which the yolk of egg, beaten sometimes with the white, is the chief ingredient, diluted as required with the milky juices expressed from the shoots of the fig-tree. This is the painting strictly termed a nuovo by the Italians. Vinegar probably replaced the fig-tree juice among the northern artists, from the difficulty of obtaining the latter, and in modern use vinegar is substituted. Vinegar should be used to prevent the putrefaction of the yolk of egg, but the early Italian painters preferred the egg vehicle when it had been suffered to stand until it had become decomposed, hence the phrase "a putrido."

The artist is often compelled to have recourse to very offensive media to make known his most refined revelations. On walls, and for coarser work, such as painting on linen, warm size was occasionally used, but the egg vehicle, undiluted, was generally preferred for altar-pieces on wood. For various purposes, and at different periods, however, milk, beer, wine and media composed of water, and more or less glutinous ingredients, soluble at first in water, such as gums, have also been used. Such are the media or vehicles described by the chief Italian writers, as used in the days of Cimabue, Giotto and Fra Angelico, and by the early painters before the invention and improvement of oil painting. The finer egg tempera in dry climates has been found to attain so firm a consistence as to withstand ordinary solvents. The use of wine in diluting these glutinous vehicles was common for a long period. Buffalmacco, of whom so many humorous stories are told by Boccaccio and Vasari, is related to have persuaded some nuns, for whom he painted, to supply him with their choicest wine, ostensibly for the purpose of diluting the colors, but really to be imbibed by the thirsty painter himself. The northern artists were sometimes compelled to content themselves with beer. In the works of the northern tempera painters there are, however, very marked differences observable in the impasto or body of colors. It is certain, therefore, that these painters employed media of different degrees of consistency. In the distemper of scene-painting, the medium is weak size of glue, but plaster of paris, sufficiently diluted, is worked with the colors. The carbonate of lime, or whiting, is less active as a basis for colors than the pure lime of fresco, but it is entirely destructive of transparency. When the more viscid media were employed by the tempera painters, the effect must, with their purer use of the colors, some of which were, moreover, transparent, have been very lustrous and powerful in comparison with modern scene-painters' distemper, and these qualities were heightened by the addition of a strong varnish; still, however, tempera fell far short of oil painting in richness and transparency.

The carbonate of lime, or whiting, employed as a basis is, however, less active than the pure lime of fresco. The vehicles of both modes are the same, and their practice is often combined in the same work. Water is their common vehicle, and to give adhesion to the tints and colors in distemper painting, and make them keep their place, they are variously mixed with the size of glue, prepared commonly by dissolving about 4 ounces of glue in a gallon of water. Too much of the glue disposes the painting to crack and peel from the ground, while with too little it is friable and deficient of strength. In some cases glue may be abated, or altogether dispensed with, by employing plaster of paris sufficiently diluted and worked into the colors, by which they will acquire the consistency and appearance of oil painting, without employing their limpidness or allowing the colors to separate, while they will acquire a good surface, and keep their place in the dry with the strength of fresco, and without being liable to mildew, to which animal glue is disposed, and to which milk, and other vehicles recommended in this mode, are also subject.

There can be no doubt that distempering has its manifold advantages, and that when well done it possesses a degree of clearness and brightness, especially in white, pink, blue and lilac, which is not attainable in oil colors, owing to the admixture of the various oils, and to the changes likely to occur in them subsequent to the application of the colors.

A fruitful cause of failure in distemper work is the neglect of proper precaution in preparing the surfaces to be colored, the great point at starting, assuming that the wall has been well smoothed, or if necessary scraped, in order that the surface may present no roughness or inequalities whatever. The first stage is but seldom attended to by painters, who assume that the plasterer, as a matter of course, leaves the wall properly finished, but this must not always be taken for granted. At all events even if the work has been carried as far as it is the plasterer's duty to take it, there is no reason why the next stage should not be considered to belong to the painter, who is so well aware of the conditions on which a good result to his work depends.

The process consists in this, the plasterers having left the walls, the painters take them in hand. With a bucket of water, a sponge, a rag, and a slab of wood, 6 inches broad and 7 or 8 inches long, on the back of which a handle made of leather is placed, and it must be mentioned that the wood is cut crosswise, each board being, as it were, a slice of a tree. The workman wets the wall with his sponge, and applies his wood brush, for this the instrument practically becomes, since the ends of the fibers, directed towards the wall, act like so many closely packed hairs.

The wood brush is rapidly worked in a circular direction, the wall being kept moistened with the sponge, and finally the surface is washed clean and well rubbed with the cloth, and then allowed to become thoroughly dry. A smooth surface is thus produced, and the next process is to stop the absorbent properties of the plaster, and here the process ends. The mixture used in this country is thoroughly well adapted for its purpose, and is compounded in the following manner:

Saturate about 12 pounds of best whiting with water, and beat it up, with a constant addition of water, until the mixture assumes the consistency of a soft paste. Add sufficient size to bind the color, 2 ounces of alum and 2 ounces of soft soap, each dissolved in water. Mix all these ingredients thoroughly well, and strain through a coarse cloth or metal strainer. Care should be taken that too much size is not used, in fact, rather than use the mixture altogether too strong, it is preferable to give two coats of medium consistency, which, in effect, are better than a single thick one. If the wall is known to be damp, no amount of care, and no application on the one side of a wall, will keep it dry if it is pervious to moisture on the other or from below. The source of the evil must be sought for, and efforts should, in the first place, be applied to the removal of the cause rather than to ameliorating the injurious effects.

The first and most general application of distempering is the process known as calcimining. In commencing to calcimine, the walls should be prepared as described above, but, of course, if they have been colored before, they will merely require washing with clean water, scraping smooth the rough patches, the cracks being stopped and made good, the whole being then passed over with the wood brush. Care should be taken that all the scrapings and other débris are swept away before the walls are finally rubbed down with a cloth and the coloring is commenced. The calcimine is made by mixing whiting, which has previously been allowed to soak for twelve or fourteen hours in water, to about the consistency of cream, care being observed that the mixture is very smooth. One teacupful of size is then to be added to two gallons of the whitewash, or, if a perfectly white wash is required, potato starch may be used. In laying on the wash, a large flat brush is employed, and, if this is not overcharged, a ceiling or walls may, with a certain amount of care, be white or color washed with little or no splashing.

The following mixture will be found useful for common work: ½ bushel of lime, 1 pound common salt, ½ pound of sulphate of zinc, and 1 gallon of sweet milk.

For brickwork exposed to damp: ½ peck of fresh well-burnt lime, with water sufficient to make it into a thin paste, pass through a fine sieve, add a gallon of clear salt which has been dissolved in boiling water. Make a thin paste of 1 pound of rice flour and ¼ pound of best glue, mix this paste, whilst hot, with the previously made compound, and add ¼ pound of Spanish whiting dissolved in 1 quart of water. Stir all well together, cover over, and let the whole stand for a week, when it is to be applied whilst quite hot.

In order to produce good work, two things are essentially necessary in the mixing of the distemper, namely, clean and well-washed whiting and pure-jellied size. The whiting should be put in to soak with sufficient soft water to cover it well and penetrate its bulk. When the whiting is sufficiently soaked, the water should be poured off, which will remove any rust or foreign matter from the whiting, it should then be beaten up or stirred until all the lumps are broken, and it becomes a stiff, smooth paste. A good workman will do this carefully with his hand, and will manipulate it until it is quite smooth, but it may be done most effectually with a broad stick or spatula, and then strained through a metal or other strainer. The size should now be added, and the two lightly but effectually mixed together. Care should be taken not to break the jelly of the size any more than can be avoided, and this may be best done by gently stirring the mixture with the hand. If the jellied state is retained intact, the color will work cool, and lay on smooth and level. The size, whether made of parchment clippings, glue, or any other material, should be dissolved in a sufficient quantity of water to form a weak jelly when cold. In practice we find that distemper mixed with jellied size will lay on better and make a better job than when the size is used hot. Color mixed on the former plan works cool and floats nicely, while the latter works dry, and drags and gathers, thus making a rough ceiling or wall, and the difference in the labor required is very much in favor of jellied size. A little alum added to the distemper has a good effect in hardening, and helps it to dry out solid and even.

In distemper painting, or, as it is more frequently called, calcimining, the base generally used for all the tints is the finest whiting, which is prepared in large quantities by various manufacturers. All the colors should either be ground very fine, or should be washed over, so as to ensure the most minute division of their particles.

It will require two coats, and sometimes more, of any of the tints to cover plaster well, and to bear out with absolute uniformity. When old plastering has become disfigured by stains, it is necessary, in the first place, to properly scrape and prepare the wall, and then to give it one or two coats of white lead ground in oil, the second being mixed with an additional quantity of turpentine, this, if well and sufficiently done, will cover all the stains, and will take the size colors very kindly.

In order to produce an absolutely level tint in distemper, great care should be exercised in carrying on the work. Whilst the color is being laid on, the windows and doors should be closed, and all draughts prevented, so that the wash may not dry too quickly, in which case the brush drags, and all piecings or brush marks will show when quite dry, but the moment the work is finished, all windows and doors are to be opened, in order to afford free ingress to the fresh air, for the moment the whole of the color is laid on, the sooner it dries the better. In order to ensure uniformity in drying, and to avoid parts becoming shady, the wash must be laid on evenly, and when the ground is once covered, no portion of it should be retouched, for such portion would then receive an additional coat, and would without fail present a more solid and brighter appearance than the rest, at the same time there is every chance that the brush, passing over the half-dry or partially set color underneath, would rub up some of it, and cause a rough appearance, whilst the edges of the retouched part would be visible, giving the idea of a patch having been applied over the spot.

The colors of which the various tints are to be composed should be ground up separately, and should be carefully added to the white body. As far as can be calculated, as much of any particular tint as may be required for one room or job should be compounded at once, to avoid the trouble of matching. Powder color should never be added to the body white. If only a small quantity of any additional color is required, it should be well ground on a slab, and taken on the point of the palette knife, or at the end of a stick, and thus mixed with the general mass. Where this is not done, the white gathers around each separate particle of the powder color, making a minute ball, with a colored center and as it were a white shell, a number of these become agglutinated. The inexperienced workman thinks the color is well mixed, because he has, during mixing, lost sight of the particles of color, but when he comes to spread the wash on the wall, the dark specks emerge from their temporary cases, and, as they are dragged along by the brush, cause lines and streaks of more or less breadth, according to the number of particles which have been bound together. These may not perhaps be noticed whilst the color is wet, but will soon appear as it dries, and the evil result will not be in appearance only, for as these specks of color have not been bound by the size with which the whole mass has been mixed, the spots and streaks caused by them will rub off, leaving the original color of the plaster, or of the previous wash, visible. Sometimes, too, when the powder color is of a heavier character than the mass, it finds its way to the bottom of the bucket or pot, and when the quantity is nearly used, the last part of it will be found to become gradually darker than that previously used, whilst if the brush be allowed to touch the bottom, it will bring up a quantity of dark color which will be deposited with the first stroke on the wall.

Great care must be taken in mixing tints, for some colors, such as Prussian blue, are so strong that a very little of them will produce the desired effect, and thus, if they are used without consideration, it becomes necessary to add more and more white, a greater quantity of the tint required is compounded, and waste results. The safer plan is to mix a small quantity of the tint in a jar or on a piece of glass, and, having spread this on a piece of paper, the painter will be able, when it is dry, to judge of the shade, and to form an idea as to the relative qualities of the different colors required. Other colors again, such as orange lead, are of such density, that they will separate from the others and sink to the bottom, and therefore tints compounded with these must be worked in a size jelly, this, too, will be learnt by trial and experience.

Nearly all of the colors given herewith may be used in either oil or distemper painting, the white, in the one case, being white lead, diluted with oil and turpentine, and, in the other, whiting mixed with size.

STRAW COLOR.

White lead, Massicot (in oil).
Whiting, Dutch pink (in distemper).
Whiting, Chrome yellow.

LAVENDER, LILAC, AND FRENCH GRAYS.

Produced according to the predominance of white, blue or red.

White, Lake, Indigo.
 ,, Lake, Prussian blue.
 ,, Indian Red, Prussian blue.
 ,, Vermilion, Prussian blue.
 ,, Indigo, Rose pink.

PEARL GRAY.

White, Black, Prussian blue.

GRAY TINTS. (Of a blue hue.)

White, Verditer.
 ,, Blue black.
 ,, Lamp black.
 ,, Indigo.

GRAY TINTS. (Of a brown hue.)

White, Madder brown, Prussian blue.
 ,, Madder brown, Prussian blue, Yellow ochre.
 ,, Indian red, Indigo.
 ,, Light red, Prussian blue.
 ,, Burnt sienna, Lake, Indigo.

BROWN TINTS.

White, Lake, Prussian blue, Yellow ochre.
" Lake, Indigo, Yellow ochre.
" Raw sienna, Madder lake, Prussian blue.
" Light red, Indigo.
" Vandyke brown, Lake, Indigo.
" Burnt sienna, Indigo.
" Burnt sienna, Lake.

GREEN TINTS.

White, Italian pink, Antwerp blue.
" Italian pink, Prussian blue.
" Yellow ochre, Indigo.
" Burnt sienna, Indigo.
" Brown pink, Indigo.
" Raw umber, Indigo.

PEA GREEN.

White, French green.
" Olympian green.
" Brunswick green.
" Prussian blue, Chrome yellow.

SAGE GREEN.

White, Prussian blue, Raw umber.
" Antwerp blue, Stone ochre.

OLIVE GREEN.

White, Raw umber, Prussian blue.

ORANGE TINTS.

White, French yellow.
" Orange lead.
" Dutch pink.
" Chrome yellow, Vermilion.

PINK TINTS.

White, Rose pink.
" Crimson lake.
" Scarlet lake.

SALMON COLOR.

White, Venetian red.
" Vermilion.

PEACH TINTS.

White, Vermilion, Indian red, Purple brown.
" Vermilion, Indian red, Purple brown, Burnt stone ochre.

VIOLET TINTS.

White, Vermilion, Prussian blue, Lamp black.

CHOCOLATE.

White, Spanish brown, Venetian red, Vegetable black.

SKY BLUE.

White, Prussian blue.

FLESH TINT.

White, Light red, Yellow ochre.
" Lake, Vermilion, Naples yellow.

FAWN.

White, Burnt sienna.
" Burnt umber, Venetian red
" Stone ochre, Vermilion.

BUFF.

White, Yellow ochre, Venetian red.

Cream-color is produced by a great preponderance of white.

DRAB AND STONE COLOR.

White, Burnt umber.
" Raw umber.
" Yellow ochre.
" Yellow ochre, Lamp black.
" Raw umber, Lamp black.

LEAD COLOR.

White, Black.
" Black, Indigo.

It must of course be understood that the colors are not to be mixed in equal quantities, but in such proportions as will produce the required hue, the slightest predominance of any one of the pigments gives the prevailing tone of the tints, whilst the addition of a further quantity of white produces all the numerous gradations, from lavender and lilac to French gray.

All colors in distemper are lighter when dry than they appear in a wet condition.

White is the basis of all tints, and is necessary in compounding the endless variety of pale colors required by the painter and decorator. Thus, white tinted with blue affords Paris white, French grays, silver grays, while among the red tints we have pink, carnation, coquilicot, and yellow with white gives primrose, straw-color and Isabella. To the colors compounded more or less with white we owe the innumerable tints of lilac, lavender, peach blossom, pea green and sage green, as shown in the preceding list of tints.

The painter is advised to mix the tints in different hues, giving in each experiment a predominance to one or other of the component colors.

A number of the tools used by a paperhanger are shown in the following illustrations.

Two styles of shears used by a paperhanger are shown in Fig. 38.

Paperhanger's paste brushes are shown in Figs. 39 and 40.

A paperhanger's smoothing brush is shown in Fig. 41 and a combined smoothing brush and roller in Fig. 42.

The felt smoothing rollers as shown in Fig. 43 are made of a number of specially prepared felt coils 2½ inches in

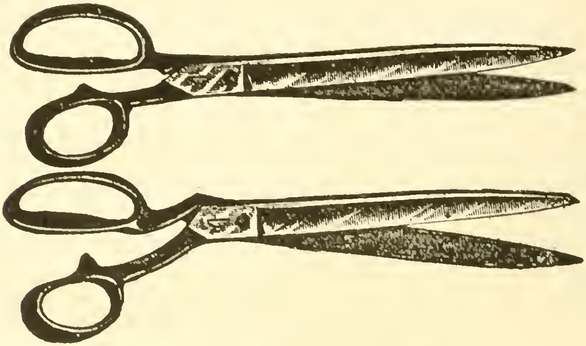


Fig. 38. Paperhanger's Shears.

diameter, which can be tightened or loosed at will. The rollers are seamless and very resilient. They can be used equally as well on rough as on smooth walls; they do not need re-covering and can be easily cleaned. They can be used for stippling paint or paper, or stenciling in oil or water colors.

The smoothing roller shown in Fig. 44 is made with a foundation of six-ply Canton flannel and a detachable cambric cover, held in place by removable ferrules, so that it may be easily replaced.

The wall paper trimmer shown in Fig. 45 has roller

Fig. 39. Paperhanger's Paste Brush.

bearings. This reduces the friction of the trimmer to a minimum, enabling the operator to manipulate it back and

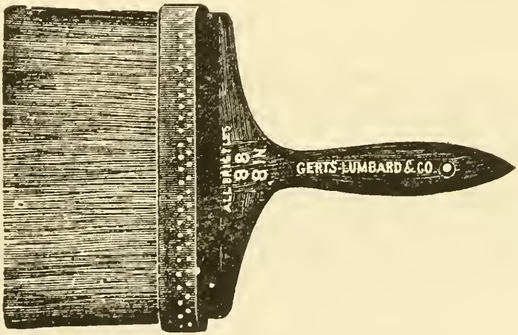


Fig. 40. Paperhanger's Paste Brush.

forth on the edge of the straight edge with scarcely any effort.

The graduating plumb and level shown in Fig. 46 is made of highly polished brass and will fit any trimmer straight edge without the manipulation of screws by means of the spring shown in the drawing. Any graduation for panel or relief work is obtained instantly by moving the pointer, which re-

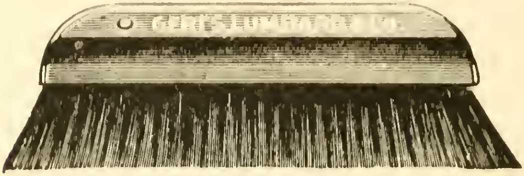


Fig. 41. Paperhanger's Smoothing Brush.

mains rigidly at degree of angle desired. By moving the pointer to 90 degrees, it can be ascertained how much the ceiling is out of level.

The paper trimmer shown in Fig. 47 has reversible cut and automatic shifting relief for the cutters. It has feed

Fig. 42. Combined Smoothing Brush and Roller.

guides on both sides of the paper and trims 18-inch length at each turn of the crank. The rollers in this machine are of hollow composite construction, and will not warp by reason of change of climate or temperature.

The paperhanger's pasting table, shown in Fig. 48, is made from the best selected and seasoned basswood. The

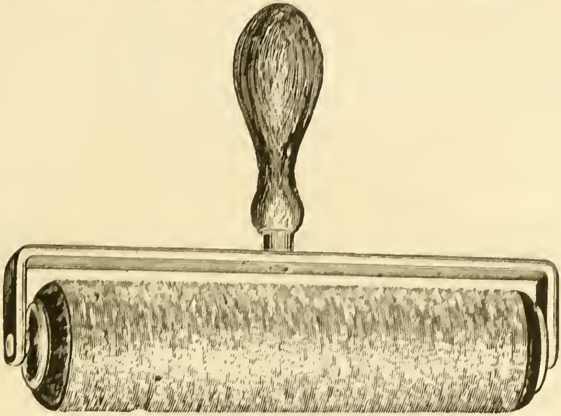


Fig. 43. Smoothing Roller.

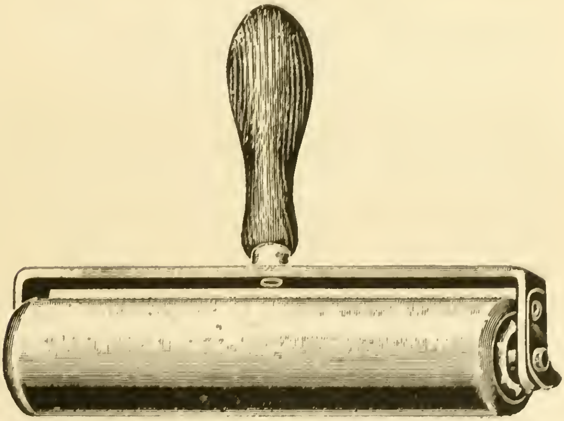


Fig. 44. Smoothing Roller.

top is mode of four pieces, tongued, grooved and glued. The legs are riveted in galvanized iron boxes. The top folds, enclosing the legs, and has a space inside for straight edge and tools.

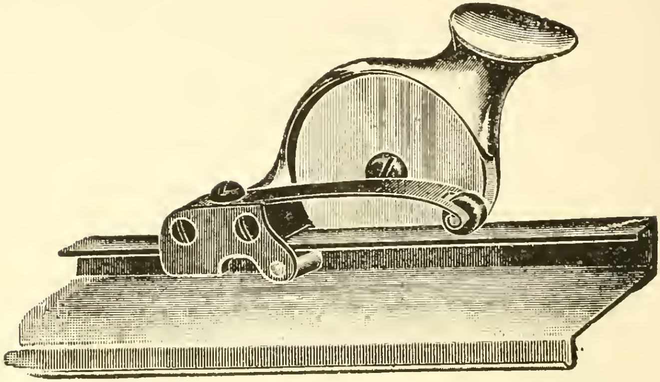


Fig. 45. Vall Paper Trimmer.

Paperhangers' knives are shown in Fig. 49: A—Polished blade, maple handle, natural wood, closed ferrule. B—

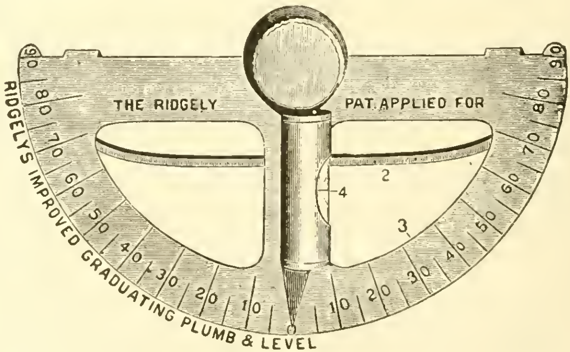


Fig. 46. Graduating Plumb and Level.

Blade tempered and polished, maple handle, shellac finish, closed ferrule. C—Tempered and polished steel blade, stain finish maple handle, closed ferrule. D—Blade tempered and polished steel blade, beech wood handle, natural finish, open ferrule.

Paperhangers' seam rollers are shown in Figs. 50, 51 and 52: A—Polished oval maple roller. B—Rubber-covered roller. C—Polished maple roller, oval or flat face. D—Rub-

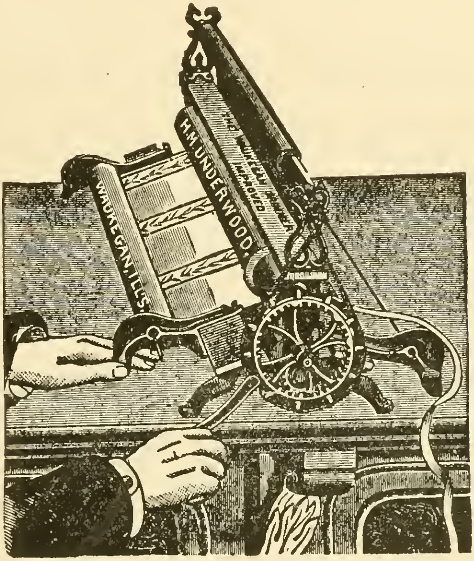


Fig. 47. Wall Paper Trimmer.

ber-covered roller. E—Oval rosewood or lignum vitae roller. F—Flat rosewood or lignum vitae roller. G—Side arm roller, flat or bevel face. H—Corrugated rubber face, hardwood core. J—Side arm roller, celluloid covered. K—Double arm roller, celluloid covered, oval face. L—Double arm roller, celluloid covered, flat face. M—Solid zylonite ivory seam roller, for feather edge work.

Paperhangers' wheel knives are shown in Figs. 53 and 54: A—Short bevel, steel bracket, plain or saw-tooth blade.

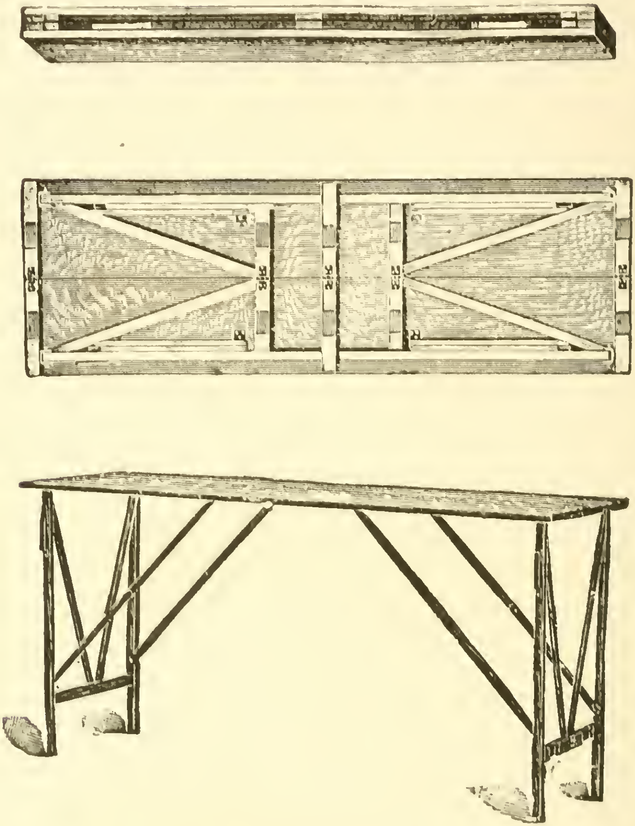


Fig. 48. Paperhanger's Table.

B—Short bevel, malleable iron handle, serrated, plain or saw-tooth blade. C—Double arm, steel bracket, saw-tooth,

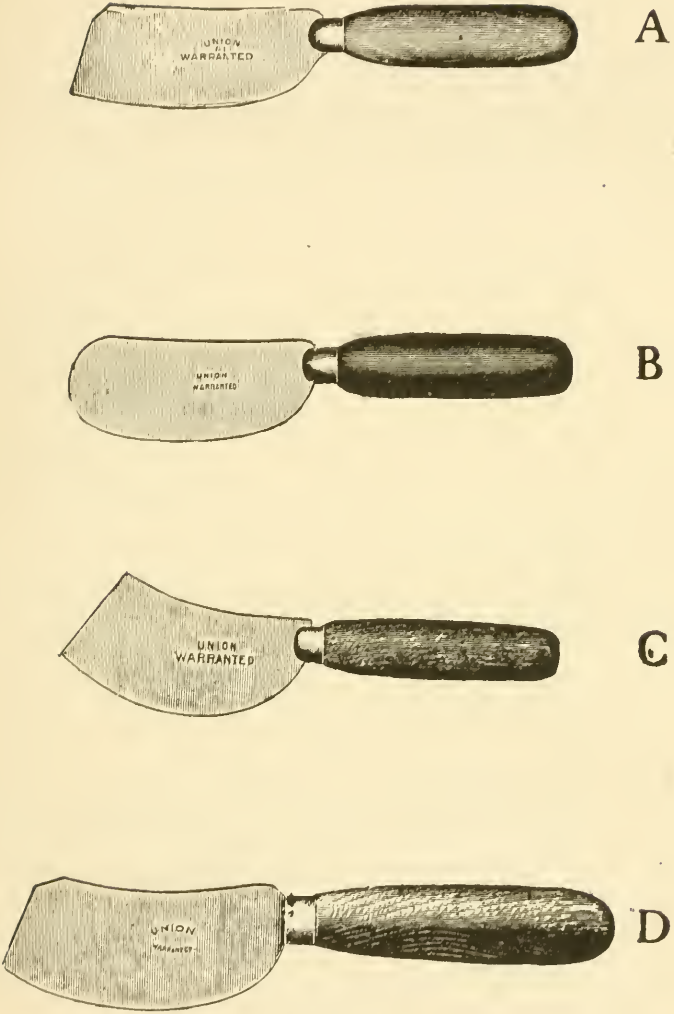


Fig. 49. Paperhanger's Knives.

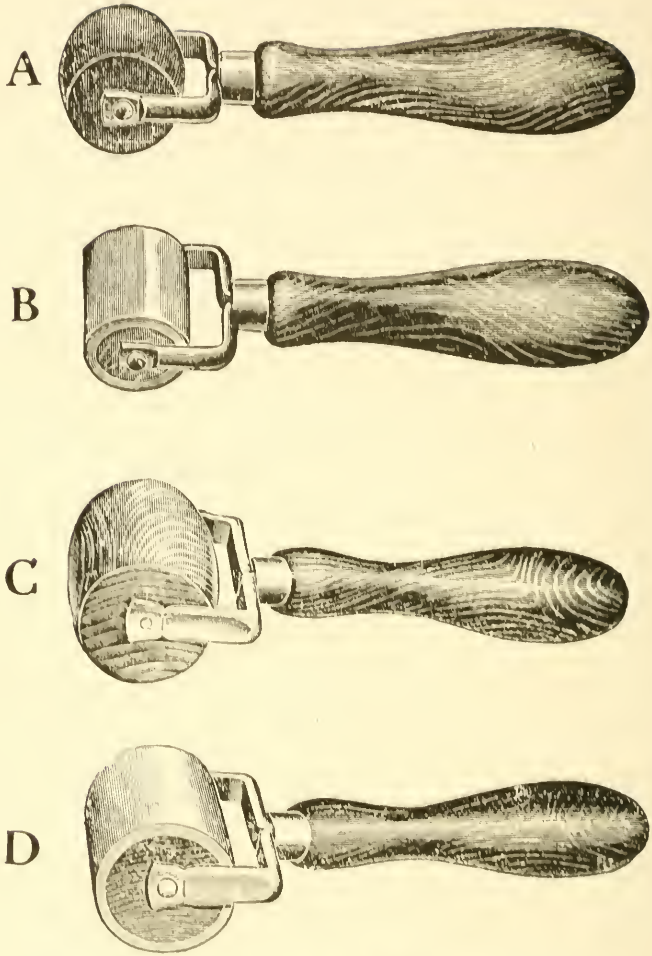
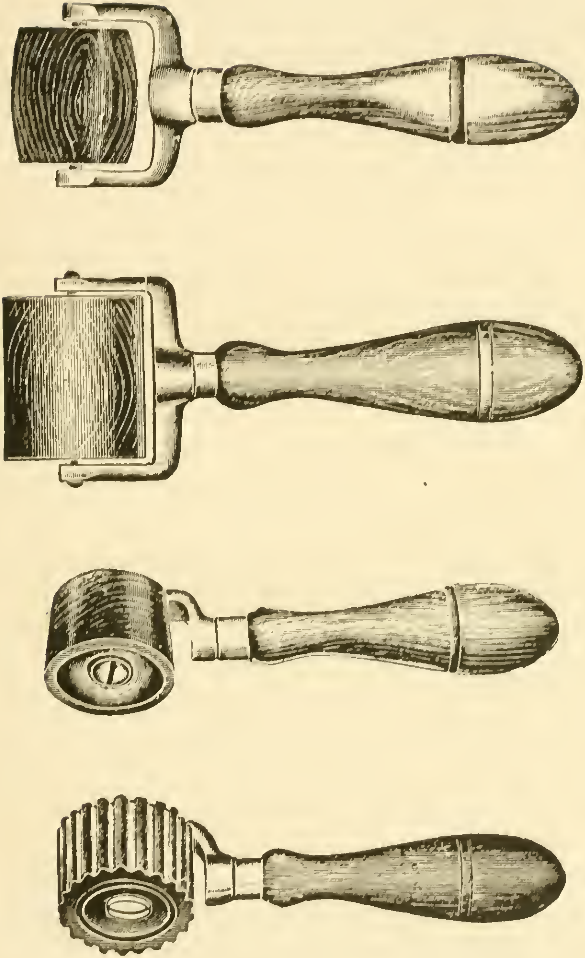


Fig. 50. Paperhanger's Seam Rollers.



E

F

G

H

Fig. 51. Paperhanger's Seam Rollers.

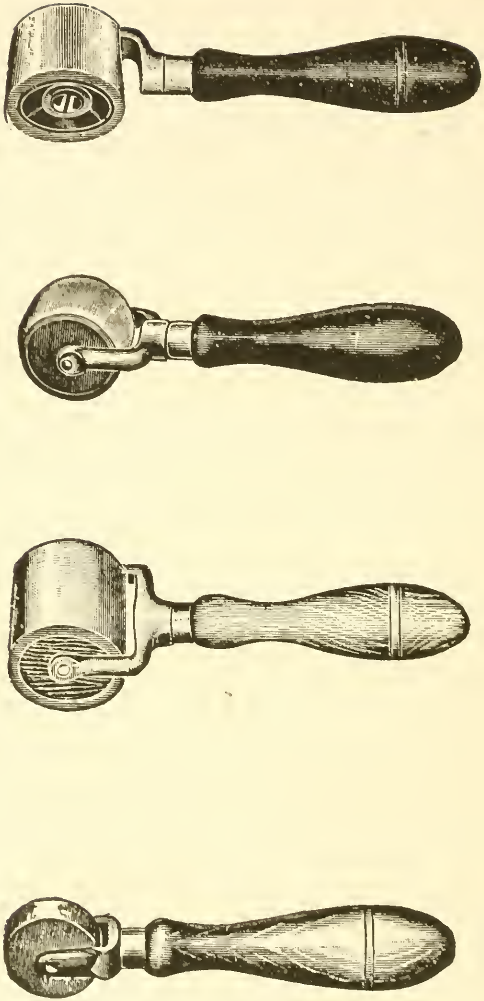


Fig. 52. Paperhanger's Seam Rollers.

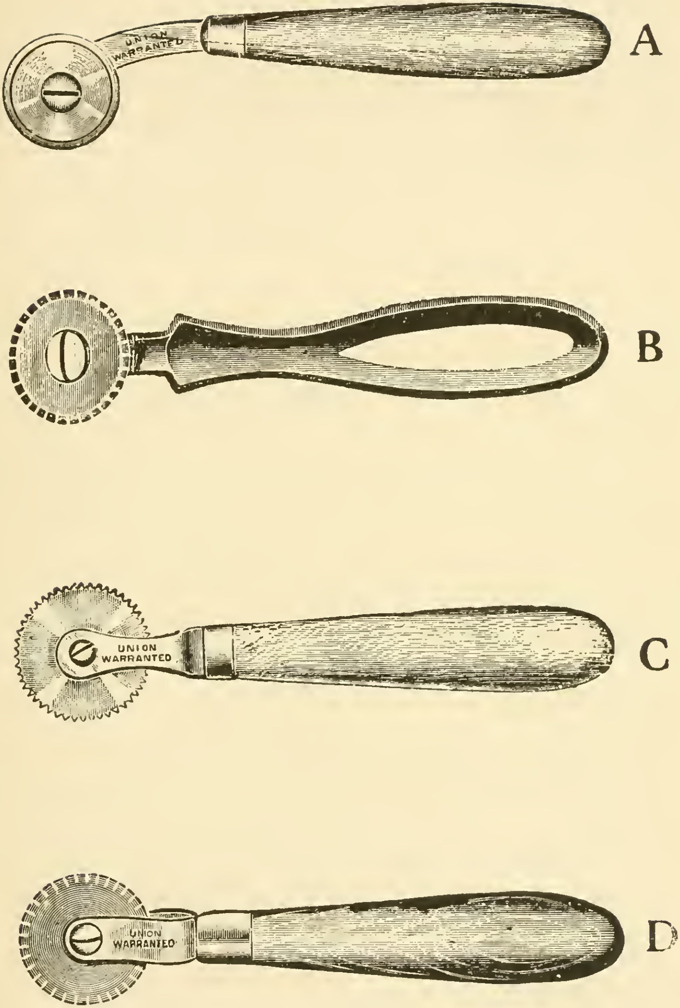


Fig. 53. Paperhanger's Wheel Knives.

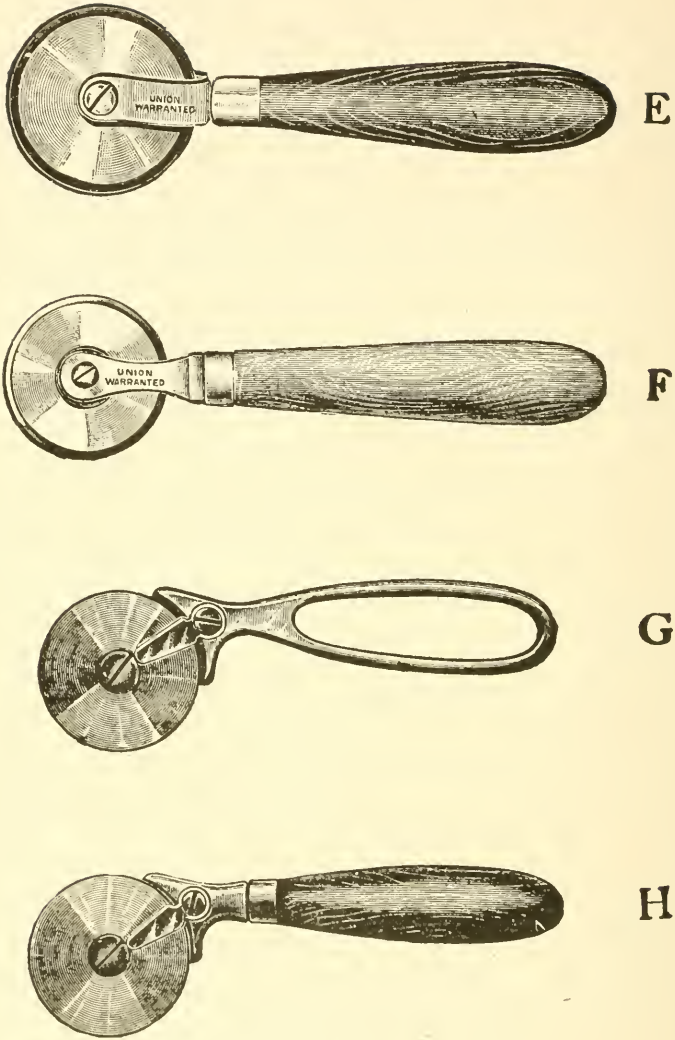


Fig. 54. Paperhanger's Wheel Knives.

serrated or plain blade. D—Bevelled both sides, steel bracket, serrated blade. E—Short bevel, double arm bracket,

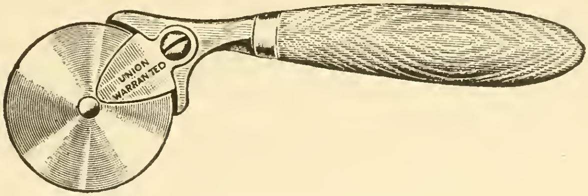


Fig. 55. Paperhanger's Wheel Knife.

et, plain blade. F—Short bevel, washers both sides, steel bracket, plain blade. G—Short bevel, malleable iron handle,

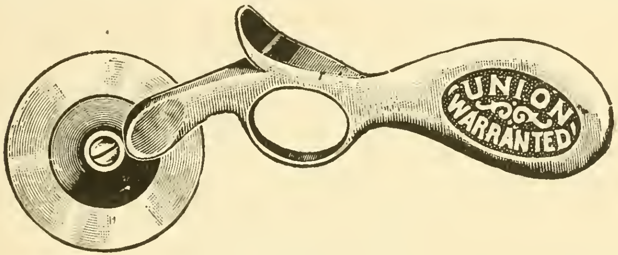


Fig. 56. Paperhanger's Wheel Knife.

paste cleaner attachment. H—Short bevel, polished handle, paste cleaner attachment.

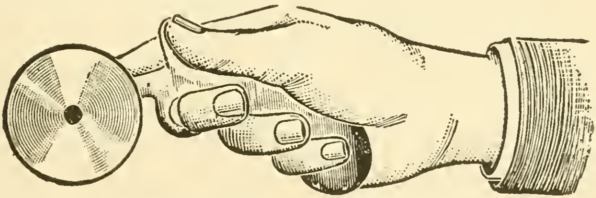


Fig. 57. Paperhanger's Wheel Knife.

The wheel knife shown in Fig. 55 has a bevel on both sides and blade made with an arbor revolving in the socket, paste cleaner attachment and rosewood handle.

Fig. 56 shows a wheel knife with steel blade ground without a bevel. It makes a clean cut without crushing the edge of the paper. The handle is said to fit the hand per-

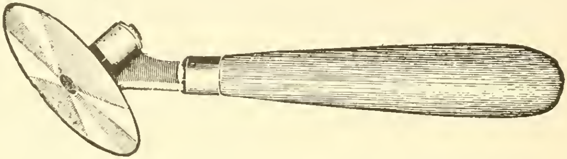


Fig. 58. Paperhanger's Wheel Knife.

fectly. Fig. 57 shows the position of the wheel knife in the hand when in use. The wheel knife shown in Fig. 58 has a short bevel, off-set steel bracket and maple handle.

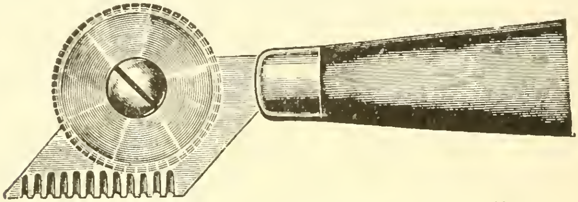


Fig. 59. Combination Casing and Corner Knife.

It may be used on any depth straight edge, as it works on a long axle.

Fig. 59 shows a combination casing and corner knife. It has a cutter with a short bevel, serrated edge. It is

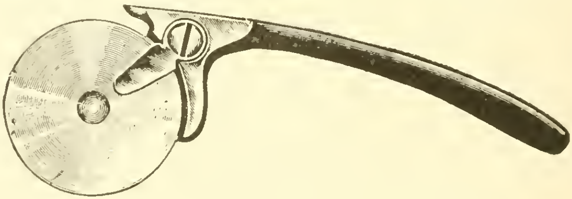


Fig. 60. Wheel Knife with Paste Cleaner.

especially adapted for ceiling work. The knife has a fluted edge, so that it will not tear the paper.

The wheel knife shown in Fig. 60 has a short bevel, malleable iron handle and paste cleaner attachment.

PAINTERS' TOOLS.

Painters' scrapers are shown in Fig. 61: A—Clipped point, metal bolster, cocabola wood handle. B—Square point, metal bolster, cocabola handle. C—Clipped point, steel ferrule, half elastic. D—Square point, flat cocabola handle, two rivets, half elastic.

Painters' putty knives are shown in Fig. 62: A—Beech-wood handle, open ferrule. B—Burnt wood handle, open ferrule. C—Burnt wood handle, closed ferrule. D—Flat beech wood handle.

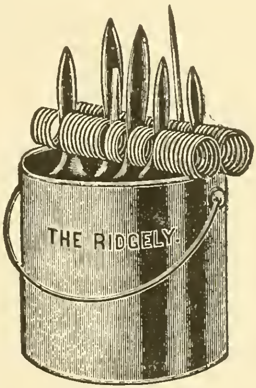


Fig. 64. Paint Brush Holder.

Painters' steel wire brushes are illustrated in Fig. 63: A—For removing paint, rust and all foreign accumulations from the surface of plain and ornamental metals, stone and brick. B—Painter's wire duster, made of very fine steel wire. C—Used to apply preparations for removing old paint. D—For removing old paint and cleaning moldings. E—For cleaning cornices and out-of-the-way places.

A painter's brush holder is shown in Fig. 64. This is indispensable for keeping the brushes in good condition.

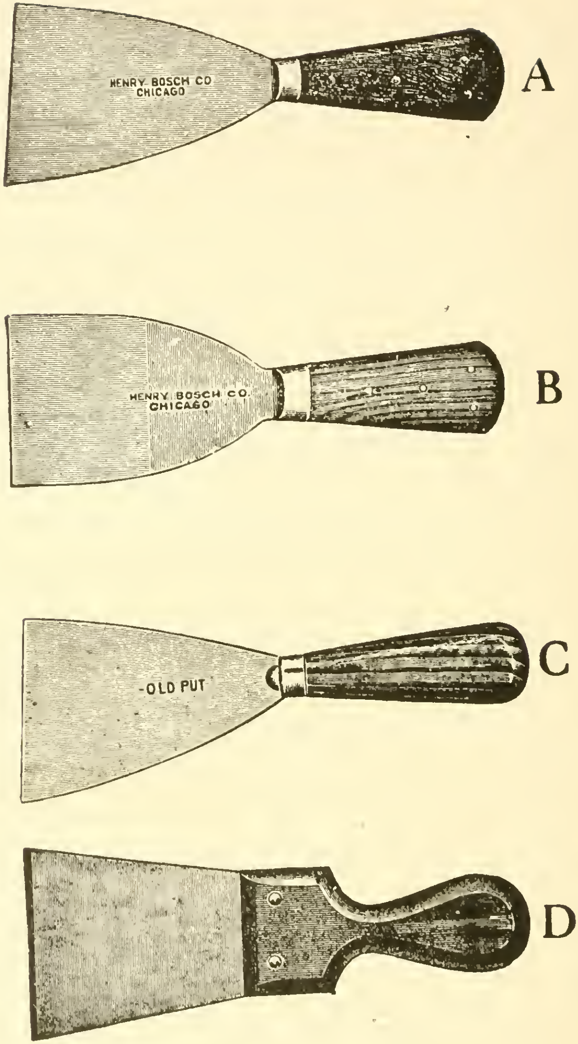


Fig. 61. Painter's Scrapers.

A

B

C

D

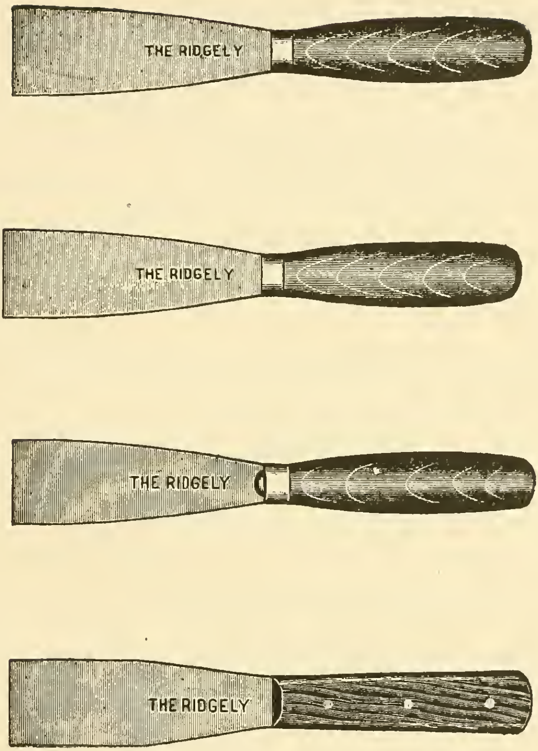


Fig. 62. Painter's Putty Knives.

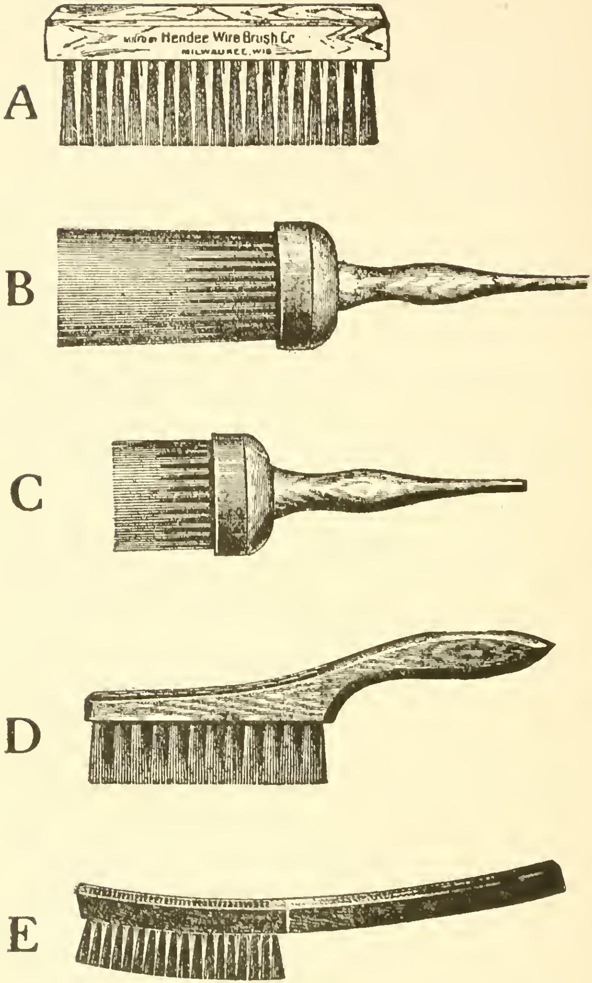


Fig. 63. Painter's Steel Wire Brushes.

PAPER HANGING.

When re-papering an old wall the first thing to be done is to remove the old paper. Now although this is very necessary in order to produce a good job, as well as for sanitary reasons, it is very frequently neglected altogether, and one paper is pasted over another time after time, the accumulation of dirt, decayed paste, and perhaps various insects forming a most unsanitary dwelling place. The paper may be usually removed by washing it over with hot water, giving a liberal quantity, and allow this to soak in, and then scraping off with an old chisel or scraper.

If the paper is varnished, or is printed in oil, that is, if it is of the quality known as sanitary paper, it may be necessary to score over the surface with a chisel before applying the water, so as to give an opportunity for the moisture to soak in. Commence at the top, taking care not to injure the cornice or ceiling, and to get every particle of the paper away. Sometimes plastered walls which have been papered with half a dozen or more papers are in such a bad condition that when these papers are removed a considerable portion of the plaster will be pulled away. In such a case it may be quite necessary to leave the old paper on. In a fairly good wall the paper may be removed without injury, provided that plenty of water is used, it is very probable that there will be some breaks, which will require mending before the new paper is applied. This can be done without much difficulty by means of plaster of Paris mixed in small quantities at the time with a little glue water, and applied with a knife or piece of wood, and smoothed off to a level surface. In mending the walls of an ordinary room in this way it may be necessary to mix the plaster half a dozen times, as if sufficient is mixed at one time for the whole job it will be found to be set quite hard, and therefore to be useless before the mending is completed. A few drops of glycerine added to the plaster will retard its setting, but this is not necessary if glue water is used. It is best not to paper over a patched wall for several days, but if time presses a coat of knotting may be given over all the patches to prevent the plaster affecting the color of the newly-applied paper. Coarse sandpaper should now be rubbed over the whole surface, so as to make it as level as possible, and then the room is ready for papering.

Choosing the Paper. This choice is usually left to the lady of the house, probably on the supposition that she has better taste in such matters than her husband. If the paper is of a cheap grade in most cases the wallpaper dealer will send a book of patterns measuring, perhaps, 24 by 18 inches, and from these small samples the occupant of the house is expected to make a selection. It is this which gives rise to so much disappointment. A small piece conveys a very little idea of the appearance the room will present when the walls are covered all over with the same pattern, and it is far better, where it is practicable, especially in the principal rooms, to obtain a roll or two of those papers which appear to be most suitable, and to pin them on the wall, so as to gain a good idea of the appearance they will present. The following hints should be borne in mind. For a small room choose a small pattern paper, never a large one, which will make it look smaller still. A room with a low ceiling will look higher than it is if a pattern having vertical stripes is chosen. The reverse of this is true of an unusually high room, which will not look so high if a paper having horizontal stripes is used. Gold papers, or those which have bronze or imitation gold in the design, are now rarely used, being rightly considered as somewhat vulgar, excepting in public or important rooms. Large pronounced patterns are usually not desirable, because they detract from the repose or quiet appearance a living room should present. A bedroom should always be papered with a cheerful design, and geometrical figures be avoided as far as possible.

In choosing a paper for a hall or staircase, or any room or apartment which is somewhat bare in appearance or devoid of furniture, it is always well to select a hanging of bold design and somewhat vivid coloring. Conversely a room full of furniture, especially if small and with many pictures on the walls, would be wholly spoilt by a bold design. During the last few years there has been a distinct tendency toward employing papers with little or no pattern at all, ingrains are much in vogue. These papers are dyed in the process of manufacturing instead of being grounded or treated with the distemper color on the surface, as is usual with ordinary wall papers. An excellent effect is produced in decorating a room with such a plain ingrain, especially if a good bold frieze is employed to form a finish, and take away from the bare effect. The objections to ingrains, however, is that they are very apt to lose their color, and also that they are very difficult to hang, as they are almost like blotting paper in texture, and they rapidly absorb the moisture from the paste. For many purposes an ingrain paper or its equivalent, having printed upon it a very small set design, produces good results. In selecting papers it should be remembered that it is not necessary to pay a high price in order to get good designs.

Having made a selection of the paper, the next thing to be done is to cut off one or more of the margins. This is readily done by means of scissors or a trimmer. In some wall-paper shops will be found a machine by which the selvedge or margins may be rapidly removed, and in some cases the paper may be purchased already trimmed, which, of course, saves a good deal of trouble. It must be remembered, however, that the wall-paper manufacturer left the selvedge on for a definite purpose, to protect the body of the paper, and that without it there is a likelihood of the paper becoming quickly soiled. It should be remembered, therefore, that when wall paper is bought ready trimmed it is necessary to take great care in handling, so as not to dirty or mar the edges. There are two ways of hanging paper, one with what is called a butt edge, the other a lapped edge. In the former both margins are cut off, and the edges of the paper must then be drawn together, so as to exactly meet, the pattern, of course, uniting accurately. The difficulty of the paperhanger using the butt edge is that he sometimes finds a difficulty in bringing the edges to meet, and if there is a space between, the white wall underneath shows through. Sometimes the paper shrinks after being hung, and produces the same objectionable effect. To prevent this it is not a bad plan to mix a little distemper to match the ground of the paper, and to paint this down the wall exactly where the several seams will come. If in this case there is an opening of, say, a thirty-second part of an inch it will not be noticed. As a rule, the unskilled workman will prefer to use a lapped edge. In this case only one margin is cut off, and the paper is lapped or placed over the other, care being taken to match the pattern as before. The objection to lapping is that the joints show somewhat conspicuously, as it will be clear that there will be two thicknesses of paper instead of one wherever the joins occur. A hint of importance is to remember that the laps should be away from the light, as this will render them less conspicuous than it would otherwise be.

Paperhanger's Paste. There are several ways of making paperhanger's paste, but they all practically come to the same thing in the end. Take a sufficient quantity of ordinary white flour, place it in a big basin, add a little water, stir and beat it up to a stiff batter, and then thin with additional water, taking care there are no lumps. Care must also be taken not to add too much cold water, so as to make the mixture too thin. When satisfied that there are no lumps, pour in slowly boiling water, stirring vigorously meanwhile only in one direction. In a short time the paste will begin to thicken, which means that it is cooked, and is then about right for use. In order to stiffen the paste, and also to prevent it becoming rancid, alum is sometimes added in the proportion of about a teaspoonful of ground alum to two quarts of paste, this, however, must never be added if the paper to which it is to be applied is ingrain, as it is likely to cause the color to fade. It must also never be used on gold papers, as it turns the so-called gold black. To preserve the paste a few drops of oil of cloves should be added, or a little carbolic acid. An excellent preservative is formaldehyde, which may be added in the proportion of about a teaspoonful to four quarts. The paste should not be used while hot, it is better if it stands for a little time. To prevent a skin forming on the top a little cold water may be added. If the paper is a very stiff one, a small proportion of glue melted in water may be added, but this is not, as a rule, necessary.

Measuring Quantity of Paper Required. It will now be necessary to ascertain the number of pieces of paper required for the room that is to be re-papered. Paperhangers can, as a rule, tell the number of pieces by glancing at a room, but the amateur will require to measure. A piece of wallpaper is eight yards long, and when trimmed 21 inches wide, there is, however, more or less waste, and the larger the pattern the greater will the waste be. In practice the simplest plan to follow is to take a roll of paper or a piece of stick out to the right length, and to measure around the room, and find out how many lengths will be required, then measure the height, and see how many lengths can be obtained from the eight yards in length, remembering that something must be cut to waste, so as to match the paper. The pieces left over will usually be sufficient to paper over doors, windows, and any odd places. The following table may be useful for reference, but it cannot always be relied upon, because it is clear that one room may have many more windows or openings in it than another.

Wall Paper Table.

Showing the Number of Pieces of Wallpaper, 21 Inches Wide.

Measure round the Four Walls in feet, including Doors, Windows, etc.

Height in Feet from Skirting to Cornice.	Lengths of Four Walls in Feet. 24	26.3	29.3	32	34.3	37.3	40	42.3	45.3	48	50.3
7 and under 7½	5	5	6	6	7	7	8	8	8	9	9
7½ " 8	5	5	6	6	7	8	8	9	9	10	10
8 " 8½	5	6	6	7	7	8	8	9	9	10	10
8½ " 9	5	6	7	7	8	8	9	10	10	11	11
9 " 9½	6	6	7	7	8	9	9	10	10	11	12
9½ " 10	6	7	7	8	9	9	10	10	11	12	12
10 " 10½	6	7	8	8	9	10	10	11	12	12	13
10½ " 11	7	7	8	9	9	10	11	11	12	13	13
11 " 11½	7	8	8	9	10	10	11	12	13	13	14

Hanging the Paper. It is supposed the paper is trimmed and cut into lengths ready to hang. The lengths are rather longer than is actually required, and the paperhanger will find that at this point he reaches his greatest difficulty, which is to paste the paper and carry it while wet to the wall and hang it in a vertical position. A good plan for a beginner is to take a plumb-bob, or if one is not available a small weight tied to a piece of string answers for the purpose, and mark out upon the wall vertical lines at the points where the joins of the paper are to come. This will at least have the effect of keeping the joins upright. Place the paper face downwards on a pasting board, and give it a coat of paste, taking care not to apply too much, or it will brush out when the paper is applied. If the table is not long enough to take the whole length, as it probably will not be, paste one half, fold the end toward the center, then carefully draw the strip over and paste the other end, folding again so as to meet the end already folded. In this condition the paper will not leave any of the pasted surface outward, and as there are at least two thicknesses, it will not be very difficult to lift it from the table. With a little care the lower portion of the paper may be folded again for convenience in carrying. Commence at a projecting corner of a door or window, or at any other position where a mis-match will show the least. Climb the step ladder, which must, of course, be provided, unfold the upper end of the paper, place it carefully beneath the cornice and down the marked line, press it against the wall with a brush, taking care that there are no air bubbles left. Then unfold another portion, and press this down also, and proceed in the same way until the bottom of the length is reached, when it will be found that a portion of the length which was cut too long projects over the skirting board. Draw the point of the scissors lightly along this edge, which will mark the paper, pull the lower end of the strip away from the wall, and cut off this superfluous portion of the paper, and press the whole back in position; one length of paper will thus have been hung. Before pasting the second length, see that you have it cut correctly at the top to watch when placing it in position. Paperhangers frequently manage this on the wall itself, using the lower member of the cornice as a guide to mark the upper edge of the length, and they cut this superfluous top edge while standing on the ladder. The paperhanger will do much better to get the upper portion right before he pastes the paper. A paperhanger's brush should be used to press the paper to the wall. These brushes are usually used where speed is required; they require a little practice before one becomes expert with them. Where a border or frieze is to be hung, the proceeding is precisely similar to that already described, except that the width of the paper is much less, and it is, of course, hung horizontally instead of vertically. If the paperhanger will take care to fold his paper several times after it has been pasted, he should find no difficulty in handling it. It must be folded in such a manner as to be unfolded piece by piece as required to go up in its proper position.

Borders and Friezes. Sometimes in the country, and even in well-built houses, rooms are found finished entirely without cornices. In such cases it is almost impossible to produce a finished effect unless a border or frieze is used. The borders should be almost always used in rooms large and small, with the exception, perhaps, of the servants' bedrooms. They cost very little, and if a comparison is made between a room finished without a frieze and another in which a good design is employed, the difference will be at once apparent.

Now that plain papers are so much in vogue, the frieze becomes an important part of the design, and drawing and dining-rooms from which a frieze is omitted is usually considered spoiled.

Hanging Ceiling Papers. Papered ceilings are used at present to a very much greater extent than they were formerly; in fact, in the better class of houses they are now used almost invariably. A papered ceiling with a papered wall gives an appearance of finish and completeness which is not apparent when the walls are papered and the ceiling is distempered. Distempered walls and distempered ceilings give the best possible appearance in interior decoration, but papered walls must always be used to a very considerable extent, and then the apartment is not finished unless paper is used on the ceiling also. Those who crave for white ceilings can get them in paper, or, rather, they can purchase many designs at very moderate prices in which the pattern is so delicate and faintly defined that it can only be discerned in certain lights. For a drawing-room a very pretty paper is one having a cream or nearly white ground, with a pattern printed in talc or some brilliant material which, while nearly colorless, shows up very prettily under the gas light. Excepting the very elaborate schemes of decoration, bright colored ceiling papers should never be used. Floral designs are out of the question for ceilings, somewhat large geometrical designs, sometimes in imitation of ribbed effects, being usually employed. To hang a paper on a ceiling requires a good deal of thought and planning, and it is by no means as easy as hanging the paper on the wall. The paper having been carefully schemed out so as to show to the best advantage, is pasted and folded as before, and hung in the same manner, excepting that a lath or stick must be used as an aid in holding up the folded portion, while the other end is being pressed to the surface. Before the paper hanging of the ceiling is commenced, all breaks and cracks should be mended in the same manner as already described in dealing with broken walls. When cutting the paper around regular angles, such as those which arise from a bay window, the best plan is to cut the paper roughly to about the angle required, leaving it rather longer than necessary, and then to mark the exact line against the cornice with the point of the scissors, then to cut off the superfluous end. Even where care is taken, this will sometimes cause a little trouble with the paste coming against the cornice, but this can afterwards be made good with whitening or coloring the cornice as already mentioned.

In rooms which have no pretensions whatever to a decorative appearance, ceilings are often papered in order to strengthen. We have seen old ceilings which appeared to be about to fall off, kept in position for years by two coats of strong paper pasted over them. In this case what is known as lining paper is used. It is sold by every dealer in paper hangings, and is cheap. It must not be forgotten that a ceiling must never be papered in any room in which there is steam at any time. For instance, in a laundry it is entirely out of place, as the first washing day will mean the descent upon one's head of all the paper from the ceiling.

Cleaning Wallpaper. The tenant or house owner at those unpleasant periods in the year when spring cleaning appears to be inseparable from a quiet existence, or when parts of the house are re-decorated owing to a sudden fit of generosity on the part of the landlord, often experiences a good deal of difficulty in determining whether a room really requires re-papering or not. Possibly the paper is fairly expensive, and is only soiled over a small portion of its surface. All ordinary papers may be cleaned without difficulty. There are on the market various preparations for the purpose which do the work very effectually, but their use is not necessary. One of the simplest ways is to take a loaf of ordinary rye bread, which is at least two days old, cut off the crust, and trim the crust also from around the edge, place on the floor sheets of newspaper or cloths to catch the crumbs, and then go over the whole surface of the paper, rubbing it with the loaf from top to bottom in regular strokes. When the end of the loaf becomes dirty cut off a very thin slice with a sharp knife, trim back the edge again, and proceed as before. Even better than the loaf is baker's dough, or flour and water mixed to a stiff dough answers equally well. A good plan is to add about quarter of the bulk of plaster of Paris to the flour, as this holds the dough together, and renders it less plastic or yielding under the strokes. Still another way is to use bran, a handful is taken and placed in a piece of flannel, and then rubbed against the surface of the paper. If there are any grease marks on the paper they can be removed in the following manner: Mix a little dry Fuller's earth into a paste, place it carefully over and around the grease spot, when quite dry take a hot flat iron and hold it nearly touching the layer of Fuller's earth. This will dry out the grease, and the Fuller's earth may then be scraped off, leaving the paper comparatively clean and fresh.

PIGMENTS.

Names of pigments are not always synonymous with the colors. Dutch pink is yellow, verditer is blue, lake is not purple-blue always, but sometimes green, yellow, brown, etc., or it may be found as a pigment color, with a chalk base, or body.

Before proceeding to describe the actual method of mixing, a few general remarks on colors may be given. White lead is used for the base of paints, because that pigment possesses greater covering properties, or body, as it is technically termed, than any other. Zinc white may be used for a base under certain conditions, and color mixed with it will not be so likely to fade as when mixed with lead. The tendency of zinc white, however, to chip and crack renders the addition of lead necessary in some cases. When practicable, the natural earth pigment should be used for tinting purposes in preference to those which are manufactured. Raw umbers, raw siennas, etc., will be found to last longer than burnt umbers and burnt siennas. As a rule, burnt umber should not be used for outside painting, but the required shade should be obtained by mixing lamp black and an oxide color, such as Venetian red.

Common colors include lamp black, red lead, white lead, Venetian red, umbers, and all other common ochres, such as greys, buffs, stones, etc. Superior or ornamental colors include bright yellows, warm tints, blues, mineral greens, etc.

In compounding pigments for painting, there is yet a further matter requiring some little consideration by the painter. All blue pigments are not chemically suitable for mixture with yellows or reds, nor all yellows with reds; in fact, a knowledge of the chemical source and affinities of pigments is almost a necessity to the painter and decorator.

As the most brief and simple way of aiding the student, it will be well to mention those ordinary pigments which it is usually advisable not to mix together.

For mixing with oil color paints, chrome is an undesirable pigment, and it is particularly to be avoided when compounding greens from Prussian or Antwerp blues, which latter colors it would eventually destroy. In such an instance, for common use the best substitute for the chrome would be bright yellow ochre, or, as it is often called, yellow paint. Raw sienna can also be used with the above blue pigments without much detriment to either. In any case where a bright mixed green is absolutely necessary the lemon chrome can be used in conjunction with good ultramarine blue or indigo.

In compounding the secondary color of purple from blues and reds, there is less danger of trouble arising. The best and purest is obtained by mixing ultramarine with madder lake, which is a beautiful crimson and transparent permanent pigment, while lakes derived from cochineal are unstable, ultramarine and vermilion will also answer. Prussian blue and vermilion give very deep purple, which may be lighted up with white. For common purposes, the cheap purple brown is most useful, if required full in strength, but if lighter and pure tints are wanted in oil or distemper, ultramarine blue and vermilion, or, for cheapness, Venetian red, is necessary. Prussian blue in water would not suit so well, but indigo could be used if cost is not a consideration.

The remaining secondary, orange, is not a color very much called for. Orange chrome or orange red is a bright opaque pigment, but otherwise like all the chromes, not a commendable article. Burnt sienna is a very opposite pigment in both nature and source. It is semi-transparent, reliable, and permanent, and is, when of good quality, a remarkably strong stainer, like Prussian blue in this respect. In compounding orange color, the reds and ochres already mentioned are usually bright enough, yellow ochre and Venetian red, or raw and burnt sienna together, give with white lead, a good and serviceable variety of permanent orange and salmon tints.

The compounding of the third division of material colors, the tertiary, from either of the two secondaries, is a subject that need scarcely here be dealt with. The painter who works at this subject will soon find those secondary pigments of orange and green which produce the tertiary citrine, whether bright or sombre, such as occasion requires. Of the remaining tertiaries, russet and olive, prepared from the secondaries purple and orange, purple and green, respectively, there is a good supply in the form of simple pigments. Notwithstanding, therefore, the necessity and advantage of the painter being able to obtain any color by the admixture of the three primaries, it is always most desirable to use a simple article of the desired color when it is to be had.

In the actual mixing of paints, it must not be thought that there is any one way that is exactly right while all other methods are exactly wrong. Every painter has his own peculiar way. In nearly all cases, the simplest plan is to use pigments ground in oil instead of dry powders. With a pallet knife break up the lead rather stiff, adding a little oil. Thin down each paint until it is rather stiffer than the whole will be when ready for actual application, or if dry pigments be used, add a little oil, and thoroughly mix. The lead, zinc, or other base being ready, add some pigment, and well stir. If several pigments are required to produce the tint, be sure to add only one at a time, and take great care that each is thoroughly mixed before the next one is added. As a further precaution, it is well not to add the pigment all at once, but to do so a little at a time. When it is certain that a thorough admixture has been effected, the next pigment may be added a little at a time. It is well to remember that some pigments, such as Prussian blue, are very strong, and the addition of too much will spoil the job. It is easy to add a little more, while it is impossible to take any out. A little precaution in this respect will save much trouble, and although it takes longer to mix the paint, it is the much safer plan. Of course, a practical painter who is used to mixing paints can add the necessary amount of colors without taking these precautions.

Having mixed the paint, add as much driers as may be necessary, taking care not to use too much. Then the paint should be strained through a fine wire strainer. It is well to mix up enough of the paint in one batch to do the whole of the job in hand, so that there may be no trouble or waste of time in matching tints. Paint mixed in cold weather is very likely to give unsatisfactory results, because the oil will stiffen and be more difficult to form into a perfect admixture. To remedy this, a gallon or so of the oil should be heated, and this poured in will warm up the paint, and prevent it pulling when applied, and so avoid the unnecessary force required to draw the brush along.

In preparing oil paint, the first question to be considered is the nature of the surface to be painted, whether of wood, stone, or metal, and to what degree it is absorbent; second to this must be remembered the conditions and position of the work, such as refer to expense, durability, and drying qualities; and lastly, to bear in mind the all-important matter of appearance and color, whether the paint is for the first or last coat.

The quantities of driers, oil, and turpentine required to bring 100 pounds of white lead to the consistency of paint is a matter that must be varied according to the conditions of the work it is required for. In summer-time, 1 pound of good driers to 14 pounds of white lead is ample for out-door purposes; in winter-time, 1 in 10 would be best. The quantity of oils required would be about 1½ gallons for 100 pounds of lead. The proportions of linseed oil and oil of turpentine it is advisable to use depends entirely upon the purpose it is intended for. With reference to the question of boiled or unboiled oil, it should be remembered that both oils are glossy when applied in sufficient quantity, boiled linseed oil has more body, and is more brilliant than raw linseed oil, raw linseed oil is lighter in color, and is not so liable to blister as boiled linseed oil, boiled linseed oil dries quicker than raw linseed oil.

To mix 1 pound of ordinary oil paint, take about 8 ounces of pigment the desired color. White lead for white, light grays, pinks, cream, etc., Venetian red or vermilion for red, and so on, according to the color desired. Add to this about 2 ounces of liquid driers, then make up to 1 pound with either linseed oil alone or oil and turpentine in equal parts. Remember, the more oil, the more driers is advisable, but never less than 1 part driers in 8 or 10 of entire bulk. If only small quantities of paint are wanted, that sold ready mixed would be cheapest and would do for ordinary inside work. A single pound could not be made cheaply, and some of the colors, bright red, for instance, could not be made at twice the retail price.

The ingredients for making about 40 pounds of best paint for indoors, tinted to a French gray color, would be 28 pounds of genuine white lead, 3 pounds of patent driers, about ½ gallon of raw linseed oil, and 1 quart of turpentine. Mix up the lead and driers with a broad stick to the consistency of a thick paste, using linseed oil. If all is to be tinted one color, for French gray add a little ultramarine blue and either a little Venetian red or lamp black. If a warm gray is wanted, add the red, if a cool metallic tint, add the black. The ultramarine can only be bought in powder; mix this well with a little oil before adding it to the paint, the other colors can easily be obtained ready ground in oil. For first coating on new plaster, nearly all linseed oil and a little driers may be used, very little lead. This will stop the suction of the plaster. As a rule, new plaster requires four coats to get a good surface.

White Lead. The pure product dissolves completely in dilute nitric acid, as well as in potash and in soda lye. When exposed to the sulphuretted hydrogen or moistened with ammonium hydrosulphide it turns brown or black, whereby it is distinguished from zinc-white. When heated with the access of air it yields its carbonic acid, and at 572° Fahrenheit passes into lead oxide and finally into minium. When digested under pressure with carbonated water for some time, the water may contain 0.22 drachm of lead per quart. The difference in covering power is due to the form, size, density and composition of the smallest particles. The white lead obtained by the French or precipitation process is looser, of a coarser grain, and possesses less covering power than the product obtained by the Dutch or German process, which is denser, of a finer grain, and never crystalline, and, though of a greater specific gravity, requires less oil.

When exposed to the light and air, white lead is fairly permanent and will resist exposure to normal conditions for a great length of time; on the other hand, when exposed to the fumes of sulphuretted hydrogen and other sulphurous gases, white lead turns brown or black through the formation of the black sulphide of lead. The production of this body is more likely to occur in large towns, where great quantities of gas are used for lighting and other purposes, which usually contains some sulphuretted hydrogen or other sulphur compounds.

White lead can be mixed with all pigments except those which, like cadmium yellow, ultramarine or King's yellow, contain sulphur, such pigments sooner or later causing the formation of the black sulphide, and thus bringing about the discoloration of the pigment or paint.

In commerce white lead is found in two forms, as a heavy white powder, having a specific gravity of about 6.47 and weighing about 180 pounds to the cubic foot, or as a paste containing about 8 per cent of the linseed oil. To make the latter, the dry white lead is first mixed in a mixing mill with about 8 to 9 per cent of its weight of raw linseed oil; it is then run through a grinding mill several times to ensure a thorough mixture of the oil and white lead. This form is much liked by painters, it being more readily miscible with oil and turpentine to make it into paint.

In order to obtain a cheaper product, white lead is frequently mixed with barytes which is distinguished by its white color and great specific gravity. The mixture is often effected in fixed proportions and for certain varieties of white lead, which are known by special names or numbers, remains unchanged. Thus Venetian white consists of equal parts white lead and barytes, Hamburg white of 2 parts barytes and 1 part white lead, Dutch white with up to 75 per cent barytes. The so-called Kremnitz white is a pure white lead. It is produced by placing trays containing a paste made of litharge and either acetic acid or lead acetate upon shelves in a chamber built of brick or wood. When the chamber is filled carbonic acid gas is sent into it and is absorbed by the lead oxide present in the paste.

Zinc White or Zinc Oxide has, in recent years, made great advances in popularity among painters. Compared to white lead, it is as white to yellow. It is indeed beautifully white, very fine, and easily worked. The whiteness is of importance in mixing paints, as the purity of color is retained, while when mixed with lead the yellowish cast to some extent destroys the purity of the original color. The fact that oxide of zinc is non-poisonous is a point in its favor of very considerable importance. It is claimed that painters who take care to wash themselves frequently and to take every precaution, are not likely to contract lead poisoning. As a matter of fact, the best of painters are at times careless, while in the rush of work, it is often impossible to take the precautions required. The most important quality of zinc white is its extreme durability.

Properly mixed it will last, at a moderate estimate, twice as long as lead, especially in large cities where the air is impregnated with sulphur derived from burning coal. Lead, in such circumstances, turns yellow or black and quickly decays, and some places, such as stables, where sulphuretted hydrogen abounds, it is useless to paint with white lead, and if zinc is used these disadvantages are avoided.

Zinc white has a very good body, better, or as good as white lead. If a proper comparison be made, and if both be thinned out to a consistency suitable to be applied by brush, it is true that zinc white will apparently not have so good body as lead, but it will spread much farther. If an exactly equal quantity of lead and zinc are both painted on an exactly equal area, zinc will cover a little better than lead. In this state, however, the consistency of the zinc paint would be rather too thick. It is easily thinned, more so, comparatively, than the lead would be.

A consideration of these facts will show the practical painter that less zinc than lead will be required to perform a good job, and when the durability is also taken into consideration as well as the beauty, it will not take long for him to make up his mind as to the superiority of zinc.

There is one point, however, about its use which must be explained. Zinc white is, when compared with lead, quite light in weight, or, in other words, its volume is much greater than lead. Now, it being an entirely different product, it must not be treated in the same way as lead would be. The painter, perhaps, takes some zinc, mixes it with raw oil, with a liberal amount of patent driers and a more liberal dose of turpentine, and then he grumbles because it does not show up to advantage. What he does is to destroy its inherent good qualities. To repeat then, zinc white must not be treated in the same way as white lead.

The proper way to treat zinc white is to mix it with refined boiled oil, no driers should be used, and only just sufficient turpentine to bring it to the required consistency. Being pale, it does not destroy the whiteness of the zinc, while it certainly aids considerably in drying. In fact, it is the only practical drier for the zinc, far better than patent driers, or any other goods of the kind. It is paler than raw linseed oil, and hence it does not destroy the most delicate tints, however light.

PIGMENTS LIABLE TO CHANGE UNDER THE INFLUENCE OF SULPHURETTED HYDROGEN, AIR AND MOISTURE.

Yellow. Chrome yellow, mineral yellow, Naples yellow.

White. Cremintz white, flake white, pearl white.

Red. Red lead, purple red, iodine scarlet.

Green. Verdigris, Scheele's green, emerald green, mountain green.

Blue. Prussian blue, Antwerp blue.

Orange. Orange chrome.

PIGMENTS LITTLE LIABLE TO CHANGE UNDER THE INFLUENCE OF SULPHURETTED HYDROGEN, AIR AND MOISTURE.

White. Zinc white, constant white, tin white.

Red. Vermilion, red ochre, Indian red, madder lakes.

Yellow. Yellow ochre, barium chromate, zinc chromate, aureolin, raw sienna.

Green. Chrome green, cobalt green.

Blue. Ultramarine, smalt, Thenard's blue.

Brown. Vandyke brown, raw umber, burnt umber, manganese brown, sepia.

Black. Ivory black, lamp black, Indian ink, graphite.

Orange. Orange vermilion, burnt sienna.

PIGMENTS LIABLE TO DETERIORATION WHEN IN CONTACT WITH WHITE LEAD, CHROME OR OTHER LEAD PIGMENT.

Yellow. Yellow orpiment, king's yellow, Indian yellow, gamboge.

Red. Iodine scarlet, cochineal, carmine.

Orange. Golden antimony sulphide, orange orpiment.

Green. Sap green.

Blue. Ultramarine.

PIGMENTS WHICH ARE LITTLE AFFECTED BY HEAT, AND WHICH MAY BE USED WHEN THE MATERIAL HAS TO STAND FIRE.

White. Tin white, barium white, zinc white.

Red. Red ochre, Venetian red, Indian red.

Yellow. Naples yellow, antimony yellow.

Blue. Smalt and royal blue, ultramarine.

Green. Chrome green, cobalt green.

Orange. Burnt sienna, burnt ochre.

Brown. Burnt umber, manganese brown.

Black. Graphite, mineral black.

COLORS THAT MAY BE USED WITH LIME.

White. Permanent white, baryta white, gypsum, zinc white.

Red. The vermilions, light red, Venetian red, Indian red, madder lakes.

Orange. Cadmium, orange chrome, Mars orange, burnt sienna, burnt Roman ochre, light red.

Yellow. Aureolin, cadmium yellow, lemon yellow, Naples yellow, Mars yellow, raw sienna, yellow ochre, Roman ochre, transparent gold ochre, brown ochre, Indian yellow, Oxford ochre.

Green. Oxide of chromium, transparent oxide of chromium, viridian, emerald green, malachite green, verdigris, terre verte, cobalt green, chrome green.

Blue. Genuine ultramarine, artificial ultramarine, new blue, permanent blue, cobalt blue, cerulean blue, smalt.

Purple. Purple madder, Mars violet.

Brown. Bone brown, bistre, Prussian brown, burnt umber, Vienna brown, Vandyke brown, Cologne earth, asphaltum, Cassel earth, manganese brown.

Citrine. Raw umber, Mars brown.

Blacks. Ivory black, lamp black, blue black, charcoal black, cork black, Indian ink, black lead, drop black, plumbago.

PLAIN OIL PAINTING.

The processes of plain oil painting are in themselves extremely simple, and depend so much on manipulative skill that a description of them must be taken only as a general guide, not by any means sufficient in itself to make a good painter. This result is not arrived at by theoretical knowledge alone, however sound, but by long-continued and earnest practice.

On the other hand, it must be urged on the attention of painters the fact that practice alone will not accomplish the end desired; a painter who can only spread a quantity of paint over a given surface is little better than a machine, and it is hoped by the instruction given in the following pages, to awaken the interest of the painter, and to show him that his occupation is not merely manual, but that each branch of the trade, if properly understood, will afford scope for the exercise of mental acquirements and for the application of knowledge.

Before the painter can commence the absolute process of painting new work, it is necessary that he should clear it from any drops of glue or whitening which may have fallen on the surface, or which may have been accidentally left by the carpenter.

In this operation he uses the stopping knife. This knife is held so that a large portion of its edge may touch the surface, and it is slanted so as to be nearly horizontal, and thus the edge works as it were under the pieces of glue and putty and lifts rather than scrapes them off. Care must be taken that the knife is not held so that its surface would be perpendicular to the wood, and that only the smallest possible pressure is used, otherwise indentations might be made, and thus more harm than good would be done.

It must also be borne in mind that this process is not to be a universal scraping; it is merely remedial, to remove any excrescences which may exist, but its purpose is not to scrape or plane the wood. This is supposed to have been already done by the carpenter, and if it has not, a tool different from the stopping knife should be used.

The dusting brush, generally called the duster, must be freely used during this process so that all the particles scraped off may be removed. The largest of the brushes used for painting is sometimes employed as a duster previously to being devoted to its proper purpose, in order that it may be rendered softer; but this is not a good plan, for a certain amount of dust necessarily finds its way up the brush, and is liable to work out when it is being used for painting purposes, thus giving the work a coarse and gritty appearance and causing much annoyance.

The next stage of preparation is that called knotting, the purpose of which is to guard against the knots appearing in the finished work, by stopping their absorbent quality, or closing the apertures of the fibre, and thus preventing the effusion of gum or sap. It is, of course, strongly urged that wood should be thoroughly dry before it is used, but this is not within the power of the painter to control; he must take the wood as he finds it, and must do his best to counteract the effects of the new wood on his work.

It must be remembered that in the knots the ends of fibres, which are so many open tubes, are exposed, and thus, if all the sap or gum has exuded, they will present spots very much more absorbent than the surface of the board itself, whilst if the wood be new and the gum and sap fresh in it, these will from time to time exude and force off the paint, or cause it to become sticky.

Patent Knotting may be purchased at the color shops, and the following are two excellent recipes for making similar compositions, which are to be applied with a brush of the second size called a tool.

Add together a quarter of a pint of japanner's gold size, one teaspoonful of red lead, one pint of naphtha and seven ounces of orange shellac. This mixture is to be kept in a warm place whilst the shellac dissolves and must be frequently shaken.

White or red lead powder mixed with glue size and applied whilst warm.

Knotting is a composition of strong size, mixed with red lead for the first knotting, which prevents the gum coming through; the second knotting is a composition of white lead, red lead and oil, but in rooms where the knots happen to be very bad they are often silvered, which is done by laying on a coat of gold size and when properly dry a silver leaf is placed on them, which is sure to prevent the knots appearing.

When the knots are more than usually bad they must be cut out.

Priming. The first process of painting is called priming, which consists of laying on a coat of paint for the special purpose of diminishing the absorbent quality of the wood or plaster. The paint used for this purpose is generally a mixture of white lead and red lead, with a proper proportion of driers; but when the finishing color is to be black, dark green or dark brown the priming may be done with a lead color made of vegetable black and white lead in equal quantities.

These colors should be mixed with boiled oil for out-of-door, and with linseed oil for in-door work, a small quantity of turpentine being added in either case, the proportions being three parts of oil to one of turpentine. The paint should be rather thin so that it may be well adapted for rapid absorption by the new wood or plaster.

Some painters, in order to save the oil coats, have resorted to the objectionable practice of spreading a coat of size mixed with water and whiting over the new work.

This may serve for temporary purposes, but it will soon be seen that it should not be adopted in good work or where durability is expected. To a certain extent the size stops the absorbent powers of the wood or plaster, but it prevents the proper adhesion of the oil paint, which soon cracks or peels off. It may, however, be used with advantage in old work, where the grease would prevent the proper drying of the oil paint, but even in such cases it is best, when possible, to scrape the wood or plaster until a new surface is reached, on which the oil paint may be successfully applied.

When the priming is thoroughly dry, it is to be rubbed down with glass paper and this operation, although in itself simple, requires a certain amount of care so that the rubbing may be equally effective over the whole surface. In order that this result may be attained, the glass paper used should not be a mere scrap, rubbed carelessly about in various directions, by which means some parts will be passed over oftener than others, and the paint may be nearly rubbed off in one spot whilst it is left almost untouched on another. A piece of the paper should be wrapped round a flat piece of wood, say 4 inches long by 3 inches wide and 1 inch thick, forming a kind of brush, and this should be rubbed equally over the whole surface, which will thus be nicely smoothed, whilst its perfectly level character will not be injured. A piece of glass paper which has been used several times in this way should be saved for use in the later stages of the work, when great refinement is required. A strip of glass paper may be wrapped over the edge of a piece of wood shaped like a chisel for use in the edges of panels and similar situations, or round the finger or a piece of rag for the curved parts of mouldings, great care being taken that a stiff edge, such as is formed by a sudden bend in the glass paper, may not come in contact with the work, producing scratches which are very troublesome to get rid of. All the dust caused by the glass paper must be carefully removed by means of the duster. When the priming has been properly rubbed down the next operation is that of stopping.

Stopping consists in filling in and making good all nail-holes, bad joints and cracks with putty, or with a paste made of putty and white lead, called hard stopping; this is done with the stopping knife.

This is another of the operations which, although simple, require a certain amount of care, lest instead of contributing to, they may mar the success of the work. Thus let it be required to stop a crack in a panel; it will not be sufficient merely to press into the interstice a small quantity of stopping and then smooth it over, for as the stopping dries it contracts and sinks below the surface, and the crack becomes just as great an eye-sore as ever.

In such a case, the stopping should be forced as far down into the crack as possible; this may be done with the edge of the stopping knife, or with a thin piece of wood, leaving the stopping, however, slightly raised above the surface. In a day or two, before the second painting is proceeded with, the stopping will, owing to a certain amount of shrinking during drying, be found nearly level with the panel and may then be smoothed down with the stopping knife.

The circumstance calling for the greatest care in stopping, is where a panel or other part of the work has received a blow and a delve or shallow concavity is formed, for it will be clear that the mere skin of stopping required to level up such a spot, would be almost certain to crack off, leaving the place totally uncovered by paint. The best way to avoid such a result is to deepen the recess in parts by pricking holes in it with a bradawl and these should incline in different directions and should be more closely placed and more numerous near the edges than in the middle of the space. The point of the stopping-knife may be used for this purpose, and deep fissures will be formed thereby; into these fissures or holes the stopping is to be forced and the portion spread over the delve will thus be as it were nailed to the wood by the filaments penetrating into the holes.

This process should be slowly done, an interval being allowed to elapse between the first and second stopping, but this is supposing a condition which cannot always be fulfilled; the exigencies of business in these days of high pressure demanding that work shall be pushed on with the utmost rapidity; but it is desired to point out the means by which failure may be avoided, and the intelligent painter, knowing this, will be able in most cases to arrange his work in such a way that some portions may be proceeded with whilst the necessary delay is afforded to others, and thus, by economy of time, and proper organization of labor, the desired end may be accomplished.

The surface having been again touched off with the glass paper, the second painting is to be proceeded with. For the second coat, the same paint used for the priming, or white lead thinned with oil and a little turpentine and driers, may be employed, the proportion of driers for ordinary cases being 1½ ounces to 10 pounds of white lead, but in winter, or in a damp climate, the proportion of driers must be increased. The following useful hints are here given:

It should be observed that second color for new work is made up chiefly with oil, as it best stops the suction of the wood, but second color for old work is made up chiefly with turpentine, because oil color would not dry or adhere to it so well.

The color should be spread on as evenly as possible, and to effect this as soon as the whole or a convenient quantity is covered, the brush should be passed over it in a direction contrary to that in which it is finally to be laid off; this is called crossing. After crossing it should be laid off softly and carefully in a direction contrary to the crossings, but with the grain of the wood, taking care that none of the cross brush marks be left visible. The criterion of good workmanship is, that the paint be laid evenly and the brush marks be not observed. In laying off, the brush should be laid into that portion of the work already done, that the joining may not be perceived. Every coat should be perfectly dry, and all dust carefully removed before the succeeding one is laid over it.

In the third painting some approach is made to the finishing color. Thus, if the finishing color is to be lavender, the third coat should consist of white, slightly tinted with that color. In some cases it is desirable that the coat preceding the finishing should be darker than that which is to be laid over it.

In the third painting, the oil and turpentine should be used in equal proportions.

The fourth may be considered as the finishing coat, although a fifth is often given, and always with great advantage. The finishing coat must not by any means be applied unless the third coat proves perfectly satisfactory; that is, unless the surface has dried absolutely uniform, as regards surface, for if one part is glossy and the other dull it will be clear that the absorbent quality is not stopped and the third painting must be repeated.

In commencing to repaint old work, the surface should, in the first case, be gone over with the stopping knife, removing all excrescences, and it is then to be rubbed with pumice stone and water, the greasy parts being well rubbed with turpentine.

Parts from which the paint has been entirely removed and decayed patches must then be gone over with a coat of priming color, and cracks and holes are to be made good with stopping. The first coat is then to be given and this is to be mixed with turpentine. The quality of the next coat will depend on the manner in which it is to be finished. If it is to be painted twice in oil and flatted, the next coat should be mixed up chiefly in oil, and tinted like the finishing color to form a ground for the flatting. The greater the gloss of the ground, the more dead will be the finishing coat, or flatting; likewise, the more dead the ground the better will the finishing oil shine. It is, therefore, a general rule, that for finishing in oil the undercoat should be turpentine, and for finishing flat the undercoat or ground color should be oil; but all turpentine grounds must have a little oil mixed with them, and all oil undercoats must have a small quantity of turpentine added to them, excepting the priming or first coat in new work.

In order to attain an absolutely solid appearance, some painters apply two coats of the finishing color, by which no doubt uniformity is secured, but the expense is, of course, materially increased thereby. There are, however, pigments of a cheaper but still permanent character, which approach in tone to the very best, and these may with advantage be used as a first finishing coat, over which the final color may be applied. Such colors must be carefully selected and must be well covered by the finishing coat.

Flatting. When the work is to be flatted, that is, when it is desired that the paint when dry should present a flat or dull appearance without any gloss, the paint used for the previous coat should be rather thicker than would under other circumstances be used; it should be mixed with linseed oil and turpentine and should be rather darker than the flatting itself is to be.

Special care is necessary in laying all the coats which precede the flatting; they must be very evenly spread and must be smoothed with glass paper in order that they may be perfectly level, otherwise the smallest irregularities will appear in the finished surface, to the injury of that perfectly flat appearance in which the beauty of the work consists.

The paint used in flatting consists of white lead with which, of course, the necessary coloring matter is mixed, turpentine alone being used as the medium with which the paint is thinned. The color should be rather lighter than is required, as it darkens a little whilst drying; a brushful should therefore be tried before the whole surface is painted in order to avoid subsequent disappointment. In order to assist in drying, japanners' gold size is sometimes used instead of driers.

Although it is, of course, necessary that the coat preceding the flatting should be dry, it ought not to be absolutely hard, for it is necessary that the flatting, which is mixed with turpentine only, should slightly dissolve the surface, so as to become in a degree incorporated with it, by which much beauty and solidity is obtained, whereas, if the previous coat had become quite hard the flatting would in most cases appear streaky when dry and would be liable to crack or peel off.

Owing to the special composition of the paint used in flatting, it dries very rapidly and two men should be engaged at once in flatting a wall. A plank placed across two step-ladders, or otherwise supported, is placed in front of the wall at about half the height from the ground. One of the painters stands on this whilst the other stands on the ground. The last mentioned commences the work, painting a strip about 18 inches wide and carrying it up as high as he can conveniently reach, he works rapidly, crossing occasionally, so that no brush marks in any one direction may be visible, laying off very lightly; that is, continuing the action of his brush, withdrawing it gradually so that the points of the hairs may only skim lightly over the work.

The painter above proceeds with the operation from the line where his fellow painter left it, and carries it up to the top of the wall, the first painter meanwhile getting on with another strip, both painters being exceedingly careful that no break shall occur and that the lines at which their work join shall not be visible in the slightest degree.

Brushes called stipplers are much used; these are broad and flat, and in form resemble a hairbrush. In practice the stipplers are gently dabbed against the wet paint, producing a level grain over the whole surface, something like the tooth on the drawing paper called not hotpressed. These brushes may be obtained of various shapes, the handles of some being continuous with the back, whilst in others it is fixed above, like that of a black lead brush. The adoption of either form is, of course, a matter of taste.

In flatting a door, the panels must be finished first, great care being taken to carry the paint clean into the edges and corners. The stiles or framing should then be done. It is convenient to paint the muntins, or munnions, first; these are the upright pieces in the middle of the door. Next to these come the upper, middle and lower rails, the horizontals which cross the door, and lastly the upright stiles, or external vertical portions of the frame of the door. The brush marks, should any appear at the parts where the work is necessarily in cross directions, will correspond with the joints which would in reality exist at these parts.

Painting Plaster. The first coat is composed of white lead mixed with linseed oil and a small quantity of litharge, the paint being rather thinner than would be used for general purposes, in order that it may soak well into the absorbent surface of the plaster. The next coat should also be thin so that the plaster may be thoroughly saturated. This will be only partially absorbed, and it will be necessary to make the third coat much thicker, mixing with it turpentine, and some of the coloring matter approaching the future tint of the room. The fourth coat should be thicker still and should be mixed with equal parts of oil and turpentine, together with the dry ingredient, sugar of lead, instead of litharge. The color should be much darker than that which is to constitute the finishing coat. All these coats must be laid on with the greatest attention as to smoothing, and they should each be thoroughly dry before the succeeding coat is applied, and should be well rubbed down with glass paper. The last coat which is to precede the flatting, however, should not be quite hardened before the finishing is applied for reasons previously explained. The process of flatting has already been described.

Painting New Walls or Stucco. It does not appear that any painting in oil can be done to any good or serviceable effect in stucco, unless not merely the surface is dry, but the walls have been erected a sufficient time to permit the mass of brickwork to have acquired a sufficient degree of dryness.

When stucco is on battened work, it may be painted over much sooner than when prepared as brick. Indeed, the greater part of the mystery of painting stucco so as to stand or wear well, certainly consists in attending to these observations, for whoever has observed the expansive power of water, not only in congelation, but also in evaporation, must be well aware that when it meets with any foreign body obstructing its escape, as oil paint, for instance, it immediately resists it, forming a number of vesicles or particles, containing an acrid lime water which forces off the layers of plaster, and frequently causes large defective patches extremely difficult to get the better of.

Perhaps in general cases, where persons are building on their own property, or for themselves, two or three years are not too long to suffer the stucco to remain unpainted; though frequently in speculative works as many weeks are scarcely allowed. Indeed, there are some nostrums set forth in favor of which it is stated, in spite of all the natural properties of bodies, that stucco may, after having been washed over with these liquids, be painted immediately with oil colors. It is true there may be instances, and in many experiments some will be found, that appear to counteract the general laws of nature, but on following them up to their causes it will be found otherwise.

Supposing the foregoing precautions to have been attended to, there can be no better mode adopted for priming or laying on the first coat on stucco than by linseed or nut oil boiled with driers, with a proper brush, taking care in all cases not to lay on too much so as to render the surface rough and irregular, and not more than the stucco will absorb. It should then be covered with three or four coats of ceruse or white lead, prepared as described for painting on wainscoting, letting each coat have sufficient time to dry hard.

If time will permit, two or three days between each coat will not be too long. If the stucco is intended to be finished of any given tint, as gray, light green or apricot, it will then be proper, about the third coat of painting, to prepare the ground for such tint by a slight advance towards it.

POOR TOOLS.

It is false economy to work with poor or cheap brushes. A good painter can not do good work, or the amount of work he should, with poor tools.

Time is money and time is lost by trying to paint with a cheap stock brush.

It is a mistake to try to work half-handed or with too few brushes.

The kit should consist of a good full stock body brush for each color, the size depending upon the width of the siding to be painted, $3\frac{1}{2}$ to 4 inches long stock brush is the one usually used, a full stock trimming brush, well broken in. There is no economy in using a half worn out body brush for trimming colors. A good trimming brush is just as essential as a good body brush, as it is impossible to cut in on cornices, corner boards and window and sash frames with a ragged edged brush, a good chiseled sash tool or a 1 inch or $1\frac{1}{2}$ inch chiseled varnish brush for brackets or mouldings, also a $\frac{1}{2}$ inch flat chiseled varnish brush for sash colors, a good duster and putty and scraping knife. This completes an ordinary kit of tools and is sufficient to do good work. It is not economy to attempt to work with less.

PRIMARY COLORS.

The painter who wishes to obtain a correct knowledge of his trade should, in the first place, endeavor to make himself acquainted with the nature and properties of the materials he is constantly using.

The ambition of a man of intelligence should be to rise above the position of a mere drudge, and he should, therefore, by availing himself of the opportunities of culture at his command, endeavor to develop the faculties with which Almighty Providence has endowed him.

Nor will the time spent in the acquirement of knowledge be wasted, for good workmanship will always command its price, and thus a painter, who improves his scientific and technical education, will without fail rise in the social scale, with benefit to himself, his family and his country.

The facility with which ready-prepared colors can now be obtained has no doubt led to a neglect of information as to their composition or special qualities, a small amount of knowledge only being picked up in the course of practice from the men with whom each painter is associated, and who have obtained their own information in a similar unreliable manner.

It is not here intended to advocate the idea that each workman should, as in olden times, manufacture his own colors and varnishes; the rate of wages as compared with the expenses at the present day wholly forbid such a system; but it is strongly urged that the painter should know the qualities of the various substances he employs in order that he may judge of their fitness for every kind of work, and likewise that he should be able to prepare them if circumstances require him to do so.

Yellow, Red and Blue are called the primary colors, the presence of which, either pure or in combination, is found to be necessary to satisfy the eye. They have each a different relation to light, and must therefore be used in proportions which fulfill these conditions. Any two of these primaries being mixed, a secondary color is produced, thus

Blue and Yellow form Green,
Blue and Red form Purple,
Yellow and Red form Orange.

In like manner, by the mixture of any two of the secondaries, tertiary colors are formed, thus: Orange and Green produce Citrine, or the set of tints of a greenish-yellow character approximating to citron; Orange and Purple form Russet, or warm brown; whilst Purple and Green produce Olive, or dull brownish green.

By the varied and due admixture of these colors an infinite number of hues, shades and tints are produced, whilst by an indefinite and disproportionate mixture of the three colors, or of the whole together, will be produced the hues usually called dirty, or the anomalous color, brown.

There are five classes of colors: The neutral, the primary, the secondary, the tertiary and the semi-neutral.

Neutral colors are three only, White, Black and Gray. According to the laws of optics, the two first comprise all others synthetically and afford them all by analysis. These are sometimes called extreme colors, gray being their intermediate.

Thus, if Black and White are mixed, Gray is formed, or if a transparent Black is washed over a white surface, a corresponding effect is produced.

Primary colors are three only, Yellow, Red and Blue. They are such as yield others by being compounded, but are not themselves capable of being produced by composition of other colors. By way of distinction they are occasionally designated entire colors. Secondary colors are three only, Orange, Green and Purple. Each of these is composed of, and can be resolved into, two primaries; thus Orange is composed of Red and Yellow, Green of Yellow and Blue and Purple of Blue and Red.

Tertiary colors are three only, Citrine, Russet and Olive. Each of these is composed of, or can be resolved into, either two secondary colors or the three primaries; thus Citrine consists of Green and Orange, or of a predominant Yellow with Blue and Red; Russet is compounded of Orange and Purple, or of a predominant Red with Blue and Yellow, and Olive is composed of Purple and Green, or of a predominant Blue with Yellow and Red.

The last three genera of colors comprehend in an orderly gradation all those which are positive or definite, and the three colors of each genus, united or compounded in such subordination that neither of them predominates to the eye, constitute the negative or neutral colors of which black and white have been stated to be the opposed extremes, and grays their intermediates. Thus Black and White are constituted of, and comprise latently, the principles of all colors and accompany them in their depth and brilliancy, as shade and light.

Semi-neutral colors belong to a class of which Brown, Maroon and Gray may be considered types. They are so called because they comprehend all the combinations of the primary, secondary and tertiary colors with the neutral black. Of the various combinations of black, those in which yellow, orange or citrine predominates have obtained the name of brown; a second class, in which the compounds of black are of a predominant red, purple or russet hue, comprise maroon, chocolate; and a third class, in which the combinations of black have a predominant hue of blue, green or olive, include gray and slate.

It must be observed that each color may comprehend an infinite series of shades between the extremes of light and dark, as each compound color may comprise a series of hues between the extremes of the colors composing it, and as the relations of colors have been deduced regularly from white or light to black or shade, so the same may be done inversely from black to white. On this plan the tertiaries, Olive, Russet and Citrine, take the place of the primaries, Blue, Red and Yellow, while the secondaries still retain their intermediate station and relation to both.

Thus, Russet and Olive compose, or unite in, dark Purple, Citrine and Olive in dark Green, Russet and Citrine in dark Orange. The tertiaries have therefore the same order of relation to Black that the primaries have to White; and we have black primaries, secondaries and tertiaries inversely, as we have White primaries, secondaries and tertiaries directly. In other words, we have light and dark colors of all classes.

It is important to the painter that he should understand the difference between hues, tints and shades. By mixing white with the original color, a tint is produced; by mixing color with color, compound colors or hues are formed, whilst from the mixture of colors or tints with black, shades result.

PRIMING.

This is the most important paint coat applied to any surface. It must fill and satisfy the surface and leave a foundation upon which future paint coats can be successfully built. It holds the same relative position in painting as does the foundation of a house in building. It must last and successfully hold the superstructure as long as it remains. It must carry sufficient linseed oil to not only satisfy the surface but bind or hold the pigment to the surface. It must carry sufficient turpentine to cause penetration and assist in forcing, by absorption, the oil and pigment into the surface. The formation of the pigment must be such as to allow of penetration into the surface, and above all, the primer must be well and evenly brushed out and into the surface.

The common idea that anyone can prime a building is a serious mistake. The priming coat offers the best opportunity for judging a painter's work. If he is a capable, careful man he will use as much or more care in applying this coat as he would in the application of the second or third coat. He will brush the paint into the wood, satisfying the soft grain, and carefully brush the hard grain where there is less absorption, leaving an even, uniform coating.

It is impossible to erect a frame building and have all of the timber of the same absorbing qualities. The sapwood absorbs paint more readily than the heartwood, which is of a harder grain. This fact does not necessitate a different reduction for each kind of grain in the same lumber, but it does necessitate the painter's properly applying and brushing out the paint.

In priming soft wood, the paint should be applied with a full brush and enough paint used at all times to satisfy the surface. It should be well brushed and especially on the harder grain to assist or force the paint into this close grain and remove by hard brushing any surplus paint that remains on the surface.

On hard or close-grained wood a medium full brush should be used in applying the paint, as this class of wood does not possess the absorbing properties of softer woods, but requires more brushing in order to force a sufficient amount of oil and binder into the wood and at the same time not leave an excess of paint on the surface.

If the priming coat is of the proper consistency, carrying sufficient pigment to fill and hide the grain, and well brushed into the grain of the wood, most of the absorption will have ceased with this coat and no excess of pigment left on the surface. This thin coat will allow the second coat to penetrate through and satisfy any part of the wood which was not fully filled at the time of priming, also allow the second coat to bind itself to the wood and priming coat.

An excess of paint on very porous woods will cause peeling or chipping. This heavy coat prevents the oil from penetrating the woods and assists in holding the coat on the surface. The oil and binder in the second coat penetrates into this heavy coat only and does not reach the wood so as to assist in forming a solid coat well bound to the surface.

Paint heavily applied to a hard or close grained surface will dry with a gloss, forming a hard glaze over the surface, into which the second coat cannot penetrate to any depth; it will only fasten itself to the outside of this glaze coat, whereas it should go through to the wood so as to help strengthen the second and subsequent coats.

Do not prime a building and allow it to stand any longer than is necessary in order to thoroughly harden the paint and allow of full absorption. If allowed to weather, the priming coat will become porous and absorb the life of the second coat and there will not be sufficient binder left to properly adhere to the surface.

Never use a cheap primer. While cheap in the first cost, it is without exception the costliest in the end. The primer should be of the best and of the same material as the intermediate and finishing coats.

Dry colors mixed by hand should never be used for priming. All paint pigments are much more bulky in the dry state than when properly handled under pressure and combined with oil. When a mixture is made without pressure the outside particles of the pigment are only coated with the oil or thinners, and when applied to a surface, the wood having a greater attraction for the oil than does the pigment, the surface will absorb the oil from the pigment, leaving a dry, porous coating to which subsequent coats cannot successfully bind.

SCENE PAINTING.

When purchasing any burlaps to paint the scenery on, confine the selection to a good article, which should not be too thick, and should be of a close texture, evenly woven and light. The stoutness should, however, be increased for very large scenes or drops. In place of burlaps, stout unbleached muslin is frequently employed, but it does not by any means answer so well.

With respect to the width of the canvas, that which is manufactured two yards wide is the most preferable, as the scene will not require so many seams. For ordinary scenery these seams should always run horizontally, but for a moving panorama they must assume a perpendicular direction, since the canvas on which it is represented has to be unrolled from a cylinder placed vertically on the stage at the time of exhibition.

These are the most needful articles to begin with: A common iron or tin kettle, in shape resembling a fish kettle, to melt the size in and a ladle to pour it out when required for use; an earthenware pan, about fifteen or eighteen inches in diameter, to contain the whiting that has been moistened and made fit for use; about four dozen earthenware paint pots, from the smallest to the largest; a grindstone and muller, or what would do still better, a grinding color mill; a large palette knife; a good sized sponge; a plumb line; some chalk and a couple of chalk lines; some common charcoal, of which only the softest and finest pieces are to be selected; some drawing charcoal, the large French is the best; a couple of pounce bags. These can be made in the following manner: Take a piece, about eight inches square, of very open canvas, of an old stocking, or of any other material that will just allow the pounce powder to pass freely through the surface of the bag. Pulverize some charcoal, chalk, or whatever other substance may be considered best adapted to the purpose, to as fine a powder as possible. Place a sufficient quantity of it on the middle part of the canvas. Then draw up the four corners and tie them together with a piece of string so as to form a round pad which is to be rubbed over the pounce to be transferred to the canvas.

Foils. These are used chiefly in fairy scenes, for the purpose of imitating gold, silver and jewels of every shade and color. They can be purchased at any theatrical wardrobe and ornament maker's, as well as at oil and color shops.

White, Gold and Copper-Colored Dutch Metal. This is also sold by the above-mentioned dealers. It is, of course, cheaper, but tarnishes sooner.

A couple of wooden palettes, one three feet by one and a half, the other four feet by two, which any carpenter can make. They should have a ledge three inches high at each end, and one at the back to prevent the colors from flowing off. They may be made with a separate division for each color if preferred. Before making use of the palettes they must have three or four coats of white lead laid over them and afterwards be rubbed down with sandpaper to get them as smooth as possible.

A Flogger. This implement is employed for clearing away the charcoal after the sketching in is completed. To make one, cut off a piece, about two feet long, from a broomstick, and round one end of it nail about a dozen strips of canvas or calico, each strip being two feet in length.

Straight Edges. Of these, three or four will be required, one being exactly two yards long and four inches wide and marked off in feet, to serve as a measure. They should be made of thin deal and have a flange at each edge. One of them should be thin and pliable enough to bear being bent whenever drawing curves or arches.

The mode of proceeding will then be as follows: Grasp the handle with the left hand and press the lower edge of the straightedge against the canvas, keeping the upper edge away from it. Now, resting the brush on the upper edge, draw it along the canvas and a line is ruled. It would be advisable to practice ruling lines in this way as it will be found to present a little difficulty at first.

Brushes. Of these you will require:

Two each flat hog tools, Nos. 2, 4, 6, 8, 12 and 24.
One each sash tools, Nos. 1 and 12.
Two each sash tools, Nos. 2, 4, 6, 8 and 10.
One 4-inch flat camel hair brush.
Two each quilled tools, Nos. 2, 4 and 6.
Six each quilled tools, No. 1.
Two 9-oz. ground distemper brushes.
Two No. 8-0 oval ground brushes.
One No. 4-0 over ground brush.
One No. 1 oval ground brush.
One No. 3 oval ground brush.

COLORS.

White. Procure the best gilders' whiting, as it is well washed and has more body than common whiting, and less lime. It is sold in large lumps and only requires to be broken up and plunged into as much water as will serve to soften it without bringing it into a liquid state. This last remark applies to all the colors when they are put into the stock pots ready for use. Whiting is used to mix with almost all the colors, to reduce them, in the same way as Flake white is used in oil painting or as water is used in water color drawing.

Flake White. A fine white, very solid, but turns a little brown in distemper, after a short time. It is only used where extra brightness is required and for the highest lights. It is sold in lumps and can be crushed in water with a palette knife to be ready for use.

Zinc White. Very white, but has less body than flake white, though more permanent. In all other respects it is the same and is prepared in the same way for use.

Lemon Chrome. A brilliant light yellow, sold in lumps, and only requires to be crushed as above.

Orange Chrome. A fine rich bright color, in all respects of the same nature as the other chrome.

Dutch Pink. A most useful yellow for distemper painting and mixes well with any other color. It is sold in lumps, but must be ground in water to be ready for use.

Light Yellow Ochre. This is a very useful and cheap color. It is sold in a powdered state and only requires to be plunged into water to be ready for use.

Dark Brown Ochre. Of the same nature as the above and prepared for use in the same way; unfortunately, it is very sandy.

Raw Sienna. A fine rich golden yellow, for glazing, chiefly; sold in broken lumps, very hard, and requires most careful grinding in water to be ready for use. As grinding shall be often spoken of let it be understood that it is always in water.

Orange Lead. A very bright and powerful red, sold in powder; requires only to be plunged in water to be ready for use.

Vermilion. A fine red, sold in powder, and only requires to be plunged in water.

Indian Red. A good color, also sold in powder, and prepared in the same way for use.

Venetian Red. A very cheap and useful color, also in powder, and prepared in the same way for use.

Damp Lake. A useful color in distemper. It is sold in a damp, pulpy state and only requires to be kept damp for use. It is a fine glazing color.

Carmine Paste. A magnificent color, has great power, and is a fine glazing color. This, also, only requires to be kept damp, as it is sold ready for use. It need not be put on the palette till required.

Rose Pink. A useful color, sold in soft lumps, but requires grinding for use.

Brown Lake. A good color, requires grinding.

Burnt Sienna. A fine color, requires most careful grinding. This is a good glazing color.

Vandyke Brown. A fine useful color, is a good glazing one, requires most careful grinding.

Raw Umber. A useful color, requires grinding.

Burnt Umber. A good color, requires grinding, and is a good glazing color.

Drop Black. A very useful color, requires grinding.

Blue Black. Is also useful, requires grinding.

Indigo. A very useful color, very hard, requires to be broken up and steeped in boiling water for some time, then ground up in the usual way. A good glazing color.

German Ultramarine. A good blue, sold in powder, and only requires to be plunged in water.

Prussian Blue. A powerful blue, hitherto scarcely used in distemper, but likely to be of much use. Requires good grinding.

Azure Blue. A fine, useful blue, better than German ultramarine for most purposes. A powder color and has only to be plunged in water.

Blue Verditer. A fine night color, but of a sandy nature, and very difficult to work with. A powder color and requires only water put to it for use.

Dark Green Lake. A most powerful green and very useful. Requires grinding for use.

Light Green Lake. The same as the above, only much lighter.

Emerald Green. A very bright green and should be sparingly used. Requires no grinding, as it is in powder.

MIXING COLORS.

The most difficult feature of painting in distemper is that the colors dry so much lighter than they are when first put on, and many of them have, by gaslight, an entirely different appearance than they have in the daytime. Most colors dry several shades lighter than they are when wet, and, worse still, they do not all dry lighter in the same proportion, so that any person new to the work cannot estimate the particular shade of his paint when first laid on. It is, therefore, advisable for the painter to try his colors on a small scale at first, and dry them in front of the fire.

To render the colors opaque, a certain proportion of whiting or flake white is always mixed with them, according to the shade desired. Transparent and glazing colors being an exception to this rule, no whiting is used with them. The strength of the size also makes a vast difference; very strong size darkens. As to the appearance of colors at night: French ultramarine, a bright blue by daylight, is a muddy purple by gaslight, and therefore unfit for distant tints or for brightness. Verditer blue, cobalt blue, celestial blue are best. Yellow is much lighter by gaslight, and rose pink loses its brightness. The colors being all mixed with water to a pulpy state are now put into the compartments on the palette, putting no more on the palette than is required for immediate use. In scene painting many of the different shades are only obtained by mixing one color with the other while on the palette. The way to do this is as follows: Suppose a purple is wanted, the painter would take up a clean brush and dip it in the size-can; he would then transfer it quickly to the compartment on the palette containing the rose pink, and having got a good brushful of his color, would spread it on the palette; he would then dip the brush in the ultramarine and mix this also with the rose pink, and to get it a shade or two lighter he would dip the brush in the whiting pan. Tints composed of three or four colors can be rapidly compounded in this way, adding more size as often as required to render them workable. Where a lot of color is required, as for skies, the colors are mixed in pots, and to get the various tints the painter dips his brush first in one pot and then in another, and in this way puts in a sky of perhaps a dozen different hues.

For foliage, a quiet general tint may be obtained by mixing Dutch pink with black, indigo with blue verditer. Light ochre with green lake gives a rich green, which may be changed to a cool one by the addition of indigo. For sunset skies mix in separate pots the following: verditer and indigo; verditer and damp lake; damp lake and orange chrome. For clouds, mix verditer and orange red, or Venetian red and azure blue; rose pink and azure blue. For cold gray clouds add a little black. For lights in clouds, mix yellow ochre and rose pink, or yellow ochre and orange red. For distant foliage mix verditer and rose pink, or use Dutch pink alone. For the sea, Dutch pink, verditer, indigo, raw sienna, azure blue and emerald green will be found most useful. For rocks some of the following tints will be useful: indigo, burnt sienna and rose pink—emerald green and black—Vandyke brown and ultramarine—indigo, rose pink and ochre. Black and Venetian red make a useful gray. For gold colors mix brown ochre and Dutch pink, or Dutch pink and sienna or Vandyke brown, these for laying in. For the lights use flake white and lemon chrome, orange and yellow chrome, chrome and Dutch pink. Purple and mauve look fresh by day, but are dirty and muddy by gaslight. For moonlight skies a good tint is verditer and indigo mixed. For clouds add black and more indigo. Water is generally the color of the sky and the objects that are reflected therein, such as trees, banks and rushes. For branches and trunks of trees, use indigo, lake and yellow ochre—burnt sienna and ultramarine—Dutch pink, burnt sienna and indigo. For grass, use pure greens, mixing more or less yellow chrome for high lights. In painting dead leaves use chrome and burnt sienna. For stone buildings, mix yellow ochre, umber and indigo, or ochre, celestial blue and red. For bricks, Venetian red, and for shadows add ultramarine. Where fire is reflected use orange lead.

Great care should be taken in mixing tints, for some colors like Prussian blue are so strong that a very little will suffice, so if used without due thought it becomes necessary to add more of the other colors.

Some painters mix molasses or golden syrup with their size, which makes the colors work more freely. In painting a scene on a new cloth the first thing to be done, after the canvas is strained, is to size it all over. This is done with strong size, size melted in a kettle with just water enough to prevent burning.

MEDIUM FOR BINDING DISTEMPER COLORS.

Size is sold in firkins or by weight. That called best double is to be preferred and when melted must be mixed with water in the proportion of one pint of size to four pints of water to make what is called working size. Another called strong size, for sizing and priming a cloth or any piece covered with canvas, may be made by dropping the size, exactly as it comes from the shop, into a size kettle in which there is just sufficient water to prevent the size adhering to the bottom of the kettle. The size is ready for using as soon as it is completely melted, without having been allowed to boil. Use is frequently made of what is called half-and-half size, a mixture of working size and strong size in equal quantities.

Should the painter be unable to procure manufactured size, the best carpenters' glue is a good substitute for it. This can be obtained almost anywhere, and, in an unmelted state, will keep good in all climates. It can be melted in a carpenter's glue pot in the usual way and then weakened with water till it is of the consistence required. The quantity of water will depend on the strength of the glue, which varies considerably, but, in any case, keep on adding as much water as will allow the glue size to set in the form of a firm jelly when cold, and if to one part of this there are added four of water, the result will be working size. Half-and-half can be made as before.

In moderately cool weather working size should assume the condition of a weak jelly when perfectly cold. Test the strength of it without waiting for it to cool, by the following means: Thin the strong size with water till about the right consistency. Then, after dipping your fingers into it, put them together a little while; if, on endeavoring to separate them they adhere ever so little, the size is properly made, but if they stick together quickly and rather firmly, it is too strong and wants weakening. If, on the other hand, the fingers separate quite freely, the size requires to be made stronger. This method of testing the strength of the working size is worth attending to as well as practicing; for if use is made of size that is too strong, your work will have a shiny appearance and the effect will be spoiled, while the colors would soon wear off if the size has been made too weak.

But should even carpenters' glue be unprocurable or not at hand when required, use leather or parchment cuttings, pieces of skin of any kind, or, in short, of any gelatinous substance that has no grease in it. Put them with water into any metal vessel and let them simmer till they are converted into a strong jelly, from which can be produced the same descriptions of size as those already alluded to.

As size does not keep well during the hot weather, when it gives off a very offensive odor, do not make more then than will suffice for the day's work. A little carbolic acid, however, mixed with the size will prevent its decomposition. The mixed colors, likewise, will probably deteriorate before the scene is finished, should the weather be hot. In that case, if the color sinks to the bottom of the mixture, the size will float on the top. Pour this out and replace it with fresh size.

TO PREPARE THE CANVAS.

If the dimensions of the canvas do not exceed that of the frame, strain it and nail it on with $1\frac{1}{2}$ or 2-inch clout nails, about four inches apart from each other, taking care that the threads of the canvas have perpendicular and horizontal directions. The nails should only be driven home about halfway, as, when the painting is finished, they will all have to be taken out again in order to remove the canvas from the frame. Having thus strained and fastened the canvas so as to get it to lie tolerably smooth on the frame, apply the size to it as afterwards directed and the whole will be stretched as tight as a drum-head.

But suppose the canvas is too large to allow the frame to take in the whole height of the scene, which frequently happens even in regular painting rooms, resort must be had to what is called a bight in the canvas and proceed thus: Nail the top of the canvas along a straight line drawn on the top of the frame, and let the remainder lie evenly down the front, dropping the portion of the canvas that extends beyond the bottom of the frame through the cut, if there be one, or gathering it up carefully below. Now drive a nail through the end of a seam that is about halfway between the top and bottom of the frame, after having pulled it slightly downwards, keeping the side edge of the canvas even with the side of the frame. Then measure how far the nail last drove in is from the top or bottom of the frame, and nail the other end of the seam to the other side of the frame at the same relative distance. Next stretch a chalk line from one nail to the other and make it fast. This will furnish a horizontal line, parallel, of course, to the top and bottom of the frame. Now give a downward pull to the middle part of the canvas at the bottom of the frame till the seam before spoken of is level with the chalk line at the center and fasten it to the frame with a clout nail. In the same way pull and fasten the canvas at each side of the above point, at intervals of four inches, till the corners are reached, when the line in which the seam is ought to coincide with that shown by the chalk line. In doing this be careful not to pull the canvas sideways, but quite perpendicularly and so that no wrinkles should form. Strain out and nail down the sides, pulling them in a horizontal direction and not harder than is necessary to make the canvas lie tolerably flat. The work being thus far satisfactorily accomplished, remove the chalk line and commence sizing as follows: Heat some of the strong size before described, and with a two-knot brush apply it to the canvas, commencing at the top of the frame and working crosswise from one side to the other to the depth of about two feet. Keep the canvas tolerably well soaked with the size, and let no part remain uncovered, except about six inches above where the bottom row of nails are driven, so that the marks caused by the latter may be afterwards got rid of. Continue thus till the whole surface of the canvas is covered up to about six inches from the bottom nails.

When all the size that has been applied to the canvas is perfectly dry, proceed with the priming. The priming is made in the following manner: Take as much of the whiting that has been soaked in water as will suffice to cover the whole surface of the canvas, taking care that it is thoroughly dissolved and free from lumps. Drain the water well from it and mix it with strong size only. The priming should now be of such a consistency that when a brush full of it is drawn against the side of the pot or pail which contains it, it will run down and as much remain on the side as will leave no part uncovered. The priming should also flow freely from the brush, but yet have enough body in it to impart, when dry, a nice even white surface to the canvas.

In laying in the priming, the flat of the brush, not the edge, should first be moved up and down the canvas with as long a stretch as possible, then horizontally, and afterwards perpendicularly again. Repeat these actions till the canvas is well covered, finishing off horizontally. Begin at the top, and the splashes will become smoothened as you proceed downwards with the priming. Be very careful to well cover the canvas, for it is most vexatious to have to touch up those places that have been left bare or not sufficiently covered, and the surface never looks so clear, or is so fit to work on as when all the priming is done whilst wet. The same precaution, also, must be taken in the priming as in the sizing, namely, not to prime nearer than six inches from the bottom row of nails.

As soon as the priming is quite dry, proceed to take in the bight before spoken of which is done in the following manner: Suppose, for example, that the canvas is eight feet deeper than the frame. At the distance of three inches from the top, which must be allowed for the row of nails, measure eight feet downwards on each side of the frame, and there strike a line across with charcoal. Then, with a pair of carpenter's pincers, draw out all the nails except those in the top row. Now let an assistant take hold of the canvas at one end of line just struck, and one or two other assistants, according to the width of the canvas, are holding the parts that are between. Let all then pinch the canvas along the struck line into a straight fold, and afterwards lift that part simultaneously till it is just under the top row of nails, being careful that the canvas which is folding itself at the back is made to lie evenly, and with as few creases as possible. If the lifting has been properly performed, the canvas will not have shifted, either to the right or to the left, and will hang tolerably even. Next drive a clout nail a little below and in the middle of the fold, and then other ones on each side, at intervals of four inches, as before, some one else helping you to keep the fold even and parallel to the top line of clouts while the tacking is being carried on. All that remains to be done is to tack down the two sides, straining out from the center towards each side. If there be a seam in the part of the canvas just lifted up, get it horizontal by means of the chalk line and nails, as before explained, which would also serve to regulate the tacking at the bottom. Now size and prime the new surface in the same manner as before, using the size and priming hot, and the whole of the canvas will present a uniform appearance.

SIGN PAINTING.

Before giving some specimens of letters especially adapted for sign writing, it should be impressed on the sign-painter that all eccentricity in the forms of the letters is for the purpose quite out of place on inscriptions over a store or on a wall, and in the situations where his work is called into requisition, however much the purposes of posters and placards are supposed to be assisted there; in the latter case the object is to catch the eye of the passer-by, in spite of the numerous other announcements by which each may be surrounded. The question in that case, becomes how to make one more striking than the other, and in this some of the placards succeed admirably. It is in fact impossible to speak too highly of the progress made in this respect by wood-letter cutters, some of whose works may truly be taken as models by the sign-painter. The test of beauty is fitness, and as the inscription of the name and trade of a storekeeper is not likely to be eclipsed by another inscription close to it, that the very architectural members serve as a separation, or, as it were, a framing, and that therefore no expedient is necessary to protect the words from being confused by the proximity or brilliancy of another inscription, but that simplicity, boldness and clearness are the great conditions to be fulfilled by the sign-painter.

The characters shown in Fig. 65 have been called Sans-serif, Celtic and Grotesque, and are well adapted for situations when, owing to distance or other circumstances, fine lines and minute details would be out of place, or would diminish the boldness of the inscription. In Fig. 65 the character is given in its heaviest form, such as would be used high up on a wall, and where there is plenty of space at the disposal of the painter. This character does not admit of shadows or thickness, as it is in itself so solid that any addition to its form renders it clumsy.

For situations nearer the eye, Fig. 66 is given, in which the letters are thinner and the general form more open. The

Fig. 65.

form is thus rendered altogether more elegant and may be either used plain, or with thickness and shading. The letters require great care in outlining, so that all the lines may be kept of the same thickness, and that the same character may be preserved throughout.

The character shown in the last example is well adapted for situations where the inscription is only of moderate

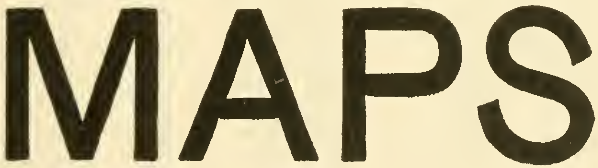


Fig. 66.

length, compared with the space at the disposal of the painter. Fig. 67, however, shows how the letters given in Fig. 66 may be narrowed, or, as it is termed, elongated, so as to get a long inscription into a moderate space, and the sans-serif letter is better adapted than any other for this purpose, being, as it were, self-contained, that is, having no serifs or projecting ends to take up space. The above is not by any means the narrowest letter of the kind, but will serve as an indication of the style.

Fig. 68 shows the character given in Fig. 67 in a lighter

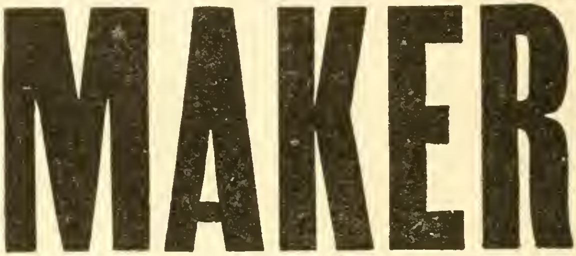


Fig. 67.

form, and is perhaps one of the most elegant letters of the kind. It may be used plain, or with the addition of thickness and shading.

In Fig. 69 is given the Roman character, the most elegant of all those in use, and requiring the greatest care in

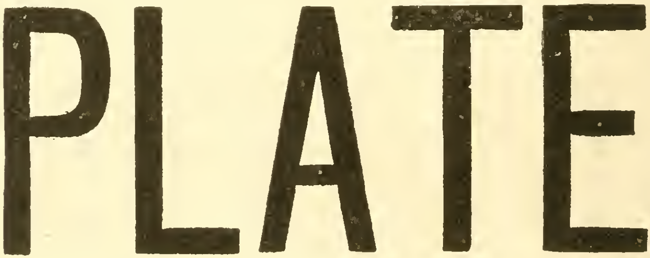


Fig. 68.

outlining. It is not well fitted for distant situations, for as such a large proportion of the lines are fine, the whole of the letter does not strike the eye equally, nor is it, when the fine lines are properly rendered, well adapted for shading or for raising by means of thickness; it will, of course, be supposed that the whole letter would be made of the same thickness of wood, then the representation of this would, in the case of the fine lines, be broader than the lines themselves, which would seem, as it were, the edges

MODES

Fig. 69.

of the wood of which the letter is composed, instead of the surface.

As this character is often used for notices and other similar inscriptions, in Fig. 70 is given a specimen of the lower

repairing

Fig. 70.

case. Experienced sign-painters adopt two-thirds of the height of the capitals as the height of the small letters, and this is an admirable proportion. Any one who will take the trouble to look, will observe that wherever the

MERCER

Fig. 71.

capitals tower above the other letters in an undue proportion, the general forms and workmanship will indicate that the inscription is the handiwork of a second-rate artist. In types, the above character is called Canon, and in Fig. 71

examples are given of the character called Aldine, a very refined letter of a narrower character than the other; these are both adapted for situations where a rather long inscription has to be got in, but, although the last looks well in print, it is not adapted for letter painting, in which characters narrower than those in Fig. 69 should not be used.

DRAPER

Fig. 72.

Fig. 72 is an example of a letter now very much used, under the name of Runic, but it would be difficult to defend the appellation, considering that it differs in every particular from the truly Runic characters, but in the multiplicity of letters it had become necessary to give some designation to this style, and on the principle that a rose by any other name would smell as sweet, the title by which this character is known has been bestowed upon it.

Runic letters possess much of the lightness and elegance

HAT

Fig. 73.

of the Roman, whilst at the same time, owing to the greater equalization of the thickness of the lines, they are bolder, and may be used with both thickness and shading, whilst the thickening of the fine lines is gradually lost in a pointed termination of the serifs.

Following up the system of thickening the fine lines of the Roman characters, a letter called the Clarendon, Fig. 73, has been introduced. It is an exceedingly handsome and dignified letter, and is, as far as general proportions are concerned, similar in every respect to the Roman. It is outlined by ruling two horizontal lines at bottom and two at top, to regulate the thickness of the serifs or feet, and these may be made to project more or less, according to the space at disposal, the example presenting the maximum in this respect.

In this, as in the Roman character, the vertical are merged into the horizontal lines by curves at the angles, and the sign-painter should beware of exaggeration in this

CASE

Fig. 74.

particular. The perpendicularity of the one line, and the horizontality of the other, must not in any way be interfered with; in the sketch they should, in fact, meet and form a right angle, which should just be rounded off. Even in this particular, the work of a first-rate sign-painter is evident, for in inferior work the curve is often begun from the very beginning of the serif of the letter to hide the failure in the horizontality of the line. The painter may in this, as in other departments of work, be assured that it is in the refinement of points such as these where the skilled artisan, possibly only another name for the artist, is distinguished from the common handicraftsman.

Fig. 74 is another specimen of Clarendon in a condensed form, and narrower than this, the letter should never be used, as the beauty of the character is lost when the space forbids the proper extension of the feet of the letters.

We would suggest to the letter painter the use of the Clarendon character in notice-boards, Fig. 75, where it is bolder than the Roman, and is perhaps more rapidly executed, as the thin lines do not require so much care as do the fine lines in the Roman.

Next in solidity to the Clarendon is the Egyptian, or,

This Desirable
RESIDENCE
to be Let.

For particulars
apply to

Fig. 75.

as it is by some painters and printers called, the Antique. It is scarcely worth while asking which is the more correct name, as neither of them is in the slightest degree justifiable. The names seem to have arisen from the letters appearing as if made up of blocks, having thus some similitude to the massive Egyptian buildings.

The letter is a most useful one, the boldest there is, and is especially adapted for being rendered with thickness and shading. It differs from Clarendon in being heavier, and in its angles being accurately rendered, without being rounded off as in the Clarendon. When Egyptian letters are painted on a very large scale all the lines may be made of the same thickness; the letters then have a very striking effect. When of a medium or small size, the down strokes should be rather thicker than the others.

Fig. 76.

Fig. 77 is an example of condensed Egyptian, and narrower than this the letter should not be used, for if the space be so limited that such a narrow letter is required a sans-serif may be used, and as that character has no projecting feet it will allow of a wider letter being employed.

The characteristic features of what may be called the three great orders of plain letters have been given, and all

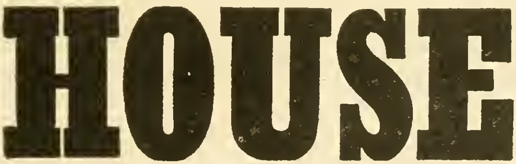


Fig. 77.

who would excel in letter painting should study and practice these until they become quite proficient in them, since all the ornamental letters should be based upon them, the general forms being the same, the difference consisting only in the lines being curved or in the addition of ornamentation.

Fig. 78 is called Classic. It is a very useful character, elegant in its simplicity. The letters should be sketched and spaced as for Clarendon, the difference consisting merely in the serifs turning round into scrolls. The effect of this letter, when painted in black on glass with a diapered gold background, is very good. The addition of thickness and shading to this character, owing to the amount of

Fig. 78.

drawing required, is a work of some difficulty and time, whilst the appearance is not thereby improved.

The character shown in Fig. 79 goes by the name of Tuscan, but it is, as it were, an ornamental rendering of the Egyptian, within the outline of which it may very well be sketched. The letter is given as usually drawn.

This letter may be shaded, or rendered with thickness.

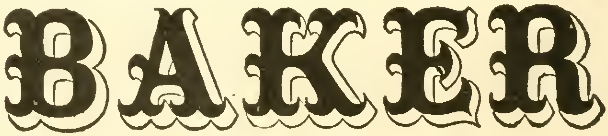


Fig. 79.

Fig. 80 shows another letter called open Tuscan. An inscription in this character in a light color on a dark ground with a darker line on the right and under side, and the pattern on the letter in a bright color, comes out, to use a technical phrase, very well. The main beauty of the letter, however, consists in the correctness of its form, and its rather angular character, and if these points are not observed, the painter may depend that all his colors, however brilliant, and all his gilding, however well done, will be thrown away or will serve to show only the more plainly the defects in the form.

Which to admire the most, the beauty of the letter shown in Fig. 81, or the plain sense of its designer, who, discarding the terms Classic, Runic, Tuscan, or other names abso-

Fig. 80.

lutely inappropriate to the character, has called it simply Ornamented, a name which it really deserves, being one of the handsomest characters in use. The coloring must be left to the taste of the painter, but it must be pointed out, that the space between the surrounding line and the letter itself is not to be filled in, in which case it would form a heavy broad border, but it is intended to be a single outline only, thus lightening the effect of the letter, and increasing at the same time its distinctness.

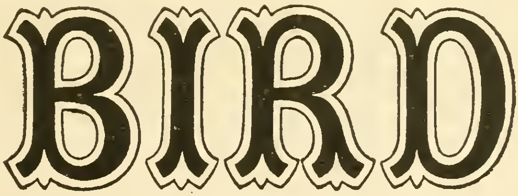


Fig. 81.

Fig. 82 is an example of Rustic character, well adapted for the name or inscription of a horticulturist or somewhat similar trade. In order to elevate the art, the sign-painter should be prepared to submit sketches of the inscription as a whole, and of individual letters drawn full size, and a well-selected set of patterns in a book will afford the customer an opportunity of examining the different characters before giving his order, and the sign-painter may be assured that this plan will be by far the most satisfactory one that could be adopted in the interests of all parties concerned.

A word is given in Fig. 83 in the Elizabethan character,

Fig. 82.

which is perhaps the best adapted for business purposes. Church text is not well fitted for general inscriptions, as it is, of course, more or less associated with sacred things, and as it has varied from time to time a great amount of study is necessary in order to render it correctly.

In contrasting the Old English character with the German text, Fig. 84, it will be observed that, whilst the former is essentially angular and severe, the latter is rounded

Fig. 83.

and free. Thus, flourishes seem almost necessary to German text, whilst they are utterly out of place in Old English or Church text. They should always have some apparent connection with the letters themselves, and should not be used just to fill up a vacant space. A word or sentence is often too crowded at one part of the surface on which it is painted, leaving a blank space at the other, and this is usually filled up with a meaningless flourish. By the method already pointed out for spacing the letters, this ugly expedient is rendered unnecessary.

The Old English and German text do not look well when rendered with thickness. They are so essentially writing characters that fine lines are indispensable to them, and the beauty of these and the contrast of them with the thick

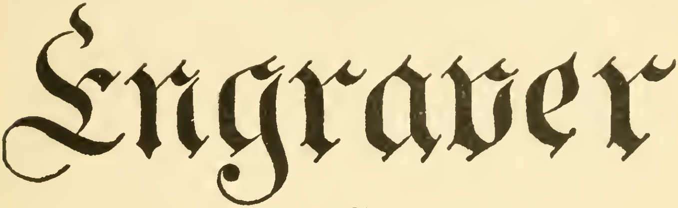


Fig. 84.

lines are diminished when both are viewed from the side, and are seen to be equal in solidity, both characters, however, look well when outlined with a darker color than that in which they are painted, but in that case, more than ever, the absolute correctness of form must be insisted upon.

Italics, as in Fig. 85, are not by any means the easiest

Fig. 85.

characters with which the sign-painter has to deal, the main difficulty being the uniformity of slope. In the letter M, the right-hand down stroke, which in the Roman character would be upright, must take the slant of the general mass of letters.

The A and V afford subjects for some study and trial. They may either be drawn so that their down strokes slant like the other letters, or they may be outlined in a parallelogram, their point being in the middle of one of the sides. The X is necessarily drawn according to the latter method. Fig. 86 shows the small letters, or lower case, of the Italic character. It is as it were a substitute for plain writing, but no flourishes of any kind are admissible.

The words written in Italic small, must not be spread, in fact, the character looks much better when packed, or placed close together, the down strokes not being too thick. It is very important that a uniform slant should be preserved throughout, and this slant should not be quite as

Fig. 86.

oblique as that of writing characters, a set square of a different degree to the one already alluded to should therefore be provided for this purpose. Of the Script or writing character, the most elegant of all, one specimen only is given, Fig. 87, knowing that this character has been more studied than any other, since it is the hand taught in schools. Yet, writing with a pen is very different from drawing the letters which are to be painted, the first is done in an off-hand manner, the latter should be drawn deliberately and carefully. The writing done with a pen is as a rule temporary in character, and the exact form of each letter and the spacing of the words are matters of but small consequence, unless the work be a piece of ornamental caligraphy or illumination. But, as already stated, the work of the sign-painter is to have a permanent object, and must therefore be carefully outlined and spaced. The painter should take as models the engraved head-lines of some of the copy-books now used in the schools, then proceed to draw the letters on a much larger scale, outlining them in pencil, and subsequently in color, and finally practicing them on an upright board.

As already stated, a fair but not exaggerated slant, and much taste, are required in the arrangement of the capitals and their heights, and of the heights and lengths of the

Fig. 87.

long letters. If the capitals are too small, a degree of meanness is given to the writing, and the effect of the tails of the letters being too short is extremely unpleasant. Various teachers of writing and engraving have different rules as to the lengths of the letters which are to project above and below the lines, and these rules, which will be apparent from the examples above referred to, must be taken as standards, to be adapted to the circumstances of the case, for the height of the surface on which the work is to be executed being limited, and a certain inscription being required, the heights of the letters must in some cases be modified, the letters should then be kept rather thinner than otherwise, or they will look clumsy, the thickness in fact of the script character should always be kept within, rather than up to, the maximum, as the work never looks well when the down strokes are too thick.

As a rule, the capitals should be at least double the height of the line of the other letters, and the long letters such as l, d, etc., should be nearly up to the same level, whilst the tails or loops of letters such as g or p should extend the same distance below the line, the letter t being just half the height of the general letters above the line. Thus if the body of a line of writing on an architrave were to be 6 inches, the capitals and long letters should be 12 inches high, whilst the latter should descend 6 inches below the line, and the letter t should be 9 inches high. It adds, however, to the dignity of the writing to give the capitals still greater height, but the long letters should never exceed the proportions laid down, whilst they may, if required, be rather shortened.

Great care is necessary in forming the turns in writing characters, so that the junctions of the up and down strokes may be gracefully accomplished, the down strokes must be drawn to their exact slant until near the turning, they must not be kept, as it were, bending in their whole length, nor on the other hand must the bend take place too suddenly.

It is not advisable either to give the appearance of thickness, or to shade writing characters, for the lightness and elegance of the work is much diminished by either process.

A very elegant style of writing, called the Italian, is well adapted for inscriptions where the business is one of a refined character.

It is in fact to such inscriptions that the script character seems specially adapted, the heavier or more solid characters being better suited to trades with which they harmonize.

This idea cannot of course be carried out to its full extent, as the sign-painter is greatly in the hands of his employer, but it seems clear that there should be a certain consonance between the trade and the inscription, for instance, an inscription in church text must evidently be better adapted to the shop of a bookseller, a clerical robemaker, or a Bible warehouse, than over a shoemaker's, a butcher's, or a toy store, while the character of the writing should as far as possible accord with the style of architecture of the store front or building on which it is executed.

STAINS.

Mordants are chemical preparations, the effect of which is to fix and enhance the colors given by stains and dye-stuffs. Spirits of niter is used for the satin-wood stain, a strong solution of oxalic acid for the oak, and dilute nitric acid for mahogany.

Mahogany Stains. 2 ounces Dragon's-blood dissolved in a quart of rectified spirits of wine, shake frequently during process of dissolution.

Dark. In 1 gallon of water boil ½ pound of madder and 2 ounces of logwood chips, brush the decoction, whilst hot, well over, and when dry, paint over the work with a solution of pearlash, composed of 2 drams of pearlash to a quart of water.

Light. In 1 quart of oil of turpentine dissolve 2 ounces of Dragon's-blood, keeping the vessel in a warm place, and frequently shaking it. When completely dissolved, the mixture is to be applied to the work, or if the latter be small, it may be steeped in the stain.

Grind raw sienna on a slab, using beer as a medium, during grinding, add burnt sienna until the desired color is obtained. This mixture is then to be thinned, either with more beer or with water, and is to be applied with a brush, and wiped off with a piece of flannel. It is desirable to avoid foxey colored mahogany, and if this stain should give too brown a color, a wash made of madder or logwood boiled in water may be passed either entirely or partially over it. The work may then be oiled, varnished, or polished, as desired.

Dragon's-blood is a name given to several resins found in commerce, which have a similar appearance, a fine dark red. They are produced by one or two species of calamus, or cane-palm, and are used for coloring varnishes, and for dyeing horn so as to make it resemble tortoise-shell. The following are the various kinds of dragon's-blood: In sticks, called stick dragon's-blood. Dragon's-blood in drops or beads, said to be the best. Dragon's-blood in tears. Dragon's-blood in lumps.

Madder is one of the most important coloring substances known, and there are several species of it. The plant is extensively cultivated in Southern Europe and in Holland. Very large quantities of the root come from Smyrna, Trieste, Leghorn, and other Mediterranean ports, much of that which is received from Holland is in powder, and comes in large casks. The Turks formerly understood the manufacture and uses of madder better than other nations, and the color thus obtained the name of Turkey red. In commerce there are the following varieties of common madder: Smyrna, French, Syrian, and Italian roots, and French, Dutch-crop, Ombros, and Mull ground madders.

Logwood. The tree producing this dye-wood is a native of Yucatan in South America, the principal town of which, Campeachy, situated on the river San Francisco in the bay of Campeachy, was formerly the mart for logwood, but it is now extensively cultivated in Jamaica, and the chief trade is removed to Belize, a British settlement in the Bay of Honduras, whence immense quantities are annually exported.

The coloring matter of the logwood tree depends upon a peculiar principle called hæmatin or hæmatoxylin, a red crystalline substance which is so abundant in some samples as to exist in distinct blood-red crystals. The stems are cut into large logs, and the bark and alburnum or white wood is chopped off, the dark red inner wood being the only valuable portion. The color of a decoction of logwood is of a brownish blood-red. Acids change it to the bright color of red ink, which is often made of an infusion of logwood chips to which acetic acid is added. The alkalies strike a purple or violet, and the salts of iron a dark violet approaching a black color.

Rosewood Stain. In 3 pints of water boil ½ pound of logwood until the decoction is of a dark red color, then add ½ ounce of salts of tartar. The wood is to receive three or four coats of this liquid, which must be used whilst boiling hot, each coat being allowed to dry thoroughly before another is applied. Veins may be formed in this with the black stain, using grainers' combs or other implements, but if this is done, the work is removed from mere staining and becomes an imitation of graining. Immerse ¼ pound red sandalwood and ½ pound of potash in 1 gallon of hot water. When the color of the wood is extracted, 2½ pounds of gum shellac are to be added, and dissolved over a quick fire. The mixture may then be used over the stain above described.

Red Sandalwood. This dye-wood is the produce of a large tree growing to the height of sixty or seventy feet on the mountains and other parts of India. It is usually imported in small billets two or three feet in length, of a fine deep red color, the concentric circles of the transverse section being divided by dark, almost black, lines, with different mordants it yields brownish red, scarlet red, deep crimson, and yellowish red. These colors are not, however, very permanent. Another dye-wood, also called red sandalwood, the native name of which is Rutka-chundun, is the production of the largest trees of India. Neither of these must be confounded with the sweet-scented sandalwoods which are furniture woods.

Black Stains. To 6 quarts of water add 1 pound of logwood and two or three handfuls of fresh walnut peelings. Let the whole boil well until reduced to about half the quantity of liquid, then strain and add a pint of best vinegar, boil again, and apply the stain whilst quite hot. Dissolve 1 ounce of green copperas in a quart of water, and apply this whilst quite hot over the previous stain, which will be very much improved thereby. In 3 quarts of water boil ½ pound of logwood chips, and add 1 ounce of pearl-ash, strain, and apply whilst hot. Boil ½ pound of log-wood chips in 3 quarts of water, adding ½ ounce of verdigris and ½ ounce of copperas. Strain this decoction and add ½ pound of rusty steel filings. Wash this stain over the previous one.

Brown Stain. Make a decoction by boiling 1 part of Catechu, Cutch, or Gambier in 30 parts of water, to which add a little soda. Apply this to the wood which is to be stained, and allow it to dry in the air. Make a solution of 1 part of bichromate of potash and 30 parts of water, and apply over the stain, which may be varied in color according to the strength of the solutions used. Catechu, which is much used in dyeing and staining, is the extract of the wood of the Acacia Catechu, the seeds of the Areca Catechu, and the leaves of the Nauclea Gambir. The Acacia Catechu is a small spiny tree, rarely exceeding twenty feet in height, the wood is hard and heavy, the center is of a very dark red color nearly approaching to black, it is from this portion of the wood that the extract is made. In India, it is made by the poorer natives, who move from place to place, selecting jungles where the Acacia is most abundant. They cut down the trees, and chop the heart-wood into chips, which they boil in water, when the water is deeply colored, it is strained off and submitted to the process of evaporation, fresh supplies of the decoction being added until the whole becomes sufficiently thickened by evaporation. It is then poured into clay moulds and left to dry in the sun. The Catechu made from the Acacia Catechu is also called Cutch and Terra Japonica. The term Cutch is said to be named from the native language, in which the substance is called Kutt. Commercially, one variety is called Catechu, and another Cutch, although the source is the same. The former has been poured out onto mats when about the consistence of honey and dried in the sun. When sufficiently hardened, it is cut into small square pieces, and, after being thoroughly dried, it is packed into cane baskets for exportation. This variety has a light chocolate-brown color, and the cubes are about an inch square, having an earthy fracture and external appearance. The other variety, Cutch, is of a darker color, rich brown, with a shining appearance and fracture, it comes much mixed with broken leaves, in which it has been laid to dry, it is packed in a similar manner to the Catechu, but is most generally run into one mass. Gambier, or Gambir, is an extract of the leaves of the Nauclea Gambir, this plant belongs to the natural order of the Cinchonas, or Jesuits' bark trees. It is made by boiling the leaves and evaporating the decoction to dryness, in appearance it resembles Cutch, but it is not so glossy in its fracture, and rather lighter in color. It is mostly imported from Singapore, where it is extensively cultivated.

Walnut Stain. Boil 1½ ounces of washing soda, bichromate of potash ¼ ounce, in 1 quart of water, and add 2½ ounces Vandyke brown. This stain may be used either hot or cold.

Red Stains. Boil 1 pound of Brazil-wood in 1 gallon of water for three hours or more, add 1 ounce of pearlash, and apply it to the wood whilst hot, then brush over it a solution made of 2 ounces of alum in 1 quart of water. A solution of dragon's-blood in spirits-of-wine makes a very good stain, as already mentioned. The Brazil-wood is cut from a tree about twenty feet high, with prickly branches and yellow flowers, the decoction yields, in dyeing, rose-color, red, and yellow, according to the mordant used. It is not used in dyeing now as much as it was formerly, owing to the introduction of superior materials.

A decoction of Archil forms a very good red stain for common work, two or three washes of it should be given, after which it should be brushed over with a hot solution of pearlash and water. Archil, or Orchil, is the coloring matter of the Orchella weed in solution. It does not in dyeing produce a fast color, but it greatly improves other dyes. It soaks, however, into the fibers of wood, and is thus a useful stain for common work.

Oak Stain. Mix 2 ounces of potash and 2 ounces of pearl-ash in 1 quart of water, which will make an excellent stain. Should the color be darker than required, it may be diluted with water. It must be used very carefully, as the potash will blister the hands if allowed to touch them, the mixture should also be used with a very common brush, as it softens the hair so as to render it of little value afterwards.

Ebonizing Stains. The woods best adapted for ebonizing are sycamore and chestnut, the work should be very well smoothed and rubbed with glass paper before staining, and should be finally rubbed with glass paper or cloth which has been a long time in use, every particle of dust being rubbed off with a smooth cloth.

Boil ½ pound of logwood chips in 3 quarts of water, and add 1 ounce of pearlash. Apply this whilst hot, then boil ½ pound of logwood chips in 3 quarts of water, and add ½ ounce verdigris, ½ ounce copperas, strain the liquid, and then add ½ pound rusty steel filings and some powdered nut-galls, and with this go over the wood a second time. When dry, the work is to be well rubbed down, and if the color should appear uneven, the second stain must be repeated, in which case it must be again rubbed down. French polish, made darker than usual by the addition of finely powdered stone blue or indigo, is then to be used. Or, the black stain first mentioned to be first applied, then a plate or slate is to be held over a lamp until a quantity of the soot has formed, this, which is fine lamp black, is to be collected and mixed with French polish, which is then to be used in the ordinary manner. This, too, may be repeated if required, the work having been previously well rubbed down.

Boil in a glazed pipkin a handful of logwood chips to 1 pint of rain-water, allowing it to simmer until reduced by about one-fourth, and with this liquid give the wood two or three coats. Now add to the remainder of the liquid two bruised nut-galls, a few very rusty nails, or a piece of sulphate of iron about the size of a pigeon's egg, and add rain-water until the original quantity of liquid is made up. This stain is to be applied hot, and the work is to be French-polished, a little blue having been previously mixed with the polish.

Nut-Galls. Gall-nuts, oak-galls and galls are excrescences formed upon the young twigs of the various species of oak. Galls are also formed upon other plants, but the nut-galls of commerce are produced on the species of oak called the Quercus infectorius, a small shrub about 5 or 6 feet in height. They originate in the puncture of an insect, Cynips gallæ-tinctoria. The puncture is effected by the ovipositor of the insect, and an egg is at the same time deposited. An interruption in the ordinary functions of the tissue of the plant takes place at the spot where the egg is inserted, the consequence is, that an excrescence of vegetable matter, principally tannin, is formed round the egg, and furnishes a nidus for the grub or larva when hatched. When this takes place, the grub eats its way out through the side of the gall, after which the vitality of the excrescence either decreases or ceases altogether. Several varieties of galls are distinguished in commerce, the principal of which are the blue and white, the only difference is, that the former are gathered before, and the latter after, the insect has escaped. The color of the blue galls is a slaty blue, and something of a grayish green, the white gall is of a light drab color, and much lighter in weight, it is also less valuable than the blue variety. Nut-galls are nearly round, with a few small excrescences over their surface. They yield a fine black color with any of the salts of iron, and are used in the preparation of writing ink.

STAINING.

The practice of staining light and inexpensive woods to the colors of more rich and costly varieties is a branch of graining, and the advantage of being able to get a permanent and decorative finish upon new wood without preparatory painting is apparent to all.

Under the above heading are two distinct treatments, in one, the color effect alone is sought after, and in the other, the figure and characteristics of the wood are also imitated. Both of these methods have their proper sphere and limitations. The description and quality of the wood stained is a most important factor of its successful treatment. For instance, white wood may be stained with the colors of light oak or maple, and a rich and satisfying effect obtained. Apply, however, the same transparent glaze to sappy and knotty deal, or to light pine with a strongly marked grain, and at once it is obvious that color and grain do not agree. Ordinary pitchpine may be improved greatly by staining to the effect of walnut, but if afterwards the figure of ordinary knotted or Italian walnut were grained upon it, then an unnatural attempt at combination would be apparent. The very common and popular red staining of cheap furniture, presumably in imitation of mahogany, strikes in the mind at once a note of discord. Mahogany is an expensive wood, and therefore imitations of its color on common stuff are rather objectionable. Then, again, the color of even the cheapest mahogany cannot be obtained by a bare coating of stain, so that it is not satisfactory from either point, consistency or appearance. Mahogany, walnut, maple, and other choice woods, particularly those which are imitated best in distemper color, can, however, be beautifully grained upon prepared plain wood, with results almost equal to work done upon painted grounds. As in most of these dark varieties it is necessary to first stain the wood a general color, the pigments and fluids most serviceable for plain staining purposes may be considered from the painter's and grainer's point of view, not from the polisher's.

Preparation for plain staining is a matter of circumstance, depending upon the nature of the wood to be stained and of that to be imitated. If the wood is of the poorest quality, soft and sappy, coat it with patent glue size of fair strength. All common staining requires to be sized to enable the varnish to bear out. It is, however, advisable that, for floors and all similar surfaces exposed to hard wear, the stain should be applied first; otherwise, instead of sinking into the wood, the color is merely lying on the surface, and is more easily worn away. In oil staining ordinary house woodwork and cheap panellings, apply the size before the stain. When the former is dry, it will be found that the oil stain, which now is graining color, also can be spread much better and more regularly, and that those sappy places which would otherwise have absorbed much stain are scarcely noticeable. In sizing white or stained wood, poor work often results from the quirks and mitres of mouldings receiving too much of the froth of the warm size. This can be easily avoided by adding one teaspoonful of turpentine to every pint of size. For preparing a higher class of woodwork whose color it is chiefly the desire to alter, there are several better methods available. For staining a good specimen of pitchpine to a walnut shade, first coat with either japanners' gold size, diluted with one-third of turps, or with raw linseed oil, a little turps, and about one-tenth part of good liquid driers. The dilute gold size is the most costly and quickest, as it may be stained upon in a few hours, but for permanence and cheapness the drying oil is the best. Both are brushed on in the same manner as varnish is applied, only rather more sparingly. When plain staining or varnishing white wood, it is often necessary to avoid all possible after-discoloration arising from the oil darkening with age, and, since it is prepared from the same source, the gold size is liable to the same defect. In such a case, then, clear size or patent size should be substituted, and the whitest copal oil varnish used for the finish. One drawback common to sizing is the tendency of the fluid to raise the surface grain of the wood, this being particularly the case when the size is used hot.

Mixing oil stains, namely, stains prepared with a drying oil and painter's pigments, is a simple matter. Take 3 parts oil to 1 part of turpentine, add the liquid, or even paste, driers as before mentioned, and then the simple addition of the pigment or stainer completes the mixture. As advised for the preparatory coating, japan gold size and turps may be used for the liquid, or, better still, copal varnish may be stained and diluted with turps. The advantage of using the two last mentioned is their quickness of hardening; whilst the cheaper oil mixtures are far better for spreading evenly and regularly over large surfaces. Herewith are a few particulars of color stains, which, with the foregoing, should suffice for all ordinary purposes:

Light oak oil stain may be made from raw sienna, with the addition of a little raw Turkey umber.

Medium oak oil stain may be made from raw sienna and burnt Turkey umber.

Dark oak oil stain is best made from burnt Turkey umber alone; the yellow cast of the copal varnish, which should be used for finishing this class of work, is here sufficient to give the required trace of yellowness.

Antique oak stain is a mixture of ivory black, finely ground, with a very little burnt sienna. Vandyke brown alone makes a deep rich stain, its color, when ground in oil, being not so red as when used in distemper. This pigment, being a notably bad drier, requires fully double the usual quantity of terebine added to the oil fluid.

Walnut oil stain for varnishing upon, without any after glazing and figuring, may be colored with burnt Turkey umber and a little ivory black. For a ground color stain, that is, one on which walnut figure is to be grained, raw umber is the better pigment, since its subdued tone contrasts more naturally with the after figure work.

Pitchpine oil stains for use on light wood are formed with raw sienna, with the addition of a little burnt sienna; a little burnt umber can be added if the siennas alone are too red. In most instances the pine is cheaply prepared, and varnished with copal. The presence of so much resin and matter of a discoloring nature in pitchpine soon causes a very appreciable darkening of the original color, hence, when it is desirous to keep the wood permanently light, the copal varnish used should be of the whitest make, and the size be either strong parchment, or the special light japanners'. All holes should be carefully stopped with common putty of two shades, colored to match both the ground and grain of the wood, after the sizing. Allow it to harden for a day or so before varnishing. When the real pine is desired to be stained much darker, besides the umbers, vandyke brown, and black pigments, use may be made of diluted washes of either black japan or Brunswick black. Use only those of a thoroughly good quality, and then with pure turpentine. When staining pine dark, it is preferable to use the stain before sizing, if the grain is desired to be very prominent, a full coat should be spread, and then shortly afterwards all the stain lying on the surface may be rubbed off with old cloth or rag free from fluffiness.

Mahogany oil stain can scarcely be obtained of a good color by ordinary brush staining. Burnt sienna alone is somewhat garish, and the only perfect substitute for the victoria lake used in distemper graining is madder lake, which is too expensive for ordinary use. Whenever cheap mahogany stain is required, it should be made to match ordinary baywood as nearly as possible. For furniture and better-class work, a good mahogany effect may be obtained by oil staining with burnt sienna and vandyke, and, when dry, over-glazing with ordinary victoria or mahogany lake in water. If the wood is at all sappy and strong in markings of a nature contrary to mahogany, it must first be sized, stopped, and then oil-stained.

Cheap water stains may be made easily from any of the above pigments, which, whether used in oil or water mixtures, should always be purchased ready ground. Nearly all these colors have a natural binding quality with water alone, but the addition of a little beer will easily bind ivory or vegetable black. Water stains must always be applied directly upon the wood, and therefore there is a double disadvantage in using them. The stain itself has no filling power, so that a second coat of either size or varnish is necessary, and water stain does not spread so well with the brush as oil. Preferably, water stain is applied with a piece of sponge, and superfluous stain should be wiped off the surface.

Maple and satinwood imitations, when grained on white wood, are executed with the same water pigments and process as upon paint. The wood for these two varieties must be free from grain or knot, and must first be once sized and varnished with the whitest materials. This gives a non-absorbent ground for working the distemper stains upon. When the figure is completed another good coat of varnish gives a capital surface.

Walnut, mahogany, and similar dark woods must have the grounds sized, and then colored with oil stain to the shade nearest to the usual grounding paint. The size and stain together will suffice for working upon, but two coats of varnish are required for dark imitations of this kind. With walnut and mahogany the first coating is applied sparingly before the glazing, and a final flowing coat afterwards.

Flat varnishing or dull polishing may be used to much advantage in finishing any kind of copal-varnished or oil-stained surface. A simple preparation of the former can be made from a piece of genuine beeswax the size of a walnut dissolved, and thoroughly mixed by heat, in ½ pint of pure turpentine, and 1 ounce of copal varnish added thereto. Dull polishing may be done by carefully dulling either varnish or polish with finely ground pumice-stone and felt, or a piece of soft cloth, used with water, and then rubbing with putty-powder and oil to obtain a soft gloss.

Matching. The purpose of this process, is, as its name implies, to make the different pieces of wood of which any piece of furniture is made up, match or correspond, so that they may be of a uniform color. It will therefore be understood that some parts may require lightening, and others darkening. For the first, make a strong solution of oxalic acid in hot water, and add a few drops of spirits of nitre, and wash this carefully over the parts which are to be lightened, when quite dry, the surface should have two or three coats of white polish. Give the parts to be lightened a wash of a clear white stain, and another of white varnish, give the intermediate parts a coat of common varnish, and oil the untouched white parts, bring all up to an equal tint by a darkening stain, if necessary.

Darkening. The darkeners generally used are logwood, lime, brown, soft-soap, dyed oil, and various chemicals, such as aquafortis, sulphate of iron and nitrate of silver. An intelligent manipulation, however, of the stains themselves will render special darkeners unnecessary, for in most cases the required depth of color can be obtained by repeating the stain, or by darkening it for a second wash, and a small quantity of coloring matter may also be mixed up with the varnish.

When it is desired to deepen the natural color of woods, or to restore such as may have become discolored by time or other circumstances, the process called Improving is adopted, and this differs in no essential particular from staining, excepting that its object is merely to improve the color and bring out the natural grain of the wood itself, instead of attempting to make it represent another from which its veining may entirely differ. Barberry root boiled in water, Gamboge or Turmeric dissolved in spirit, give good yellow stains adapted for the purpose. A good red oil for rubbing discolored mahogany or rosewood, or for deeping the color of bay-wood, may be made in the following manner: Tie up some Alkanet-root in a muslin bag, and let it soak over night in some sweet oil. The oil which is then pressed from the bag will impart a beautiful red color to all the rest. The grain of the wood is well brought out by its being rubbed with ammonia before the oil is applied. Rectified naphtha, colored with Camwood dust, is another good red tint. Discolored ebony may be improved by washing over it a strong decoction of gall-nuts in which a quantity of steel filings has been immersed, this liquid should be allowed to stand a day, and should then be carefully strained, and, as before stated, a little indigo should be added to the French polish. Raw oil mixed with a small quantity of turpentine serves to improve most woods when well rubbed into them, and this may be greatly enhanced in value by grinding up with it a small quantity of the color which it is desired to impart to the wood, or by mixing with it oil previously colored in the manner already described.

The well-known pigment called Gamboge is a gummy and slightly resinous exudation from the young wood of the Gamboge-tree. Though not a dye-stuff, Gamboge is much used in coloring, forming a valuable water-color, and is also used in coloring lacquer for varnish for brass-work. There is some reason to believe that Gamboge is made from more than one species. There are three kinds of Gamboge:

Pipe Gamboge, which is the best, it comes from Siam in rolls one inch and a half in diameter and about twelve inches long, through which there is a hole about half an inch in diameter. Lump Gamboge, in masses weighing about one or two pounds, and having the appearance of a hardened yellow paste. Gamboge in tears or small drops.

Turmeric is the rhizone, or root-stalk, of a plant called the Curcuma longa. There are several varieties, of which the China and Bengal are considered the best. The colors produced by Turmeric are various and very beautiful shades of yellow. It is not as a dye-stuff considered permanent, but in the stains, when oiled or varnished, this failing is materially remedied.

Alkanet-root. The plant from which this root is obtained is of a diffuse character, rarely attaining a height of a foot. It is much cultivated in the south of France, and some portions of Germany. Its chief use is in giving a fine crimson color to perfumery and woods, for which purposes it is soaked in oil in the manner above described.

Cam-wood. This tree is a native of Sierra Leone, and has shining leaves and white flowers. It is of considerable size, often attaining the height of fifty feet. The stem is the part used, it is cut into logs about four feet in length, and these, after the removal of the bark and outer wood, are split and trimmed square for exportation, they are of a deep red color, and yield a brilliant red dye, which is rendered much deeper by sulphate of iron.

STENCILLING.

Some of the methods by which the embellishment of walls and ceilings can be achieved by means of stencilling are extremely simple, and their effectiveness when finished is far out of proportion to the smallness of the time, the labor, and the cost involved. Some of these methods it is intended briefly to indicate in this article, and the reader

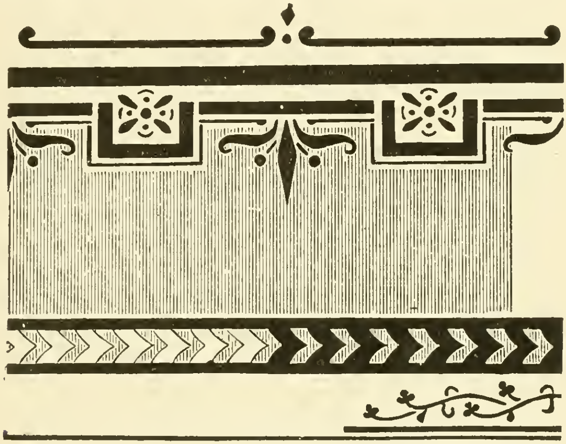


Fig. 88.

will find no difficulty in following out the directions which follow.

Fig. 88 shows a simple treatment in ashlar work suited for ornamenting a dado. Stencils have been arranged with a particular aim to their use for a drawing-room or parlor, and as giving a sensation of more decided elegance and delicacy of environment than does wall paper or paint. We have a deep frieze (Fig. 89), a base and scroll-pattern border (Fig. 90), and an ornament for the ceiling (Fig.

91). It will be seen that the frieze design will require much more care in enlarging than the one shown by Fig. 88, and also that it cannot be extended in the same manner as the latter. Some alteration in depth may be effected with the dark border-band on top. This may be omitted or, to gain width, may be repeated as a base-band to the frieze.

It will be noticed that two ground colors are suggested in the base-border (Fig. 90). On this feature much of

Fig. 89.

the charm of the effect will depend, and it well repays the trouble of first painting in the upper half with a darker or contrasting color.

The chief danger, and one that must be avoided at all cost of color prettiness, lies in the colors and tones not being balanced—that is to say, the design must be kept equally distinct and plain throughout, and not dying away into the wall in some portions. The blending of stencil ornament is scarcely a task for the novice, and perhaps the best results will be met with when the color-charm is present in the contrasting masses of color, and the designs kept full in contrast and pleasing by reason of their form and arrangement of line and curve.

A deep Gobelin or greenish blue may be used for stencilling the frieze design, or a marone brown. The base (Fig. 92) should be stencilled with similar color, upon grounds of medium Gobelin blue (upper) and wall color (lower portion). If the frieze design is done in blue, use

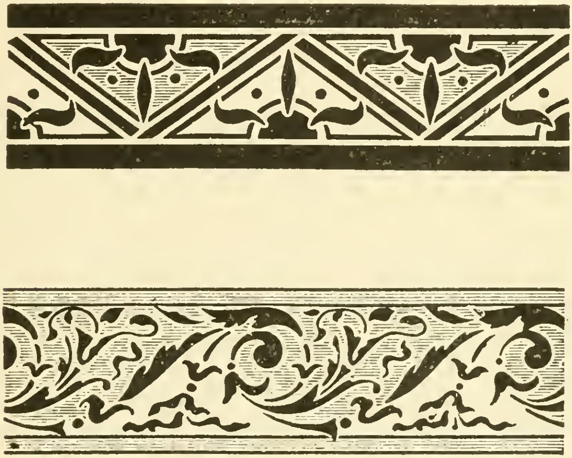


Fig. 90.

marone brown for the margin band, which is, of course, put in with a small separate stencil. The cornice will be in old gold and creams, in tone with wall filling, the ceiling gray, and the ceiling stencil in blue and marone brown upon a margin having old gold ground. The woodwork of room should be nut-brown and fawns, with a little gilding.

Stencil brushes, as shown in Figs. 93 and 94, specially made for this work are to be bought at the dealers. They are of short hair, flattened across the end for the purpose of dabbing, fixed in round handles bound in tin or brass.

Stencilling has a perfect legitimate use as a help in laying in decorations which are afterwards to be finished by hand pencilling. When stencilling is thus made only a

Fig. 91.

preliminary process, the design may be treated freely. Breadth and simplicity are no longer essentials, and in making the plates ties may be put in at random, or wherever they will give greatest strength, for all traces of them can be removed, as before said, with the pencil, yet a difficult

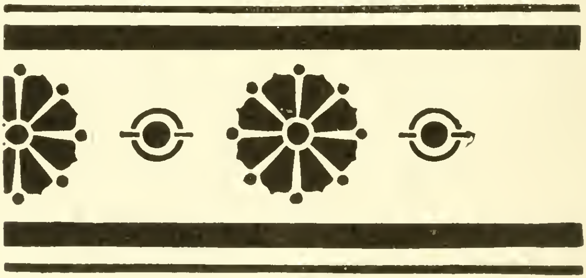


Fig. 92.

matter in purely stencilled work, as the pencil will not give precisely the same texture as the stencil brush. Thus used stencilling becomes an invaluable aid to an indifferent decorator, who by this means gets in all the main details leaving only unimportant parts to be made good afterwards by hand work.

Used as a decorative process, stencilling has a character of its own, and an interest in proportion as it is characteristic.

The design drawn, method of producing a stencil from it will be described. Stencils may be cut in vellum, paper, parchment, lead foil, and thin brass, the two latter are unsuitable to the requirements of the decorator, the lead foil being used principally by glass writers and embossers. Having prepared the paper, the process of cutting out will be found to demand the greatest care, and, above all, well ground and sharpened tools. Have an oil-stone within reach, therefore, and use it frequently. It is quite useless going to work with a blunt knife. There is much

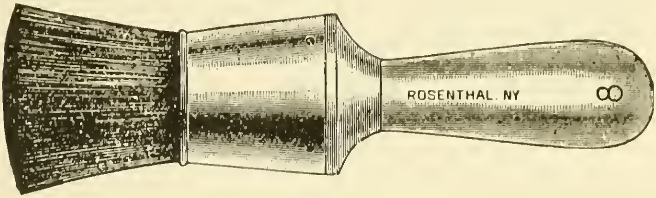


Fig. 93.

diversity of opinion as to the most suitable blade for stencil cutting. The ordinary penknife blade is scarcely graduated enough for the purpose, for sweeping round the curve in the pattern shape.

In cutting, the knife should be held firmly between the forefinger and thumb, the thicker part of the blade resting lightly against the tip of the second finger. The stencil paper should be held in its position by the left hand. In cutting a curve draw the paper gently but steadily away from the body, and consequently against the cutting blade in the direction required by the degree of curvature shown in the design. A square of plate glass is the best material for cutting on. Perforations of a circular form are made by the use of a leather-punch, procurable at any tool warehouse. These punches are made in various sizes, and are so constructed that the pieces cut out of the stencil paper by the cutting edge pass into the body of the punch, whence they are easily removed at the opening in the upper portion of the implement. It is not necessary to strike the punch, a firm pressure of the hand is generally sufficient for the purpose required, slightly turning the wrist at the same moment.

A sheet of tin might, and probably does, answer for the time, but the repeated indentations of the surface and the deep cuts or scratches it receives beneath the pressure to

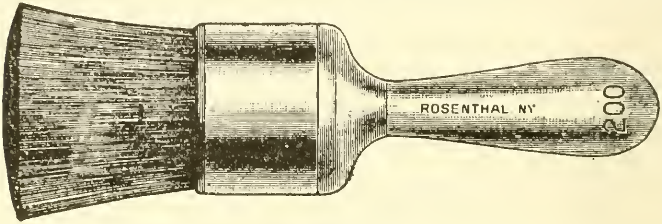


Fig. 94.

which it must of necessity be subjected, militate against its use. The edge of the knife may not be so much injured, but the point may at any moment slip into one of the scratches, and that simple deviation from the direction in which it was intended it should have gone would not improbably ruin an early completed stencil-plate.

It is, again, a frequent mistake to make a stencil on too stout a paper. The strength of paper does not depend upon its stoutness, a closely woven thin paper often possesses greater tenacity than much more bulky specimens. Heavy drawing paper may be used for almost every purpose.

TURPENTINE.

Turpentine does not burn the paint as many believe. Turpentine evaporates the slowest of any of the volatile paint solvents. It is used to give ease in working, form depth of penetration and assist in drying. Use turpentine liberally in priming or middle coats. When used in under-coatings, turpentine reduces the gravity of the oil and assists in opening the pores of the wood, thus allowing of greater depth of penetration. If used in middle coats or for recoating old surfaces, it assists in penetrating the previous coating and materially helps to cut the oil which is the gloss of the paint, leaving a better tooth for the binding of the finishing coat.

Never substitute gasoline or benzine for turpentine, they are not substitutes. Gasoline is not a paint solvent, it is the lightest of the petroleum products and worthless as a substitute for the use to which turpentine is put. Benzine and naphtha, while better paint solvents than gasoline, are light petroleum products of high specific gravity, reducing rapidly and evaporating quickly, they do not penetrate but evaporate on the surface, making the paint work hard, retarding the brushing out of paint and preventing working the pigment into the pores of the wood, leaving too much pigment and a dangerous undercoat without sufficient penetration or binder.

Study the surface to be painted and use turpentine in the reduction according to the condition of the surface. If new work, constructed of hard, close-grained lumber, more turpentine must be used than if constructed of soft, open-grained lumber of quick absorption. The liberal use of turpentine in priming improperly seasoned lumber or lumber which contains moisture will assist in producing better penetration.

In repainting an old surface, the first coat must be reduced with turpentine according to the porosity of the surface. If a hard, flinty surface, much more turpentine must be used than if porous or weather-beaten. The mixture should range from flat, half flat to semi-gloss. Never apply a heavy coating of full oil reduction.

Paint which has become fatty and gummy can be partially remedied by the addition of a small amount of turpentine. When painting in hot, humid weather, a small amount of turpentine added to the finishing coat will aid in hardening the paint.

VARNISHES.

It is not economical for painters to make these for themselves, as they may be purchased both cheaper and in most cases better than they could make them. At the same time it is well to know how to make these important compounds, for it may so occur that the materials may be obtained where the varnish itself could not, or other circumstances may render it desirable that the varnish should be made at home, a few receipts for the purpose are, therefore, given.

Table Varnish. Take of oil of turpentine 1 pound, beeswax 2 ounces, colophony 1 drachm, Dammar resin 1 pound, spirits of turpentine 2 pounds, camphor 200 grains. Allow the mixture to stand for twenty-four hours, and the portion poured off is fit for immediate use.

Furniture Varnishes. Dissolve 1½ pounds of shellac in 1 gallon of naphtha, and it will be ready for use as soon as the dissolution is complete. Dissolve 12 ounces of shellac and 3 ounces of copal, or an equivalent of Copal Varnish, in 1 gallon of naphtha. Dissolve 2 ounces mastic, 1½ pounds shellac, 4 ounces seed lac, 4 ounces sandarach, or 1 gallon of rectified spirits of wine, benzoin, and dragon's blood, tumeric and other coloring matters may be added as required.

Mahogany Varnish. Gum sandarach 2 ounces, shellac 1 ounce, gum benjamin ½ ounce, Venice turpentine 1 ounce, spirits of wine 1 pint. Color red with dragon's blood, or yellow with saffron, place the vessel containing these ingredients in a warm spot, until the gum has dissolved, then strain for use.

White Furniture Varnish. Dissolve 6 ounces of white wax in 1 pint of oil of turpentine by gentle heat, or white wax 6 parts, petroleum 48. To be applied to the work whilst warm; allowed to cool, and then to be polished by rubbing with a coarse cloth.

Dark Varnish for light wood-work. Shellac 16 parts, gum sandarach 32, gum mastic 8, gum elemi 8, dragon's blood 4, anatto 1, white turpentine 16, alcohol 256. Dilute also with alcohol, if required.

Varnish which resists boiling water. Linseed oil $1\frac{1}{2}$ pounds, amber 1 pound, pulverized litharge 5 ounces, powder white lead 5 ounces, minium 5 ounces. Boil the linseed oil in an untinned copper vessel, and suspend in it the litharge and minium in a small bag, which must not touch the bottom of the vessel. Continue the ebullition until the oil has acquired a deep brown color, then take out the bag, and put in a clove of garlic, this is to be repeated seven or eight times, the boiling being continued. Before amber is added to the oil, it is to be mixed with 2 ounces of linseed oil, and melted over a fire that is well kept up. When the mass is fluid, it is to be poured into the linseed oil, this mixture is to be boiled and stirred continually for two or three minutes. Afterwards, filter the mixture, and preserve it in a bottle well corked up. When this varnish is used the wood must be previously well polished, and covered with a thin coat of soot and spirits of turpentine. When this coat is dry, some of the varnish may be applied with a sponge, taking care that it is equally distributed on every part. This operation is to be repeated four times, being always careful that each coat be well dried before another is put over it. After the last coat of varnish the wood must be dried in an oven, and afterwards polished.

Turpentine Varnish. One pint of spirits of turpentine, 10 ounces clear resin pounded, put it in a tin can on a stove, and let it boil for half an hour. When the resin is dissolved, and the mixture has cooled, it will be ready for use.

White, hard, spirit Varnish. In three pints of rectified spirit dissolve 1 pound of gum sandarach, and add 6 ounces of turpentine. Dissolve 4 ounces gum mastic, ½ pound gum juniper, in 4 pints rectified spirit, add to the mixture 1 ounce of turpentine. Mastic in tears 2 ounces, sandarach 8 ounces, gum elemi 1 ounce, Chio turpentine 4 ounces, rectified spirit 1 quart.

Mastic Varnish. Immerse 10 ounces of the clearest gum mastic in 1 pint of turpentine, place the vessel containing the mixture in a sand bath until the mastic is all dissolved, then strain it through a fine sieve, and it will be ready for use, if too thick, it may be diluted by the addition of spirits of turpentine.

Copal Varnish. Melt 8 parts of powdered copal gum in an iron pot by slow heat, and 2 parts balsam capivi previously warmed. Then remove from the fire, and add 10 parts spirits of turpentine, also warmed, in order to reduce to the necessary degree of thickness for working.

Gum Copal is made more soluble in spirits of turpentine by melting the powdered crude gum, and allowing it to stand for some time loosely covered. Powdered copal 24 parts, spirits of turpentine 40, camphor 1, 4 ounces copal, ½ ounce camphor, 3 ounces white drying oil, 2 ounces essential oil of turpentine. Reduce the copal to powder, mix the camphor and drying oil, then heat it on a slow fire, add the turpentine and strain. As other soft resins are sometimes substituted for mastic, so inferior hard resins are sometimes employed in the place of copal, in the composition of varnishes celebrated as copal varnishes. Copal is difficult of solution in turpentine and linseed oils, both of which enter into the composition of the ordinary Copal Varnishes, which are employed by the coach painter and afford the best varnishes used by the house painter and grainer. Combined, however, with linseed oil and oil of turpentine, copal varnish affords a vehicle superior in texture, strength, and durability to mastic and its megilp, though in its application it is a less attractive instrument, and of more difficult management. As copal swells while dissolving, so its solutions and varnishes contract, and consequently crack, in drying, and thence linseed oil is essential to prevent its cracking. The mixture of copal varnish and linseed oil is best effected by the medium of oil of turpentine, and for this purpose heat is sometimes requisite.

Iron-work, Varnish for. Dissolve in about 2 pounds of tar oil, ½ pound of asphaltum and a like quantity of pounded resin, mix hot in an iron kettle, care being taken to prevent any contact with the flames. When cold the varnish is ready for use. This varnish is for outdoor work and iron-work.

Common work, Varnish for. Place 3 pounds of powdered resin in a tin can, and add 2½ pints of spirits of turpentine, shake well, and allow the mixture to stand for a day or two, shaking it occasionally. Then add 5 quarts of boiled oil, shake the whole, and allow it to stand in a warm room until clear. This clear portion is then to be poured off for use, and may be reduced in consistency by the addition of turpentine. This varnish is intended for protecting surfaces against the effects of exposure to the atmosphere, and has been used with great advantage for coating wood and iron-work.

Defects in Varnishes and their Remedies. In applying oil varnishes to different objects, various defects often make their appearance, these are in many cases very obscure in their origin, although painfully obvious in their effects. The defects may arise through faults in making the varnishes, through defects in the surface of the objects which have been varnished, through faulty methods of application, or through climatic changes. Seeing, therefore, that there are so many factors which produce defects in varnished surfaces, it is no wonder that the causes of such defects are obscure, especially as the varnisher may be of an unobservant character and fail to notice faults at the time the varnish is being applied. Cracks and pinholes:

these are often due to climatic changes, especially liable to occur in winter time, when a cold day will follow a hot or warm one. Keeping the object in a warm place for some time will tend to cure this fault, and take care that the varnish cannot get chilled while drying. Peeling, blistering, spots, and crawling are defects which may be traced to a greasy nature of the surface on which the varnish is applied. This may be due to the use of bad pinning, paint, or rubbing the work down with oily rags, or to drops of oil on the surface on which the varnish is applied, and not properly removed in the preparing operations. The remedy consists in preventing the application of oily matters to the surface, and to see that they are thoroughly removed. Sagging: this defect arises from two causes, a very greasy nature of the surface, or from applying the varnish too thickly. The varnisher is tempted to take up too much varnish on his brush, and unless he takes care to spread this well he will leave it too thick, and then sagging or running down may occur. If in the preparatory processes too thick a coat of paint is put on, the varnish may tend to soften this, and then this defect is liable to occur. Sweating and blurring may be due to defects in the manufacture of the varnish, the gums used have not been properly melted and too much of their volatile constituents left in, or the varnish may have been sent out before it was properly matured. Varnishing on a damp surface will also develop these defects. Deadening may be due to faulty preparation of the varnish, but more often it is due to climatic conditions, varnishing in too damp an atmosphere, on damp surfaces, in the presence of deleterious gases and vapors, too porous a subject, too large a proportion of driers used in making it, all of which tend to cause loss of lustre in a varnish, either immediately or after a time. It is difficult under these circumstances to point out a remedy, for one will scarcely know the exact cause in any particular case, and of course it is obvious that the remedy will vary with the cause, and what will do for one case will not do for another. The varnisher should, if he wants to produce a good job, take every precaution to prevent defects arising, for in this case an ounce of prevention is worth a ton of cure. He should see that his varnish is of good quality, that his cans and brushes are in good condition and clean, that the surface he has to varnish is in proper condition, free from grease, dry, and having a smooth surface. He should never attempt a job in wet or damp weather, and he should take care that, after varnishing, his work is not exposed to any bad influences which will retard the drying and hardening of the varnish.

VARNISHING.

Two grades of varnishes will usually be required by the painter, inside and outside. That which is used outside will cost a little more than that intended for the interior, as it must be made of materials to resist the weather. If the color of the work is dark, oak varnish is the best to use, but there are various grades of pale varnishes suitable for very light work, some can be obtained which have very little color at all. A special grade of varnish is made for application to wall paper, this, however, is a common grade of varnish, and is not recommended. It is much better to pay a little more and get a good copal varnish. Before paper is varnished it is necessary to give it two coats of size. Concentrated size powder may be used for the purpose, two coats are necessary, so as to ensure no portion of the work being missed. If this is not done the varnish will soak in the paper and leave a nasty black mark.

As a rule, a paper wall should not be varnished. The distempered surface of an ordinary paper looks much better, and it may be kept quite clean if it is frequently brushed down lightly. Dadoes are used in halls and staircases because they assist in giving a finished effect to what would otherwise have a mere bare appearance, and also because when varnished they prevent soiling of the paper by dirty hands. The dado is twice sized, care being taken to apply the size a little above the edge of the dado, so as to prevent the varnish running.

The application of the varnish to either paper or wood work requires some care. The painter is apt to try to get over the work too quickly by taking too much in his brush at once, and this is certain to lead to nasty running or tears. The best way is to dip a little more than the tip of the brush into the varnish, to apply it almost in the same manner as paint across the work, and then to finish by lightly stroking the surface all in the same direction with the tip of the brush, so that the varnish flows and the brush marks are obliterated. Special brushes are required for varnishing, and it is useless to attempt to do good work of this character with an ordinary paint brush. There is no economy in buying a cheap varnish brush. The work done with one is very likely to be marred by the bristles coming out, and such tools only last a comparatively short time. A varnish brush when put aside for a day should be put in either raw linseed oil, or, better still, in some of the same varnish in which it has been used. It should be suspended and on no account to be left to rest upon its bristles. When not required for further use for some time it should be washed out first with raw linseed oil, and then with turpentine, and then wrapped in paper and put away in a cool dry place.

When to Varnish. It might appear that it is unimportant when varnish is applied so long as the work is inside, and is not exposed to showers of rain. As a matter of fact, varnish is the most susceptible material used in painting, and the better quality it is the more sensitive is its nature. In hundreds of cases of varnish which turned out badly, it is safe to say that in nine cases out of ten the trouble is to be attributed simply to the state of the weather. If varnish is applied on a foggy day, for instance, it is almost certain to bloom, that is, a dull appearance almost like the bloom on fruit will appear on the surface. This is difficult to get rid of, although a rag dipped in kerosene oil passed over the surface will often assist. It sometimes happens that a day may be free from rain, and yet a very bad one to do varnishing because the atmosphere may be charged with humidity. A dry day and a warm one is the best for applying varnish. Still, there are other considerations which should not be overlooked. A hall which was varnished showed on one side very badly, while the other side was apparently perfect, the same varnish being used by the same workman. Such a case appears to be somewhat mysterious, the explanation of such cases is probably that the weather was cold, that the door was open during the process of varnishing, which chilled that portion of the surface reached by the cold air.

Varnish manufacturers who understand quite well the nature of their products take care to mature their varnishes by storing them in tanks for months together, and in all well-regulated varnish factories the temperature of the maturing room is kept uniform the year round, for unless this is done the products would vary greatly in use, and give a great deal of dissatisfaction. It will be seen from this that in putting varnish aside it is necessary to store it in a warm place, and to take care that it does not get chilled, if it should become very cold it is well to gently heat it before using it. In piano factories, carriage shops, and in any other places where the varnished surface must be very brilliant and uniform, it is often the custom to take the most painstaking care to prevent any marring of the varnish by cold, draughts, or dust. The temperature is kept always uniform by means of steam or hot air pipes, double doors and windows are used, and sometimes the precautions taken go to the extent that all the air entering the room is thoroughly strained and freed from dust. The workmen have clothes which they put on previous to entering the room. It is not suggested that painters should take any precautions of this kind, but mention is made of the subject here in order to impress them with the necessity of taking the greatest care with varnishing.

There are two additional reasons which give rise to unsatisfactory varnishing. The first is the habit of mixing varnishes. Experienced painters will sometimes assert that they can get a better result by mixing two varnishes together than they could by using only one. There is some excuse for the practice when the supply of a certain varnish runs out, but ordinarily it is entirely against common sense. Varnishes are made for so great a variety of purposes that there is no necessity to mix two together. A moment's reasoning will make it clear that if two varnishes mixed together would give a better result than either one used separately, that the varnish manufacturers themselves would make such a mixture before sending the varnish out. It is quite possible that the ingredients from which the varnish are made would react detrimentally one on the other. It is therefore strongly advisable for the painter not to mix varnishes under any circumstances.

The second objectionable practice alluded to is that of thinning the varnish by adding linseed oil to it; in cold weather varnish sometimes pulls, that is, it is so thick that it is a little difficult to apply without considerable strain on the wrist. In such cases the workman will sometimes add the oil, which may not show up at the time, but it is sure to eventually prove disastrous. Cases have been known where the painter, to save himself trouble, has smuggled in a small bottle of linseed oil, and has added it surreptitiously to the varnish, and caused a great deal of complaint to the manufacturers. In the above remarks only turpentine and oil varnishes have been referred to, not spirit varnish. This, however, is almost invariably mixed with stain as far as the painter's use is concerned. Under the head of Staining will be found information on this subject.

Varnishing can only be properly done by means of brushes specially made for the purpose. There is a very useful grade of varnish made which is known as rubbing varnish. This is applied in the ordinary way, and is, when dry, rubbed down with felt and water dipped in powdered pumice stone. Several coats are usually given, each being rubbed down.

WATER COLOR PAINTING.

It is difficult to give a list of the colors which are most serviceable for water color painting, but from a comparison of those employed by others, it would appear that the following twenty-four may be safely recommended as being most useful:

Black Blue, Brown Madder, Brown Pink, Burnt Sienna, Burnt Umber, Cadmium, Cobalt, Emerald Green, French Blue, Gamboge, Indian Red, Indian Yellow, Indigo, Crimson Lake, Lemon Yellow, Light Red, Payne's Gray, Prussian Blue, Raw Sienna, Rose Madder, Sepia, Vandyke Brown, Vermilion, Yellow Ochre.

These colors should be arranged in the box systematically. It will be found very convenient to place the yellow pigments at one end, the reds and browns in the center, and the blues at the other end.

In laying on the colors it must be borne in mind that if two tints be mixed the effect will be different from that produced by first laying on one and then the other above it, and if a transparent color be placed over an opaque one, the result will be different from that produced if both be blended. Thus cobalt and light red give a cool gray, but cobalt washed over light red produces a gray of an entirely different character.

It is not customary to put in the shadows with neutral tints before employing the local colors, as it has been found that the method which best represents the effects of shade is to deaden the local color by the admixture of gray or blue tones.

Colors which are complementary produce harmonious effects when opposed to each other.

Red is complementary to Green,
Blue " " Orange,
Yellow " " Purple.

White placed by the side of any color heightens its intensity, while black similarly used reduces its power, gray renders it more powerful.

Never touch a color till it is thoroughly dry; whether this is the case may be ascertained by seeing if the paper glistens; should it do so, it is unfit to work upon.

Have plenty of color in the brush, and do not be afraid to carry it boldly up to the outline.

A little powdered cuttlefish bone may be advantageously used in skies or distances to produce a slightly hazy effect. It should be rubbed in with the finger, and speedily removes any irregularity of color.

The sun should never be allowed to shine on the paper when a sketch is being made, as the eye becomes dazzled and incapable of correctly judging the colors. The color also is too rapidly dried, giving a dirty effect. This is especially the case with large washes.

Depth of tone should be produced by repeated washes of color. If the artist attempts to produce it by a single wash, it will produce an effect of paintiness, hardness, and want of transparency.

While the sketch is in progress it should be frequently viewed from a distance. Many artists throw the drawing on the ground, or even view it upside down, so as to judge of the effect as a whole, with reference to the arrangement of light and shade, and without regard to the subjects portrayed.

Primary colors must be very sparingly introduced, and broken colors, composed of various pigments, duly combined, produce very agreeable results, though it must be remembered at the same time that the purest and freshest effects result from the combination of a small number of pigments.

Local Color is the color of objects when viewed in ordinary daylight, and comparatively near to the eye. Local color is, of course, modified by increase or diminution in the brightness of the light on the increased or diminished distance from the spectator. Cast shadows are darker than the objects which throw them. Foreground objects appear to exhibit the brightest lights, the most powerful shaded sides, and also cast the strongest shadows, while the atmosphere between the sketcher and the objects in the distance and middle distance tends to reduce the value of those which are furthest from the eye.

Breadth is a most desirable quality to be aimed at, so that the lights and shades may be massed, and not cut up into small detached pieces.

The color of a drawing should not be carried in its full intensity up to the very edge, otherwise the subject will appear to be cut out, with consequent loss of atmospheric effect, and for the same reason the principal objects should not be placed too near the margin, and lines such as roads should be arranged so as to lead the eye into the picture. The area of washes should diminish as the work proceeds. The general coloring must not be darkest in the immediate foreground, but nearer to the middle distance, where also the highest lights should be placed.

Meaning and decision should always be given to all strong and dark touches.

The entire horizon must never be allowed to cut hard against the sky, and endeavors ought to be made to produce some appearance of mystery in every drawing.

Light and color should always be carried through the picture, that is, the sky should not be entirely cold whilst the landscape is warm, nor vice versa. The sky color must always be carried into the landscape.

Aerial perspective is the modification of light, shade, and color which is caused by the atmosphere, or more especially by vapor in the form of mist or haze, interposing between the spectator and the object represented. The local color of objects is modified by the intervention of atmosphere and vapor in proportion to the distance of the objects from the eye.

Atmospheric effects influence colors in light as well as in shade, modifying their distinctness, and producing that mystery which is one of the principal charms of a drawing.

Aerial perspective is greatly assisted by employing retiring colors, such as blue and gray, for the sky and distance of a landscape, colors like madders and broken reds for the middle distance, and by reserving yellow, red, and orange for the background. It is also assisted by carrying over the horizon and distance the colors of the sky and clouds in the earlier washes.

If, during the progress of the drawing, any portions of color appear to stand out too distinctly or prominently, they may be taken out with the paint rag, so that they might not obtrude or detach themselves too much from objects in the same plane.

Foregrounds. Here all color should be more or less broken. Trees of which the foliage may be brilliant green have twigs and stems of leaves which are of a warm reddish brown, the local colors are thus modified and subdued where otherwise they might appear crude. Rocks may appear gray, but lichens, with their yellow or rosy tint, warm some portions of the stone, and thus prevent the appearance of coldness. Buildings with their different materials, some of which may be toned by age and exposure, exhibit broken tints of the greatest variety and beauty.

The great difficulty with an amateur is to fill up the foreground intelligently without undue display of detail. It is most desirable therefore that herbage, heath or foreground plants should be massed as far as may be practicable, and that, in the treatment of stones, rocks or broken ground, excessive light and shade should be avoided, so as not to attract the eye too strongly and prevent it from penetrating further into the scene.

Trees. In representing these the local color should be first laid on, a little warmer in the light and deeper and cooler on the shadow side, separating definitely the lights from the shadows, and in them showing detail. When the foliage is massive, deep shadows must be added. The forms of the highest lights must be carefully rendered, and they must not be frittered away by any attempt to represent the innumerable leaves which go to make up the entire foliage.

The trunks of trees may be usually treated with warm color, purple lake or madder, combined if necessary with light red and cobalt. Both trunks and branches should be traced up and marked wherever visible. The warmth of their colors contrasts well with the coolness of the foliage, but care must be exercised that they do not come too forward, or they will destroy the appearance of roundness.

In representing trees great assistance is afforded by the modern plan of taking out. Where high lights are required, water is applied by the brush in the required form, this is removed with blotting-paper, and the color is then sharply wiped out with a handkerchief or wash-leather.

In coloring trees it must be remembered that they rarely appear as a true green. The upper part of the leaves reflect the blue or gray of sky, and the warm tints of earth are reflected on their under sides. Although the local color of trees in the foreground may be fully visible, it is much modified in the middle distance by their remoteness from the spectator, so that the tone becomes more gray than green, and the leafage is quite indistinct. In the extreme distance neither trunk nor branches are visible, and the mass is broken by the shadows occasioned by the varying positions of the trees.

It is most desirable for any one who is anxious to represent rocks with accuracy to be acquainted with the different strata and formations and with their colors when they are first fractured and after they are weathered. Rocks, by their hardness of form, naturally affect the character of the landscape. Too great an exhibition of detail gives the impression of smallness.

However delicate the tints of rocks may be, they should always be painted with more powerful pigments than those employed for the sky and cloud, otherwise they may appear weak and feeble. Variety may be given to the local color by taking up on the point of the brush when charged with the compound tints portions of pure pigment such as madder, lake, blue or gray.

Water is most difficult to represent, and the suggestions given for different tones and tints may be varied indefinitely. The colors which appear in both running and still water are largely the result of the reflections of sky, cloud, and surrounding objects, but they are also produced by the light or shade reflected from its surface, and by the color of the objects over which it flows. Smooth water should always be treated broadly and be painted as far as possible at the same time, and with the same tints, as the objects which are to be reflected in it. The reflections, if too powerful or too brilliant, may be modified by subsequent glazing.

The surface of smooth water is best represented by working the tints in a horizontal direction, but reflections in water are generally perpendicular. If the water is turbid the shadows will be visible on the surface, but in perfectly pure water they can hardly be recognized.

The first tone should be decidedly gray, as reflecting sky and clouds, and on this may be worked raw sienna and brown madder, while nearer the eye French blue, Prussian blue, or indigo may be employed. For very dark parts brown pink, purple madder, and Vandyke brown are useful. On the sea the blue should increase in depth towards the horizon, possibly, however, with a light streak just where the sky meets the water.

Waves breaking close to the shore will be warm in color, owing to the sand and seaweed underneath.

In the representation of mountains the greatest attention should be paid to accuracy of outline and to the irregularities of form, color, and shade in the general contour. The outlines present themselves at such different angles, and some will be in shade while others will be in brilliant light or half-light.

To produce the effect of ruggedness on distant mountain sides, a brush with dry color may be dragged over the surface.

Mountains may be put in with light red, and this should then be washed over with cobalt. The shadows should be worked with a deeper tint of cobalt.

Mists or Clouds in the landscape greatly assist the artist in producing aerial effects.

In painting clouds bring up the form sharply and decisively with the side of the brush. This operation is of essential importance.

Plenty of color should always be kept in the brush, and care taken to preserve the purity of the tints. When the drawing is commenced cadmium or rose madder may be washed very lightly over the entire paper, omitting very white clouds or snow. Clouds differ very much in form according to the character of the landscape, whether flat, hilly, wooded, or mountainous.

To indicate the direction of the wind, keep the edges of the clouds ragged on one side.

Sharpness of form in painting skies is needed to prevent the appearance of woolliness, and when the use of a brush with water is not sufficient to produce granulation and atmosphere, the paper may be rubbed very carefully with a piece of the finest glass-paper, this removes a little of the surface. Color afterwards applied will flow freely, and the clouds will not appear to have hard edges. The highest lights may be taken out with a sharp knife.

The foregoing directions are of the most practical character, and in the general hints for coloring various objects widely different schemes of color are suggested, but the artist's mind selects, refines, exalts the beautiful features of Nature, moulding the plastic substance to its will, and imbuing it with something of its own spirituality.

WHEN NOT TO PAINT.

There are certain times of the year when outside painting should not be done if satisfactory results are to be expected. If painting is done too early in the spring, the surface is very apt to be full of frost and moisture and the pores closed through contraction, thus producing uneven absorption. The side of the building exposed to the heat of the sun will expand and the pores open to a greater extent than the protected side of the building. All paints and oils are much heavier in cold than in warm weather, and if applied under a low temperature there is apt to be too heavy a coat over a contracted surface, which will crack through expansion under the summer heat.

Do not paint after a frost or in early spring when frost is leaving the ground, filling every part of the building with dampness. Remember that heat ascends and brings the dampness with it.

Paint should never be applied to extremely hot surfaces. Paint applied under extreme heat sets and dries very rapidly, and under the direct heat of the sun's rays is very apt to blister, especially on old work. Remember that tints absorb while white reflects heat, and when it is too hot to paint with white, remember it is also too hot to paint with tints. This should not be taken as an argument against summer painting, but only as a caution against working on extremely hot surfaces.

In spring painting follow the sun with your work. In summer painting let the sun follow you. Switch your work according to the time of the day.

Do not paint while the plaster is drying out; allow time for it to harden through. Remember there are 80 to 90 gallons of water used in every 100 yards of plastering, most of which must escape some place. If the building is tightly closed or is being dried by heat, the moisture will be largely driven out through the siding, causing the paint to break away, blister or peel.

Do not paint buildings having damp basements without first removing the cellar windows and ventilators so as to have a free circulation of air, thus drying out the under part of the building, otherwise the dampness will go up through the house between the siding and plastered wall and be attracted to the surface through the siding.

Do not paint near fresh mortar beds. The heat, moisture and fumes from the lime will be absorbed by the oil in drying, causing it to flatten out and destroying its life.

Do not paint in sultry weather or in a heavy, wet atmosphere, as the moisture from such conditions penetrates the surface to an extent that it takes several days of good drying weather for the building to again be in condition to receive paint.

Do not paint during or immediately after a heavy fog or dew. In a few hours lumber absorbs more dampness in this kind of weather than from heavy rains. Moisture from heavy fogs and dews penetrates lumber to a greater depth than from any other source. It is especially important to guard against these conditions.

In most sections of the country the season of exterior painting is comparatively short and it is a great temptation for painters who have been obliged to lie idle all winter to start early spring painting. The season of painting can be easily extended and more satisfactory results obtained by using judgment as to the best time of the year to paint a building according to its surroundings. There are very few property owners who would not be willing to extend the time of painting if shown that better and more satisfactory results can be obtained by so doing.

A building exposed to the sun and weather on all sides will dry out much quicker and be in condition to paint much earlier in the spring than one in a confined space where the sides of the building are not exposed to the sun or have no opportunity to dry out before the summer weather arrives.

A building surrounded by vines or dense foliage is in no condition to paint until the heat of the summer has drawn the moisture, not alone from the building but the ground surrounding it. The building may be so densely shaded that it will be paintable only at a time of the year when it would be impossible to apply paint to an exposed surface without danger of its blistering under the extreme heat of the sun.

Under certain conditions, better results will be obtained on a surface which is checked, cracked or shows indications of peeling, by allowing the building to stand through the summer and deteriorate to the full extent, repainting in the fall when the old, loose surface can more easily be removed.

Do not expect the paint to do all the work. It won't.

No paint manufacturer can make one paint which will meet every requirement.

Judgment must be used as to the surface to be painted.

Never use a cheap primer. The priming coat should be of the best. It is the foundation upon which all subsequent coats must be built.

The best paint, if properly applied or applied over a surface not in condition to receive paint, will not give good results.

A successful painter is one who makes a thorough study of the work on hand and knows what is necessary to use in order to produce the best results. If oil or turpentine is needed, he should know when and how much.

Good results can not be obtained on poor lumber.

Moisture is the bane of the painter and paint manufacturer. Possibly more trouble can be traced to moisture than to any other cause of paint going wrong.

Paint will blister, peel and scale if the surface painted contains moisture.

Moisture is always present in improperly seasoned or green lumber. It is often present because of defective window casings, leaky down spouts and freshly plastered walls.

It is important that the foundation should have ventilators or windows, so that there will be a free circulation of air underneath the buildings to carry off the dampness. If this precaution is not taken, the dampness will go up through the space between the plastering and siding and the sun and warm air will draw it through to the outside, causing the paint to blister, peel and scale.

Mildew is another serious trouble. This is a vegetable growth and is always a sure indication of dampness.

Do not be in a hurry with the work. Do not apply the paint too heavily.

A well-brushed-out coat of the proper consistency and plenty of time allowed for its hardening through will more than repay in the after effects for the time spent.

There is a difference between paint drying and hardening. Paint may dry in a few hours, but takes days to harden.

Light and air are essential to the proper drying of paint.

With inside painting, do not tightly close the room and expect the paint to dry. It won't.

Good results can not be had on an old surface unless it is put in proper condition to receive paint and the paint prepared and applied according to the condition of the surface.

Paint when struck with frost before it is dry wrinkles and loses its gloss.

Heavy dews on paint not dry also destroy the gloss.

There are certain times of the year when outside painting should not be done if satisfactory results are to be expected.

Do not paint too early in the spring, as the surface is very apt to be full of frost and moisture.

More complaints of peeling can be traced to early spring painting than to painting done at any other time of the year.

All paints and oils are much heavier in cold than in warm weather. If applied in a low temperature, there is apt to be too heavy a coating.

Painting should never be done in extremely hot weather.

Better and more uniform results can be obtained if the full amount of paint required for each coat is mixed at one time.

Prevent the paint from skinning over as much as possible by keeping the mixing keg covered when not in use. The formation of skin robs the paint of its drier.

Paint must be kept of a uniform consistency to give uniform results.

Where japan is used, always get the best and use it sparingly. Never add japan last or after the mixture has been thinned down.

An excess of japan will keep the paint from hardening and make spongy work.

There are very few exceptions to the statement that boiled linseed oil shonld never be used for undercoatings.

Always use pure raw linseed oil for reducing paints. Insist on having the best. See that it bears the brand of some reputable oil crusher.

There are no substitutes for linseed oil.

An excess of oil in the middle coat on new work and first coat on old work will retard the hardening and cause the finishing coat to flatten out, also very apt to cause blistering.

Tacky Paint. This is more often caused through improper application of the undercoats than through any fault of the paint.

Paint, varnish, or a similar product applied over a glossy surface or a surface which is not hard dry is much more likely to remain tacky than if applied over a thoroughly dry, half flat or flat surface.

Some paint pigments are natural dryers, while others are non-dryers. The non-drying pigments, when used in painting, if not properly prepared and applied over a suitable surface, are very apt to dry tacky and remain so.

Varnish added to oil paint will cause the paint to remain tacky. Colors in oil mixed with varnish will not harden, but soften under exposure to heat.

Always prime a building before the plasterer commences his work.

Never second or third coat a building while the plaster is drying out. A building should never be tightly closed while the plaster is drying out.

USEFUL INFORMATION.

Alabaster, To Clean. Make a paste with quick-lime and water, spread this well over the discolored article, and leave it on for about twenty-four hours, then remove with soap and water, applying some friction on parts which are worse than others. Alabaster, if not too much discolored, may be cleansed with a strong lye of soap and water, or, the superficial dirt and grease having been removed, it may be washed with diluted muriatic acid.

Glass, To Remove Grease From. Dissolve carbonate of soda in water, in the proportion of 1 of the former to 10 of the latter, and let the liquid boil in a clean untinned iron pot. Slake 8 parts of quick-lime in a covered vessel, and add the hydrate thus formed to the boiling liquid, stirring it meanwhile. Great care must be exercised in using this caustic solution, which must not be allowed to touch the hands, the glass must therefore be dipped in it by the aid of tongs or pliers. When the grease is dissolved the glass is to be well brushed and subsequently rinsed in water.

Gold Size. Heat ½ pound linseed oil in a flask, and gradually add 2 ounces of powdered gum animi, stirring the oil continuously until the whole of the gum is dissolved. Continue boiling until the mixture becomes a little thicker than tar, when it must be strained through a coarse cloth. Previous to use, it is to be ground up with sufficient vermilion to render it opaque, and turpentine must be added in order that it may work freely.

The following method of making gold size is derived from a very old source, and is given in the words of the original:

To Make Gold Size. Take Gum Animi, Asphaltum, of each 1 ounce, minium litharge of gold and umber, of each ½ ounce, reduce all into a very fine powder, and add to them, of linseed oil 4 ounces, of drying oil 8 ounces, digest over a gentle fire that does not flame, so that it may only simmer and bubble up, but not boil, for fear it should run over and set the house on fire. Keep constantly stirring with a stick till all the ingredients are dissolved and incorporated, and do not leave off stirring it till it becomes thick and ropy, and is boiled enough, let it stand till it is almost cold, and then strain it through a coarse linen cloth, and keep it for use. To prepare for use, mix with oil of turpentine during heating, and strain again, add vermilion, and thin as required with turpentine.

Iron-work, Paints for preserving. Plumbago and hot coal tar.

Equal parts of asphaltum and rosin dissolved in common turpentine.

For machinery, dissolve 2 pounds india-rubber, 4 pounds resin, 2 pounds shellac in 5 gallons of benzine. This may be used with any other paint as a vehicle.

Wrought-iron bridges, are painted with white lead as follows: The iron-work is first made clean by scrubbing and brushing it with wire brushes, this done, all the cavities and fissures are filled up with a putty of litharge, linseed oil, varnish, and white lead. This filling being dry, brushing is repeated. Afterwards paint is applied consisting of 300 pounds of white lead, 10 gallons of crude linseed oil, and 1¼ gallons of turpentine. This paint is repeated when the previous coat is sufficiently dry, and finally evenly overspread with white sand. Galvanizing is also employed to prevent rusting. A galvanizing paint consists chiefly of zinc powder and oil varnish. Rusting is further prevented by rubbing the red hot iron with wax, tallow, pitch, or coal tar. Rubbing with heavy petroleum is also well adapted for keeping iron-work clean.

Marble, Jasper, Porphyry. To clean. Mix quick-lime with very strong soap-lees until the liquid is about the consistence of milk, paint it over the substance to be cleaned, and leave it on for twenty-four hours, after which it is to be washed off, and the stone is to be well rubbed with putty-powder and olive oil.

Marble which has not been tarnished by exposure to the open air may be well washed with potash-water, and subsequently with water with which a small quantity of hydrochloric acid has been mixed.

Mix soda, pumice stone, and finely powdered chalk, in proportions of two parts of the former to one each of the latter, pass these ingredients through a fine sieve, and mix them with water so as to form a paste of some consistency. This paste on being well rubbed into the marble will remove the stains, the marble is then to be washed with soap and water, when a beautiful polish will be produced.

Clean with diluted muriatic acid, or soap and warm vinegar. Dissolve 1½ pounds of potash in a gallon of water, add 1 pound of virgin wax, and let the whole boil for half an hour, then allow it to cool, when a cake of wax will be formed on the surface. This cake is to be ground up in a marble mortar, soft water being added, until a smooth paste is formed, and this laid on the marble, and well rubbed with a piece of flannel when dry, will produce a good polish.

Paint, Anti-corrosive. Take equal parts by weight of whiting and white lead, and half the quantity of fine sand, gravel, or road-dust, and a sufficient quantity of coloring matter. This mixture is made in water, and can be used as a distemper-color, but it is more durable to dry it in cakes or powder after mixing, and then use it as an oil-paint by grinding it again in linseed oil. The proportion of oil recommended for this purpose is 12 parts by weight of linseed oil, 1 boiled linseed oil, and 3 sulphate of lime, well mixed. One gallon of this prepared oil is used to 7 pounds of the powder.

Paint, Economical. Skim milk 2 parts, fresh slaked lime 8 ounces, linseed oil 6 ounces, white Burgundy pitch 2 ounces, Spanish white 3 pounds. The lime to be slaked in water exposed to the air, mixed in one-fourth of the milk. The oil in which the pitch is previously dissolved to be added a little at a time, then the rest of the milk, and afterwards the Spanish white. This quantity is sufficient for twenty-seven square yards, two coats.

Paint for Wire-work. Boil good linseed oil with as much litharge as will make it of the consistency to be laid on with the brush, add lamp black at the rate of 1 part to every 10 by weight of the litharge, boil three hours over a gentle fire. The first coat should be thinner than the following ones.

Paint, To remove old. Wet the place with naphtha, repeating as often as is required, but frequently one application will dissolve the paint. As soon as it is softened, rub the surface clean. Chloroform, mixed with a small quantity of spirit ammonia, has been very successfully employed in removing the stains of dry paint from wood, silk, and other substances.

Paint, To destroy. Mix one part by weight of pearlash with three parts quick-stone lime, by slaking the lime in water and then adding the pearlash, making the mixture about the consistency of paint. Lay the above over the whole of the work required to be cleaned with an old brush, let it remain fourteen or sixteen hours, when the paint can be easily scraped off.

Paint, To remove. In those cases where it is requisite to remove painting entirely from its ground, it is usual to resort to mechanical scraping, or to the very dangerous operation of setting fire to the painted surface immediately after washing it over with oil of turpentine, called turps, for burning off the paint from the old disfigured work, an operation which may be safely and more easily accomplished by laying on a thick wash or plaster of fresh-slaked quick-lime, mixed with soda, which may be washed off with water the following day, carrying with it the paint, grease, and other foulness, so that, when clean and dry, the painting may be renewed as on fresh work.

Paint, Metallic. Break common resin into dust or small pieces, and dissolve in benzine or turpentine until the solution acquires the consistency of syrup or molasses, or, equal parts of each of the above hydrocarbons, and any other hydrocarbon that will dry and combine with drying oils, can be used instead of turpentine or benzine. When the solution is complete, it is gradually added to oxide of zinc, which has previously been made into a paste with boiled linseed oil, until the whole mixture acquires the consistency of a paint suitable for use. A white paint of a durable and glossy character is thus produced. Other pigments, such as sulphate of barytes, oxide of iron, Brunswick green, or red lead, can be added to make any desired color of paint. One great advantage of its use is its effectual resistance to heat and moisture. It never blisters or cracks even under the hottest sun or in the most inclement weather.

Painted work, To clean. When painted wainscot or other wood requires cleaning, soft soap and fuller's earth should be applied with a flannel. The work should proceed from the top downwards, and the water should be prevented from running on the clean parts as much as possible, or marks will be made which will appear after the whole is finished. One person should dry with a soft rag as fast as another has scoured off the dirt and washed off the soap. When the paint is soiled in parts only, and does not require a general cleaning, dip a sponge or a piece of flannel into soda and water, wash it off quickly, and dry immediately, or the soda will eat off the paint. When paint simply requires to have the dust removed from it, a cloth should not be used, but, after blowing off the loose particles with a pair of bellows, the operation should be completed with a long-haired brush. With care, paint will look well for a long time if guarded from the influence of the sun.

Painting, Effect of, on Wood. It is, of course, generally understood that the main purpose of painting wood is to preserve it from decay, but this effect is only to be expected when the wood is previously quite dry, if this is not the case, the painting is injurious instead of being beneficial to the timber. There is a cause which affects all wood most materially, which is the application of paint, tar, or pitch before the wood has been thoroughly dried. The nature of these bodies prevents all evaporation, and confines the internal moisture, which is the cause of sudden decay. Both oak and fir posts may be brought into a premature state of decay, by their having been painted prior to a due evaporation of their moisture, and painting affords no protection to timber against dry rot. On the other hand, the doors, pews, and carved work of many old churches have never been painted, and yet are often found to be perfectly sound, after having existed for centuries. Painted floor-cloths are very injurious to wooden floors, and soon produce rottenness in the floors that are covered with them, as the painted cloth prevents the access of atmospheric air, and retains whatever dampness the boards may absorb, and therefore soon causes decay, carpets are not so injurious, but still assist in retarding free evaporation.

Putty, To make. Pulverize the required quantity of whiting, which has been specially dried, and pass through a sieve of about forty-five holes to the square inch, mix the powder with as much raw linseed oil as will form it into a stiff paste, which should be well kneaded and left for a day or so, it must then be worked up, a small quantity at a time, so that it may be rendered quite smooth, and that balls of the dry whiting powder may not be imprisoned in different parts of the putty, for these would make their appearance when the putty was being used, and would of course injure the adhesiveness of the composition. Putty should be kept in an earthenware pan covered with a wet cloth. Putty which has become hardened may be made again fit for use by warming and beating it up, and kneading it whilst in that condition. For particular purposes, as for fanlights, iron-framed greenhouses, and other places where the lap or hold is very narrow, a little white lead may with advantage be added. To color putty, mix red ochre, lamp black, or other color with the whiting.

Putty, To soften. Slake some quick stone lime in water, and add one-third of the quantity of pearlash, make the mixture about the thickness of paint. Apply it with a brush to the putty on both sides of the glass, and leave it on for a day or so, the putty will then have become so softened that it may easily be removed with a glazier's knife, and the pane of glass may then be taken out.

Size, To make. Practically, size is merely glue so much diluted with water that it does not for a very long time harden in the mass, but preserves a jellified condition, and is thus sold in barrels. A better kind is however supplied, made into very thin square cakes like glue, which is principally used for sizing wood which has been stained, or for refined purposes. Parchment size is the best for distemper colors, and is made in the following manner: Place a quantity of parchment cuttings in an iron kettle, cover them with water, and allow them to soak thoroughly, from twenty-four to thirty-six hours will be required for this purpose, and should the water have been absorbed, more must be added. The whole is then to be boiled for about six hours, during which the scum which rises must be removed. It is afterwards to be strained through a coarse cloth. Size prepared in the following manner will keep good for several weeks: Dissolve 3 or 4 ounces of alum in boiling water, and add the solution to every pailful, boil and strain the size a second time, and set in a cool place.

Size, Glove-leather. Take ½ pound of the cuttings of white glove-leather, put them into water and allow them to steep for about twelve hours, add about 6 quarts of water, and allow the mixture to boil down to 1 quart, strain, and allow to coöl.

Smell of Paint, To get rid of. Place a vessel full of lighted charcoal in the middle of the room, and throw on it two or three handfuls of Juniper berries, shut the windows, the chimney, and the door, twenty-four hours afterwards the room may be opened, when it will be found that the sickly and unwholesome smell will have left. The smoke of the Juniper berries possesses this advantage, that should anything be left in the room, such as tapestry, it will not be in any way injured.

Plunge a handful of hay into a pail of water, and let it stand in the newly painted room.

Fill three or four tubs with about eight gallons of water, and an ounce of vitriol, and place them in the newly painted room near the wainscot. The water will absorb the effluvia from the paint in about three days, but it should be renewed each day during that time.

Soft Putty. This is made of whiting and boiled linseed oil, with white lead in the proportion of one-tenth of the whiting, a small quantity of salad oil is then to be added in order to prevent the white lead from hardening and cracking off, as common putty often does in certain situations.

Varnish, Green transparent. Thin some copal varnish with turpentine, grind well together equal quantities of Chinese blue and chromate of potash, and mix them thoroughly with the diluted varnish.

The precise shade of green may be varied by the different proportions in which the Chinese blue and chromate of potash are used.

For Venetian blinds, give the wood a couple of coats of light lead-color, and allow it to become perfectly hard. Grind some dry white lead in spirit of turpentine, and add to it one-third of its quantity of verdigris or navy green, which has previously been ground in oil, to this mixture add sufficient common oak varnish to bind the color. Two, or if required, three coats of this varnish are now to be applied, and as it dries very rapidly the whole may be finished in a few hours.

Varnish, To remove, from Pictures or Fine Work. By friction, if it be a soft varnish such as that of mastic, the simple rubbing of the finger ends, with or without water, may be found sufficient, a portion of the resin attaches itself to the fingers, and by continuous rubbing removes the varnish. If it be hard varnish such as that of copal which is to be removed, friction with sea or river sand, the particles of which have a rotundity that prevents their scratching, will accomplish the purpose. The solvents commonly employed for removing varnish are the several alkalies, alcohol and essential oils used simply or combined. Of the alkalies, the volatile in its mildest state, or carbonate of ammonia, is the only one which can be safely used in removing dust, oil, and varnish from a picture, which it does powerfully, it must, therefore, be much diluted with water, according to the power required, and employed with judgment and caution, stopping its action at the proper time by the use of pure water and a sponge. A thick coat of wet fuller's earth may be employed with safety, and, after remaining on the paint a sufficient time to soften the extraneous surface, may be removed by washing. Both pictures and gilding have been restored to their original beauty by the application of wet clay.

Worm in Wood-work, Prevention of. The ravages of worms and insects are among the principal causes of the destruction of timber. Some woods are more subject than others to be destroyed by them, such as alder, beech, birch, and in general all soft woods of which the juices are of a saccharine nature. Against the common worm, oil of spike is said to be an excellent remedy; and oil of juniper, or of turpentine, will prevent them in some degree. A free use of linseed oil is a good preservative, and so is a covering of copal varnish, but these can be applied to small articles only. Another application is sulphur which has been immersed in nitric acid and distilled to dryness, which, being exposed to the air, dissolves into an oil, the parts to be secured from the worm are to be anointed with this oil, which does not give an unpleasant odor to the wood. Lime is an excellent prevention against the worm, and sap-wood should always be impregnated with it when used in a dry situation. As worms do not attack bitter woods, soaking wood in an infusion of quassia has been tried, and is said to have the desired effect.

Zinc, To prepare for painting. In 64 parts of water, dissolve 1 part of chloride of copper, 1 of nitrate of copper, and 1 of sal ammoniac, and add 1 part of commercial hydrochloric acid, brush the zinc over with this mixture, which gives it a deep black, leave it to dry for twenty-four hours, when any oil color will firmly adhere to it, and withstand both heat and damp.

A Useful Cement. Alum and plaster of Paris, mixed with water and used in the liquid state, form a hard composition and a useful cement.

Barytes in Chrome Yellow. The detection of barytes in chrome yellow is a very simple matter, and as it is a very commonly employed adulterant, the following may be found useful: Put a small portion of the yellow into a test tube, add a sufficient quantity of concentrate muriatic acid, and boil. The yellow is almost immediately resolved into a white semi-crystalline chloride of lead and a green solution of chloride of chromium. A large amount of water is added to the test, which is again boiled. If there is no barytes present, a clear solution will be formed, as chloride of lead is soluble in boiling water. The barytes, if present, will be left behind as a heavy, fine white deposit, which may be washed by repeatedly boiling with water.

Bathrooms. These should be warm in coloring, to assist a feeling of warmth during the winter toilet, and they should of course be washable in every part, as otherwise the steam from hot baths may destroy the work in a very short time.

Black Varnish for Ironwork. The following is recommended as a good recipe for a black varnish for ironwork: Take ½ pound of asphaltum and ¼ pound of resin, and dissolve in 1 pint of turpentine, rub 2 ounces of lamp-black with a little linseed oil to form a paste, and stir this into the first-mentioned ingredients. The mixture, now being ready, can be painted on any ironwork with a soft flat brush.

Boiling Points. Mercury, 630° Fahrenheit, linseed oil, 266° Fahrenheit, olive oil, 412° Fahrenheit, sulphuric acid, 410° Fahrenheit, oil turpentine, 315° Fahrenheit, water, 212° Fahrenheit, and alcohol, 174° Fahrenheit.

Carver's Polish. In 1 pint of spirits of wine dissolve 2 ounces of seedlac and 2 ounces of white resin. The principal use of this polish is for the carved parts of cabinet work, such as standards, pillars, and claws. It should be laid on warm, and if the work can also be warmed at the time it will be still better. All moisture and dampness should be carefully excluded.

Cement for Marble. Stir to a thick batter with silicate of soda, 12 parts Portland cement, 6 parts slaked lime, 6 parts fine lead, 1 part infusorial earth. This is very excellent for marble and alabaster. The cemented objects need not be heated. After twenty-four hours the fracture is firm, and the place can with difficulty be found.

Cement Mortar. About 8 parts of furnace ashes, slag, or coke, 4 parts of slaked lime, and 1 of clay, are taken and mixed dry, so as to form a cement, which, on mixing with water, sets in the ordinary way. The proportions of the materials may be varied so as to produce either an aerial or hydraulic cement.

Cleaning Paint. Provide a plate with some of the best whiting to be had, and have ready some clean warm water and a piece of flannel, which dip into the water and squeeze nearly dry, then take as much whiting as will adhere to it, apply it to the painted surface, when a little rubbing will instantly remove any dirt or grease. After which wash the part well with clean water, rubbing it dry with a soft chamois leather. Paint thus cleaned looks as well as when first laid on, without injury to the most delicate colors. It is far better than using soap, and does not requre more than half the time and labor.

Durable Colors. One of the necessary qualifications of the painter is the knowledge of the colors that will stand the sun and weather. The manufactured chemical colors are generally not very durable, and are therefore not very suitable for outside work. The chrome yellows, chrome greens, and Prussian blues are fugitive, whether used alone or mixed. A combination of two colors of durable nature is often subject to change of tone. Of the more durable colors for external use, the ochres, Indian and Venetian reds, burnt and raw umbers, and burnt and raw siennas may be mentioned. Zinc white, though of less body than white lead, is more delicate and durable, and should always be used in place of white lead at the seashore, where it is especially durable. The action of the salt air injures the lead. The most durable blacks are lamp-black and vegetable black, the most durable yellows are yellow ochre and Naples yellow, both of which have a good body. Chrome yellow is fugitive, and, like other lead salts, it becomes dark in bad air. Of the reds, those to be depended on are the Venetian red, Indian red, light red, and madder lake; carmine lake, vermilion, and chrome red are best avoided on the exterior. The only blue that will stand is ultramarine, though it is expensive. Prussian blue, cobalt, Antwerp blue, and indigo will fade either singly or in combination. The umbers and siennas, burnt and raw, burnt ochres and Vandyke brown, are permanent colors. Raw umber is very durable in both water and oil, and does not injure other pigments when mixed with them. The same may be said of yellow ochre, a natural-colored clay, which does not lose its color when mixed with lime, and hence it is well adapted for distemper painting. Mixed greens are not so durable as those direct from copper, arsenic, etc., which are, however, injurious to health. Emerald green made of verdigris and a solution of arsenious acid, and Scheele's green and Vienna green, arsenites of copper, are very poisonous.

Durable Limewash. For one barrel of color wash, ½ a bushel of white lime, 3 pecks of hydraulic cement, 10 pounds umber, 10 pounds ochre, 1 pound Venetian red, and ¼ pound lamp-black. Slake the lime, melt the lamp-black with vinegar, mix well together, add the cement, and fill the barrel with water. Let it stand twelve hours before using, and stir frequently while putting it on. This is not white, but of a light stone color, without the unpleasant glare of white. The color may be changed by adding more or less of the colors named, or other colors. This wash covers well, needing only one coat, and is superior to anything excepting oil paint.

Enamelling a Bath. To remove the dirt and grease from a bath, make a strong lye of soda, say 2 pounds of soda to a pail of water, and well scrub it out with this. Then rub it well down with pumice-stone or glass-paper, then wipe out all the dust. To make a good job it will want three coats of enamel. After giving the first coat let it stand for a day, after it is dry, before applying the second, and let it be two days between the second and third coats, to allow it to get thoroughly dry, a very essential point.

Enamelling upon Glass. This is a German method for enamelling glass: A mixture of dry enamel, thick pine oil, and damar lac is laid on the glass in a semi-dried state. After drying the drawing is pressed in. The enamel is then burned. In this way it is possible to reproduce the forms of figures in slight relief, the hairs of animals, the feathers of birds, and the veins of leaves.

Filler-up for Nail-Holes. As a material for filling up nail-holes in wood and broken places, the following is recommended as simple and effectual: Take fine sawdust and mix into a thick paste with glue, pound it into the hole, and when dry it will make the wood as good as new.

Filling. A very complete filling for open cracks in floors may be made by thoroughly soaking newspapers in a paste made of 1 pound of flour, 3 quarts of water, and a tablespoonful of alum, thoroughly boiled and mixed, make the mixture about as thick as putty, a kind of paper putty, and it will harden like papier-maché.

Filling for Cracked Ceilings. Whiting mixed with glue water or calcined plaster and water makes a good putty for filling cracks in plastered ceilings.

Frost-withstanding Mortar. Mortar made in the following manner will stand if used in almost all sorts of weather; 1 bushel of unslaked lime, 3 bushels of sharp sand, mix 1 pound of alum with 1 pint of linseed oil, and thoroughly mix this with the mortar when making it, and use hot. The alum will counteract the action of the frost on the mortar.

Fugitive Colors. Lakes and vermilions are very fugitive when exposed to the light, and an endeavor must be made to mix them so as to retain their beauty and natural color the longest possible time. Varnish containing no resin gum has been found by experience to extend their life and beauty the longest.

Gilding on Iron. The following directions are for putting on japan and gilding on ironwork: The articles to be japanned are clean of oil, usually by the use of turpentine, and the japan varnish applied, when the articles are placed in a hot oven to dry. To gild japanned articles, the part to be gilded is covered with oil size, thinned with turpentine, and gold powder put on with a puff. This is then varnished and moderately heated in an oven. Leaf gold may be applied in the same way.

Glass Window Writing. To mix colors: Mix dry fine colors with clear varnish or linseed oil, turpentine, and driers, also dry colors, gold size, and turpentine. By using dry colors a good body is obtained. As to background, use quick drying varnish and dry colors or gold size and turpentine, these will dry quickly. Rich brown: 2 parts black, 1 part yellow, 3 parts red, 3 parts turpentine, 1 part oil, a little gold size, and drier. Olive color: 16 parts lemon chrome, 2 parts Prussian blue, 2 parts lampblack, 3 parts turpentine, to 1 part oil, driers, and gold size. For black letters get as much black as required, and mix with gold size and turpentine, turpentine mostly, to required thickness. Any other color can be treated in the same way. For background use pure white lead, and mix with maple varnish and turpentine, for cream color stain with lemon chrome and yellow ochre in oil and stipple with a new brush. Do not paint letters and background same day, or they will work into one another.

Green or Golden Color for Brass. The pleasing green or golden color generally to be found on the cheap and light brass articles of French manufacture can be easily produced at but trifling expense by the following means: 1¾ ounces of caustic soda and 1½ ounces of milk sugar are dissolved in 1¾ pints of water and boiled for a quarter of an hour. The solution is as clear as water at first, but gradually acquires a dark yellow color. The vessel is next taken from the fire, placed on a wooden support, and 1½ ounces of a cold concentrated solution of blue vitriol stirred in. A red precipitate of suboxide of copper is at once formed, and by the time the mixture cools to 167° Fahrenheit the precipitate will have settled. A suitable wooden sieve is placed in the vessel, and in this the polished articles are laid. In about a minute the sieve is lifted up to see how far the operation has gone, and at the end of the second minute the golden color is dark enough. The sieve and articles are now taken out, and the latter are washed and then dried in sawdust. If the brass is left longer in the copper solution, in a short time a fine green lustre is produced, becoming yellow at first and then bluish green. After, it turns green, then the well-known iridescent colors finally appear. To obtain uniform colors it is necessary that they be produced slowly, at temperatures between 135° and 170° Fahrenheit. The copper bath can be used repeatedly, and can be kept a long time, if bottled up tightly, without change. After it is exhausted it can be renewed by adding 3/8 of an ounce of caustic soda, replacing the water that has evaporated, heating to boiling, and adding 7/8 of an ounce of a cold solution of blue vitriol.

Harmonious Colors. A whole wall, ceiling, or other space should not be entirely covered over with rich ornament, and so also in a colored piece of drapery or other ornamental work, it is better to have some portion of it much less rich and of less complicated pattern than the rest, and in some cases to have only a border round a single ground destitute of any pattern, as it is apt to fatigue the eye when overloaded with an equal richness of detail throughout. This is still more important in a colored building, where, if the whole walls, columns, and other parts are covered with elaborate and colored patterns, the eye feels a want of repose, and the same when a building is covered entirely with sculptured ornament without color. The richly carved part not only requires an unsculptured portion in order that it shall not fatigue the eye, but is improved and set off by the contrast, and contrast is as necessary for effect in form, quantity of detail, position of lines, as it is in color. On this principle great effect is sometimes given to a colored pattern by having a portion of the composition on the wall of the building without any color at all, and for the same reason an expanse of wall in a room often looks well when painted with a single uniform ground surrounded by a rich pattern. Again, certain colors are better suited for some places than for others, and the brighter and more transparent for higher positions, and if the hangings of a room are scarlet, crimson with gold has a richer and better effect for chairs than scarlet and gold. A carpet may be darker than the general tone of the draperies, and some of its colors may be carried up by the walls or the curtains, but if the carpet is dark, the furniture shows better by being of a lighter hue. Red, or a light color, is better than blue for table covers, and though green is not recommended for daylight, it lights up well at night, when blue does not, and this then often appears black, or when of a light tone is scarcely to be distinguished from green. Much, however, may be done to give blue its proper effect, even by artificial light, either by placing a light tone of blue close to the darker one, or by interspersing it with white, which will often lead the eye to see the darker blue, and prevent its appearing black. This may be seen in some Persian carpets where two blues are used. And if some of these have too much green for daylight, they have a good effect at night, except when in excess. Dark green, like dark blue, looks darker by artificial light.

How to Use Glue. For glue to be properly effective it requires to penetrate the pores of the wood, and the more a body of glue penetrates the wood the more substantial the joint will remain. Glues that take the longest to dry are to be preferred to those that dry quickly, the slow drying being always the strongest, other things being equal. For general use, no method gives such good results as the following: Break the glue up small, put it into an iron kettle, cover the glue with water, and allow it to soak twelve hours. After soaking boil until done. Then pour it into an air-tight box, leave the cover off until cold, then cover up tight. As glue is required, cut out a portion and melt in the usual way. Expose no more of the made glue to the atmosphere for any length of time than is necessary, as the atmosphere is very destructive to made glue. Never heat made glue in a pot that is subject to the direct heat of a fire or a lamp. All such methods of heating glue cannot be condemned in terms too severe. Do not use thick glue for veneering or joints. In all cases work it well into the wood, in a similar manner to what painters do with paint. Glue both surfaces of the work, except in cases of veneering. Never glue hot wood, as the hot wood will absorb all the water in the glue too suddenly, and leave only a very little residue.

Inert Pigments. An inert pigment is one which, when mixed with oil, will have no chemical action upon it. It will have no chemical effect upon any other substance with which it is mixed, as for instance barytes, silica and gypsum. On the other hand, white lead, Prussian blue, and chrome yellow, are chemical colors, and are supposed to chemically affect the oil and some other pigments.

Killing the Smell of Paint. Place a vessel of burning charcoal in the center of the room and throw on it two or three handfuls of juniper berries. Shut the windows and doors close. Twenty-four hours afterwards the door may be opened, when it will be found that the smell of the paint has disappeared. This can be done without any injury to curtains and tapestries.

Making Plaster Set Quickly or Slowly. In order to make plaster set quickly, mix it with water into which a little sulphate of potash has been dissolved. To make it set slowly, mix it with fine slaked lime. The time of setting may be regulated by changing the relative quantities.

Manganese. The various compounds of manganese are perhaps more used than any other driers. Of these the black manganese contains most oxygen, but many regard it as less useful than umber, which contains considerable manganese, and also iron. Umber is thought by some to make a less sensitive oil, that is, a fluid oil, or varnish, which changes less on exposure to the cold. Both manganese and umber lose some of their substance in the oil, but to what extent manganese or iron soaps are formed with the oil acids is not known. Both umber and black manganese boiled with oil darken it.

Marbleizing Glass. One method of marbleizing glass consists in applying a mixture of varnish and oil to the surface of water of proper extent, and spraying or blowing upon the layer or film of oil and varnish dry colored powders to represent the mottled, speckled, veined, or other appearance of mottled or other stone. The glass is prepared by being coated upon one surface with varnish or japan, and is then placed upon the powder supported by the oily surfaced water, and the powder immediately adheres or fastens itself to the varnish or japan on the glass. The apparatus for distributing the color consists of a spraying device or distributor having a receptacle for the composition, which is introduced through a hole covered by a perforated cap. There is a diaphragm with holes or perforations, which are closed by a slide. This diaphragm separates the space containing the mixture from a passage or extension, the end of the casing of the passage being contracted sufficiently to fit upon the end of the bellows. To operate this device the receptacle is filled with the composition, the cap is secured in its place, and the slide lifted. The bellows are then operated, and the pressure of air drives the mixture in fine spray or drops upon the surface of the water. The device for applying the dry colors to the floating sheet or drops of oil and varnish is similar to that described, but in order that a number of colors may be sprayed or blown upon the floating oil and varnish at the same time, the receptacle is divided at the end into two or more parts, and a shaft, having agitators, is extended through them. The air is forced by bellows or other suitable means through perforations in the diaphragm. Caps cover the various chambers, etc., and are perforated to permit of the escape of the powder. In operation the air from the bellows or other source enters the perforations in the plate, and, passing through the chambers, causes the agitators to lift the powder and agitate it, and at the same time the air pressure forces the powder through the perforations in the cap in fine streams of dust, and of course by moving the distributor, the dust may be distributed upon the floating oil or varnish as may be desired. It is obvious that the design of the marble, stone, or other article is produced upon the floating body of oil and varnish before it is applied to the glass, and it is also obvious that by coating the surface of the glass with varnish or other adhesive material of a like nature, upon placing the same with the surface having the varnish or adhesive material down, so that it shall be brought in contact with the coloring matter held by the floating surface or layer of oil and varnish, the coloring matter will immediately adhere to the japan or other adhesive coating, and will thereby become fastened to the glass, so that upon the removal of the glass the design laid out upon the floating layer of japan and oil is removed from the water, together with such of the floating oil and japan as unites therewith. Of course the coloring or mottled or other appearance of any marble or other stone, or of any other material, may be reproduced upon the glass by this process, as it will only be necessary to change the dry colors to correspond to those of the stone or article to be imitated or copied.

Metallizing Wood. A new method of treating wood, which gives it the appearance of a piece of shining polished metal, with a surface so hard and smooth as to be susceptible of a high polish, is as follows: The wood is first steeped in a bath of caustic alkali for two or three days, according to its degree of permeability, at a temperature of between 165° and 197° Fahrenheit. It is then placed in a second bath of hydrosulphate of calcium, to which a concentrated solution of sulphur is added after some twenty-four to thirty-six hours. The third bath is one of acetate of lead, at a temperature of from 95° to 120° Fahrenheit, and in this latter the wood is allowed to remain from thirty to fifty hours. After being subjected to a thorough drying, it is in a condition for being polished with lead, tin, or zinc, as may be desired, finishing the process with a burnisher of either glass or porcelain, the appearance of the wood being in every respect that of polished metal, having, in fact, the semblance of a polished mirror, which is unaffected by moisture.

Moulding Composition. A composition for making good some slight portion of a defective moulding is made of powdered whiting with glue in solution worked into a paste, with a sufficiency of turpentine to destroy the brittleness, a little linseed oil may be added to prevent stickiness. The composition may be colored to suit the surroundings.

Moulding Wax. To prepare wax for taking moulds, put some common beeswax into an earthenware pot, place it over a slow fire, and when it is all melted stir into it a little white lead or plumbago, about 1 ounce of the lead to 1 pound of the wax. This mixture tends to prevent the mould from cracking when cooling, and from floating in the solution. It should be re-melted two or three times before using for the first time. Another kind is made thus: Melt carefully over a moderate fire 2 pounds of yellow beeswax, add 4½ pounds of Venice turpentine, 2 ounces of lard, 1¾ pounds of purified bole, and mix thoroughly. Then gradually pour the mixture into a vessel containing water, and thoroughly knead several times with the hands. The wax should be melted at such a low temperature that no bubbles appear upon the melted surface.

Paint for Iron. The following are anticorrosive paints for iron: Take 10 per cent. of burnt magnesia, or even baryta or strontia, and mix it cold with ordinary linseed oil paint, and then enough mineral oil to envelope the alkaline earth, the free acid of the paint will be neutralized, while the iron will be protected by the permanent alkaline action of the paint. Iron to be buried in deep earth may be painted with a mixture of 100 parts of resin, 25 parts of gutta percha, and 50 parts of paraffin, to which 20 parts of magnesia and some mineral oil have been added.

Plumber's Solder. Mix 2 or 3 parts of lead and 1 part of tin. It must be free from zinc.

Polished Floors. These should be rubbed two or three times with linseed oil, and then polished every week with turpentine and beeswax. The oftener the oil is rubbed in to begin with, the darker the boards will be.

Preserving Painted Iron. A method of preventing paint from detaching itself in large flakes from iron surfaces is as follows: First wash the surface to be painted with soap and water, rinse and let dry. When dry, go over it with a stiff brush dipped in hot linseed oil. When this becomes tacky the paint can be applied. If the object is small, and of such a nature that heating will not hurt it, raise the temperature until a drop of oil brought into contact with it smokes. Go over the surface carefully with the raw oil, and let cool. It is now ready to receive the paint. With large objects which cannot be heated, the main point is to apply the oil as hot as possible, the nearer to boiling point the better. Objects thus painted will preserve the coat of color for an indefinite period, the paint being unaffected by heat or cold, excessive moisture or excessive dryness. Wood exposed to the weather may be treated with good results in the manner indicated.

Preserving Putty. Good putty is made to harden on exposure, and consequently cans should be kept closed, and a little water, or, better still, linseed oil, should be kept on top of putty in tubs, large cans, and barrels, to prevent a hard crust from forming. A putty that shows no signs of getting stiff or hard after being open and exposed, lacks an important element of value.

Preventing Glue from Cracking. The addition of a little chloride of calcium to glue will prevent its cracking when exposed to considerable heat.

Putty for Polished Wood. Take a small quantity of white beeswax, melt it down, and, while liquid, mix with whiting, as it gets thick, keep adding boiled oil until you have it as you wish it, when using it, sheet the wood over solid, let stand until the next day, when you can remove the surplus by using No. ½ sandpaper. It is easier and cheaper than the shellac, and can be levelled sooner, leaving nothing but the pores or grain of the wood filled, which is better than having the wood all stained up with the shellac.

Removing Iron Rust. Iron rust can be removed by salt mixed with lemon juice being rubbed on, or either place the article in a bowl containing kerosene oil or wrap it in a soft cloth well saturated with the oil, allow it to remain so for two days, and then scour the rusty spots with brick-dust. If very badly rusted, use salt melted with hot sulphuric acid, after scouring well, rinse in boiling water, and polish clean with soft flannel and a little sweet oil.

Removing Spots from Ceilings. A very simple remedy for removing rain spots or such caused by water soaking through ceilings, has been employed with good results. Take unslaked white lime, dilute with alcohol, and paint the spots with it. When the spots are dry, which ensues quickly, as the alcohol evaporates, and the lime forms a sort of insulating layer, painting can be done with size color, and the spots will not show through again.

Removing Oil Stains from Marble Statuary. Make a paste with fullers' earth and hot water, cover the spots with it, let it dry on, and the next day scour it off with soap. Another recipe is to take ¼ pound soft soap, ¼ pound powdered whiting, 1 ounce soda, piece of blue the size of a walnut. Boil all together for a quarter of an hour, and rub over the marble while hot. Leave it on for twenty-four hours at least, then wash off, and polish with a coarse flannel. The above quantity is quite enough for an ordinary mantelpiece.

Restoring Antique Furniture. To restore to their original appearance antique pieces of furniture which have become unsightly on account of too frequent varnishing or besmearing by unskilled hands, the following method should be employed: Take equal parts of strong alcohol and good oil of turpentine, and heat this mixture in a bottle by placing it in hot water. With this warm liquid paint the article, whereupon the old varnish will dissolve at once. The varnish is then removed by scraping and wiping, and the spreading, scraping, and cleaning is repeated as often as necessary until the surface has become entirely clean again, so that the object may be rendered glossy, or dull, as required. This process is especially recommended, since it does not change or attack the color of the wood, as is often the case if lye is used.

Rotten Stone. This is sometimes harsh and gritty, and the best way of trying it is to take a little between the teeth, when the least portion of grit may be detected. Careful workmen will always wash it before they use it. This is effected by stirring the fine powder in a considerable quantity of water, then allowing it to remain at rest for a few seconds, and pouring the water into a glazed earthen vessel, the powder which precipitates will be very fine and smooth, by washing the remainder, the whole of the finer parts may be separated from the grit.

Rust on Marble. To remove rust from marble, an operation which depends upon the solubility of iron sulphide in a solution of potassium cyanide, is thus effected: Clay is made into a thin paste with ammonium sulphide, and the rust spot smeared with the mixture, care being taken that the spot is only just covered. After a lapse of ten minutes, this paste is washed off and replaced by one consisting of white bole mixed with a solution of potassium cyanide, 1 to 4, which is in its turn washed of after a lapse of about two and a half hours. Should a reddish spot remain after washing off the first paste, a second layer may be applied for about five minutes.

Securing Brass Letters to Glass. Every one who uses brass letters on glass windows, and knows how often they drop off from unequal expansion, or from the too energetic efforts of window cleaners, will find the following useful: Litharge 2 parts, white lead 1 part, boiled linseed oil 3 parts, gum copal 1 part. Mixed just before using, this forms a quick-drying and secure cement.

Size, or Mordant Varnish. One of the best mordants or sizes for signs or for work to be exposed to the weather, is called fat-oil size. It should be prepared as follows: Expose boiled linseed oil to a strong heat in a pan, when it begins to smoke, set fire to the oil, allow it to burn a moment, and then suddenly extinguish it by covering the pan. This will be ready for use, when cold, but will require thinning with a little turpentine.

Softening Putty. When ordinary putty becomes very hard, it may be softened for the purpose of easy removal by keeping it moist for a short time with caustic potash or soda, or if the putty be painted with nitric or muriatic acid it will be softened in about an hour.

Specks. These are liable to appear when varnish is allowed to skin over. Some varnishes will skin over although the can is constantly corked, and this skin being broken and mixing with the varnish will cause it to look sandy or seedy. The well-known common causes of specky work may be mentioned, dust or pumice powder upon the job, dirt present in the air, particularly liable in loosely or badly built shops during windy weather, and specks or lice in the varnish brush due to a variety of causes.

Sponges. New sponges should always be soaked in warm water for several hours before being used, and the water should be changed while it is at all colored. Feel the sponge all over before using, as frequently small portions of rock remain in it, the sharp points of which scratch the paint.

Strong Glue for Damp Places. For a strong glue which will hold in a damp place, the following recipe works well: Take of the best and strongest blue enough to make a pint when melted. Soak this until soft, pour off the water as in ordinary glue-making, and add a little water if the glue is likely to be too thick. When melted add three tablespoonfuls of boiled linseed oil. Stir frequently, and keep up the heat till the oil disappears, which may take the whole day, and perhaps longer. If necessary, add water to make up for that lost by evaporation. When no more oil is seen, a tablespoonful of whiting is added and thoroughly incorporated with the glue.

Sulphate of Manganese. This is a pink-colored salt, useful, especially with zinc white, for exposure to sulphur gases. The following is the formula for its use: Sulphate of manganese 1 part, calcined sulphate of zinc 1 part, and acetate of manganese 1 part. These must be ground and sifted into a fine powder, and then dusted over 97 parts of zinc white. Another method for its use is: 6 to 8 ounces of sulphate of manganese to 100 pounds of ground zinc white paint, the powder thoroughly mixed with a portion of the paint, and this portion thoroughly mixed with the whole. Unless care is taken in the mixing, the work may be spotted.

Taking Grease out of Boards. Pipeclay and water mixed together until they form a thick paste, and spread over the part where there is a stain, will take out the grease very soon. Other plans are to cover the part thickly with dry fuller's earth, or a mixture may be made of 5 parts of fuller's earth to 1 part each of pearlash and soft soap with boiling water to make a paste, lay it on quite hot, and leave till dry, and then scour it with soap or silver sand and water. For simply making the boards a good color and to keep them free from insects, use the following mixture: $\frac{1}{4}$ pound of lime and $\frac{3}{4}$ pound of sand to $\frac{1}{2}$ pound of soft soap. Lay it on the boards and scrub it in well, wash it off with clean water, and make it as dry as possible. If ink should be spilt on boards, it may be removed by the application of muriatic acid, and afterwards simply washed. For painted boards, either on the floor or wainscoting, nothing better or more cleansing can be used than fuller's earth, with or without soap.

Testing Plaster of Paris. The method of testing the quality of plaster of Paris is by taking a small pinch of the powder between the finger and thumb and gently rubbing it, if small particles of it are felt, grit indicates that parts of the plaster have already absorbed water, and it is therefore unfit for use. The same test may be observed by taking a pinch of the powder again and placing the fingers under water, and then rubbing the same way as before. If, however, in both of these tests no grit is felt, and under water a thin creamy substance is found, which is easily rubbed off the fingers, the plaster is in a proper condition for use.

To Clean White Marble. Mix together $\frac{1}{2}$ pound of pearlash, $\frac{1}{2}$ pound of soft soap, and 1 pound of whiting. Boil them until they become as thick as paste, and let the mixture cool. Before it is quite cold spread it over the surface of the marble and leave it for at least a whole day. Use a soft water to wash it off, and rub it well with soft cloths. For black marble nothing is better than spirits of turpentine.

To Perforate Glass. In drilling glass, stick a piece of stiff putty or clay where the hole is required, and make a hole in the putty the size required, reaching down to the glass. Pour a little molten lead in the hole, and if the glass is not too thick, the piece will at once drop out.

To Polish Marble. To polish marble, such as table-tops, the following mode is followed by masons: With a piece of sandstone with a very fine grit rub the slab backward and forward, using very fine sand and water, till the marble appears equally rough, and not in scratches, next use a finer stone and finer sand, till its surface appears equally gone over, then, with fine emery powder and a piece of felt or old hat wrapped around a weight, rub till all the marks left by the former process are worked out, and it appears with a comparative gloss on its surface. Afterwards finish the polish with putty powder and fine clean rags. As soon as the face appears of a good gloss, do not put any more powder on the rag, but rub it well, and in a short time it will appear as if fresh from the mason's hands.

To Remove Rust. A mixture of kerosene oil and emery powder rubbed on with a piece of cloth makes steel as bright as a button. But as prevention is better than cure, to prevent the formation of rust the bright steel should be painted with wax varnish, made by dissolving 1 part of solid paraffin in 15 parts of benzole. This is a much more cleanly application than such fatty compounds as white lead and oil, and is well suited for steel grates and similar goods.

Transparent Paints for Glass. Take for a blue pigment Prussian blue, for red crimson lake, for yellow Indian yellow, for brown burnt sienna, for black lamp-black, and for other shades a mixture of the appropriate colors. Rub them in a size made as follows: Venice turpentine 2 ounces, oil of turpentine 1 ounce, and apply with a brush. For temporary purposes, fine and brilliant colors are obtained by dissolving aniline dyes in white shellac varnish, but they are fleeting colors, and do not always pay for the trouble.

Useful Size. A useful preparatory size can be made by boiling a handful of the leaves of wormwood and two or three heads of garlic in a quart of water, until the liquid is reduced to one-half, then strain it through a cloth, and add half a handful of common salt, and nearly half a pint of vinegar. The design of this composition, usually employed in gilding looking-glass and picture frames, is to obviate the greasiness of the wood, and prepare it the better to receive the coats which are to be laid on, and to preserve it from the ravages of worms. When used it is mixed with a sufficient portion of good glue, boiling hot. In applying it to the gilding of plaster or marble, the salt must be left out of its composition, as, in damp situations, this would produce a white saline efflorescence on the surface of the gold.

Varnishes for Engravings, Paints, and Maps. A piece of plate glass is heated, and while yet warm a little wax rubbed over it, water is then poured over the plate, the moistened picture laid thereon and pressed closely down by means of a piece of filtering paper. When dry the picture is removed, and will be found to possess a surface of great brilliancy, which is not injured by the process of mounting. Boil Chio turpentine till brittle, then powder and dissolve in oil of turpentine. Canada balsam and clear white resin of each 6 ounces, oil of turpentine 1 quart, dissolve. Digest gum sandarach 20 parts, gum mastic 8 parts, camphor 1 part, with alcohol 48 parts. The map or engraving must previously receive one or two coats of gelatine.

Waterproof Glue. Dissolve ½ ounce each of gum sandarach and mastic in 8 fluid ounces of strong alcohol, to which add ½ ounce of turpentine. Put the dissolved gums into a double glue-pot, add by degrees a hot thick solution of glue to which isinglass has been added, stir the whole over the fire until all the ingredients are thoroughly incorporated. Next strain through a cloth while hot, and it is ready for use. It may now be returned to the glue-pot, and ½ ounce of very finely powdered glass added to it. It should be used quite hot. Take of shellac 3 parts, india-rubber 1 part by weight. Dissolve each separately in ether free from alcohol. It is best to do this in stoppered bottles and without heating, as the ether readily evaporates.

When solution is complete, mix the two, and keep well stoppered for use.

Waterproof Wash for Lime. This may be made by mixing the powder from 3 parts rock quartz, 3 parts broken marble and sandstone, also 2 parts burned porcelain clay with 3 parts freshly slaked lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes finally like stone. It is applied thickly to the surface, allowed to dry for a day, and the next day frequently wetted, which makes it waterproof.

Whitewash that will not Rub off. Mix up half a pailful of lime and water, ready to put on the wall, then take ¼ pint of flour, mix it with water, then pour on it a sufficient quantity of boiling water to thicken it, and pour it while hot into the whitewash, stir all well together, and it is ready for use.

Writing on Glass. To write on glass, or, as it is properly termed, to etch, as the letters are eaten out by an acid, either liquid hydrofluoric acid or hydrofluoric acid gas is required, according to the effect desired to produce. The former eats away the glass but leaves it clear, the latter gives the part operated upon, a ground-glass appearance. For the first way, clean a piece of glass, warm it, rub over with white wax or beeswax, and trace the letters with a needle or penknife, going down to the surface of the glass, make a wall of wax all round the edge of the glass, and pour on hydrofluoric acid, and leave for two or three hours, then clean with turpentine. To produce letters with a ground-glass appearance, place in a leaden dish 2 parts of powdered fluoride of calcium, pour on 3 parts of sulphuric acid, and with a stick mix into a paste. Prepare the glass as before, except that there is no need for a wall of wax around the edges, cover the leaden vessel with this piece of glass, and by warming the vessel gas will be evolved which will attack every clear part of the glass. The workman must be very careful indeed in using the acid, of the gas, the fumes, if breathed, are highly injurious, causing ulcers on the lungs, whilst drops of the acid on the skin will act like a red-hot iron, and produce very painful sores, which are not very easily healed. Opal can also be treated as described above, and the letters colored or enamelled afterwards, or china colors may be used and the opal fired. White letters on colored glass may be obtained by using flashed glass, and treating the flashed side with acid, which is soon eaten through, leaving the plain glass underneath.

Zinc Sheeting Paints. A very durable weather-resisting paint for zinc sheets is made by mixing oxide of zinc with a fluid silicate, such as water glass and potash and soda, to which the required pigments are added. The proportion should be about three-quarters of a pound of zinc white to every pound of silicate, with or without water. This zinc silicate paint becomes insoluble in water in about twenty-four hours. It is equally useful for interior and outside work, but it must not be applied to greasy surfaces, nor to old coats of paint. New zinc, not being oxidized, should first be prepared by the application of a solution of 1 part of soda in 10 parts of water, and then be thoroughly washed with water only. A quick drying, weather-resisting paint of dark color for zinc sheets is made by mixing 5 pounds of graphite with 1 gallon of vinegar. The oxidized surface of the zinc, previously well brushed, is painted with the above, one coat giving a sufficiently dark color. New sheet zinc, however, requires two coats, and must first be oxidized by the following application, which is not strong enough to cause any deterioration of the metal: 1 part each of chloride of copper, nitrate of copper, and sal ammoniac, dissolved in 64 parts of water, and 1 part of hydrochloric acid added to the solution.

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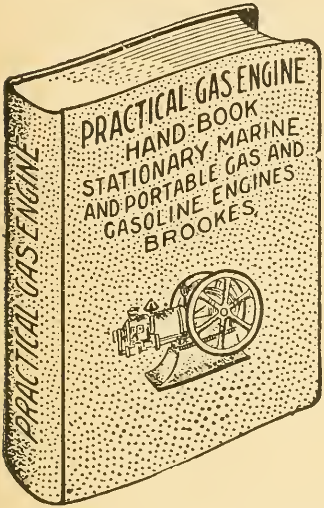
The Practical Gas & Oil Engine HAND-BOOK



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